

*Handbooks in
Finance*



HANDBOOK of CORPORATE FINANCE

EMPIRICAL CORPORATE FINANCE
Volume 2

Editor: B. Espen Eckbo



North-Holland

**HANDBOOK OF
CORPORATE FINANCE:
EMPIRICAL CORPORATE FINANCE
VOLUME 2**

HANDBOOKS IN FINANCE

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EMPIRICAL CORPORATE FINANCE

VOLUME 2

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William T. Ziemba
University of British Columbia

Publisher's Note

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PREFACE: EMPIRICAL CORPORATE FINANCE

Judging by the sheer number of papers reviewed in this Handbook, the empirical analysis of firms' financing and investment decisions—empirical corporate finance—has become a dominant field in financial economics. The growing interest in everything “corporate” is fueled by a healthy combination of fundamental theoretical developments and recent widespread access to large transactional data bases. A less scientific—but nevertheless important—source of inspiration is a growing awareness of the important social implications of corporate behavior and governance. This Handbook takes stock of the main empirical findings to date across an unprecedented of corporate finance issues, ranging from econometric methodology, to raising capital and capital structure choice, and to managerial incentives and corporate investment behavior. The surveys are written by leading empirical researchers that remain active in their respective areas of interest. With few exceptions, the writing style makes the chapters accessible to industry practitioners. For doctoral students and seasoned academics, the surveys offer dense roadmaps into the empirical research landscape and provide suggestions for future work.

Part 1 (Volume 1): Econometric Issues and Methodological Trends

The empirical corporate finance literature is progressing through a combination of large-sample data descriptions, informal hypotheses testing, as well as structural tests of theory. Researchers are employing a wide spectrum of econometric techniques, institutional settings, and markets structures in order to distill the central message in the data. Part 1 of Volume 1 begins by reviewing key econometric issues surrounding event studies, and proceeds to explain the econometrics of self-selection. It then explains and illustrates methodological issues associated with the growing use of auction theory, and it ends with a discussion of key elements of the corporate finance evidence from a behavioral perspective.

In Chapter 1, “Econometrics of Event Studies,” S.P. Kothari and Jerold Warner review the power of the event-study method; the most successful empirical technique to date for isolating the price impact of the information content of corporate actions. The usefulness of event studies arises from the fact that the magnitude of abnormal performance at the time of an event provides a measure of the (unanticipated) impact of this type of event on the wealth of the firms' claimholders. Thus, event studies focusing on announcement effects for a short horizons around an event provide evidence relevant for understanding corporate policy decisions. Long-horizon event studies also serve an important purpose

in capital market research as a way of examining market efficiency. The survey discusses sampling distributions and test statistics typically used in event studies, as well as criteria for reliability, specification and power. While much is known about the statistical properties of short-horizon event studies, the survey provides a critical review of potential pitfalls of long-horizon abnormal return estimates. Serious challenges related to model specification, skewness and cross-correlation remain. As they also point out, events are likely to be associated with return-variance increases, which are equivalent to abnormal returns varying across sample securities. Misspecification induced by variance increases can cause the null hypothesis to be rejected too often unless the test statistic is adjusted to reflect the variance shift. Moreover, the authors emphasize the importance of paying close attention to specification issues for nonrandom samples of corporate events.

Self-selection is endemic to voluntary corporate events. In Chapter 2, “Self-Selection Models in Corporate Finance,” Kai Li and Nagpurnanand Prabhala review the relevant econometric issues with applications in corporate finance. The statistical issue raised by self-selection is the wedge between the population distribution and the distribution within a selected sample, which renders standard linear (OLS/GLS) estimators biased and inconsistent. This issue is particularly relevant when drawing inferences about the determinants of event-induced abnormal stock returns from multivariate regressions, a technique used by most event studies today. These regressions are typically run using samples that exclude non-event firms. The standard solution is to include a scaled estimate of the event probability—the inverse Mills ratio (the expected value of the true but unobservable regression error term)—as an additional variable in the regression. Interestingly, as the authors point out, testing for the significance of the inverse Mills ratio is equivalent to testing whether the sample firms use private information when they self-select to undertake the event. Conversely, if one believes that the particular event being studied is induced by or reflects private information (market overpricing of equity, arrival of new investment projects, merger opportunities, etc.), then consistent estimation of the parameters in the cross-sectional regression requires the appropriate control for self-selection. What is “appropriate” generally depends on the specific application and should ideally be guided by economic theory. The survey also provides a highly useful overview of related econometric techniques—including matching (treatment effect) models, panel data with fixed effects, and Bayesian self-selection models—with specific applications.

In Chapter 3, “Auctions in Corporate Finance,” Sudipto Dasgupta and Robert Hansen introduce auction theory and discuss applications in corporate finance. The authors explain theoretical issues relating to pricing, efficiency of allocation (the conditions under which the asset is transferred to the most efficient buyer), differential information, collusion among buyers, risk aversion, and the effects of alternative auction designs (sealed-bids versus open auction, seller reserve price, entry fees, etc.). It is important for empirical research in corporate finance to be informed of auction theory for at least two reasons. First, when sampling a certain transaction type that in fact takes place across a variety of transactional settings, auction theory helps identify observable characteristics

that are likely to help explain the cross-sectional distribution of things like transaction/bid prices, expected seller revenues, valuation effects, and economic efficiency. This is perhaps most obvious in studies of corporate takeovers (negotiation versus auction, strategic bidding behavior, etc.) and in public security offerings (role of intermediaries, degree and role of initial underpricing, long-run pricing effects, etc.). Second, auction theory provides solutions to the problem of optimal selling mechanism design. This is highly relevant in debates over the efficiency of the market for corporate control (negotiations versus auction, desirability of target defensive mechanisms, the role of the board), the optimality of the bankruptcy system (auctions versus court-supervised negotiations, allocation of control during bankruptcy, prospects for fire-sales, risk-shifting incentives, etc.), and the choice of selling mechanism when floating new securities (rights offer, underwritten offering, fixed-price, auction, etc.).

In Chapter 4, “Behavioral Corporate Finance,” Malcolm Baker, Richard Ruback and Jeffery Wurgler survey several aspects of corporate finance and discuss the scope for competing behavioral and rational interpretations of the evidence. The idea that inherent behavioral biases of CEOs—and their perception of investor bias—may affect corporate decisions is both intuitive and compelling. A key methodological concern is how to structure tests with the requisite power to discriminate between behavioral explanations and classical hypotheses based on rationality. The “bad model” problem—the absence of clearly empirically testable predictions—is a challenge for *both* rational and behavioral models. For example, this is evident when using a scaled-price ratio such as the market-to-book ratio (B/M), and where the book value is treated as a fundamental asset value. A high value of B/M may be interpreted as “overvaluation” (behavioral) or, alternatively, as B poorly reflecting economic fundamentals (rational). Both points of view are consistent with the observed inverse relation between B/M and expected returns (possibly with the exception of situations with severe short-selling constraints). Also, measures of “abnormal” performance following some corporate event necessarily condition on the model generating expected return. The authors carefully discuss these issues and how researchers have tried to reduce the joint model problem, e.g., by considering cross-sectional interactions with firm-characteristics such as measures of firm-specific financing constraints. The survey concludes that behavioral approaches help explain a number of important financing and investment patterns, and it offers a number of open questions for future research.

Part 2 (Volume 1): Banking, Public Offerings, and Private Sources of Capital

In Part 2, the Handbook turns to investment banking and the capital acquisition process. Raising capital is the lifeline of any corporation, and the efficiency of various sources of capital, including banks, private equity and various primary markets for new securities is an important determinant of the firm’s cost of capital.

In Chapter 5, “Banks in Capital Markets,” Steven Drucker and Manju Puri review empirical work on the dual role of banks as lenders and as collectors of firm-specific

private information through the screening and monitoring of loans. Until the late 1990s, U.S. commercial banks were prohibited from underwriting public security offerings for fear that these banks might misuse their private information about issuers (underwriting a low quality issuer and market it as high quality). Following the repeal of the Glass–Steagall Act in the late 1990s, researchers have examined the effect on underwriter fees of the emerging competition between commercial and investment banks. Commercial banks have emerged as strong competitors: in both debt and equity offerings, borrowers receive lower underwriting fees when they use their lending bank as underwriter. The evidence also shows that having a lending relationship constitutes a significant competitive advantage for the commercial banks in terms of winning underwriting mandates. In response, investment banks have started to develop lending units, prompting renewed concern with conflicts of interest in underwriting. Overall, the survey concludes that there are positive effects from the interaction between commercial banks' lending activities and the capital markets, in part because the existence of a bank lending relationship reduces the costs of information acquisition for capital market participants.

In Chapter 6, “Security Offerings,” Espen Eckbo, Ronald Masulis and Øyvind Norli review studies of primary markets for new issues, and they extend and update evidence on issue frequencies and long-run stock return performance. This survey covers all of the key security types (straight and convertible debt, common stock, preferred stock, ADR) and the most frequently observed flotation methods (IPO, private placement, rights offering with or without standby underwriting, firm commitment underwritten offering). The authors review relevant aspects of securities regulations, empirical determinants of underwriter fees and the choice of flotation method, market reaction to security issue announcements internationally, and long-run performance of U.S. issuers. They confirm that the relative frequency of *public* offerings of seasoned equity (SEOs) is low and thus consistent with a financial pecking order based on adverse selection costs. They also report that the strongly negative announcement effect of SEOs in the U.S. is somewhat unique to U.S. issuers. Equity issues in other countries are often met with a significantly positive market reaction, possibly reflecting a combination of the greater ownership concentration and different selling mechanisms in smaller stock markets. They conclude from this evidence that information asymmetries have a first-order effect on the choice of which security to issue as well as by which method. Their large-sample estimates of post-issue long-run abnormal performance, which covers a wide range of security types, overwhelmingly reject the hypothesis that the performance is ‘abnormal.’ Rather, the long-run performance is commensurable with issuing firms’ exposures to commonly accepted definitions of pervasive risk factors. They conclude that the long-run evidence fails to support hypotheses which hold that issuers systematically time the market, or hypotheses which maintain that the market systematically over- or under-reacts to the information in the issue announcement.

The cost of going public is an important determinant of financial development and growth of the corporate sector. In Chapter 7, “IPO Underpricing,” Alexander Ljungqvist surveys the evidence on one significant component of this cost: IPO underpricing, commonly defined as the closing price on the IPO day relative to the IPO price. He classifies

theories of underpricing under four broad headings: ‘asymmetric information’ (between the issuing firm, the underwriter, and outside investors), ‘institutional’ (focusing on litigation risk, effects of price stabilization, and taxes), ‘control’ (how the IPO affects ownership structure, agency costs and monitoring), and ‘behavioral’ (where irrational investors bid up the price of IPO shares beyond true value). From an empirical perspective, these theories are not necessarily mutually exclusive, and several may work to successfully explain the relatively modest level of underpricing (averaging about 15%) observed before the height of the technology-sector offerings in 1999–2000. Greater controversy surrounds the level of underpricing observed in 1999–2000, where the dollar value of issuers’ underpricing cost (‘money left on the table’) averaged more than four times the typical 7% investment banking fee. Two interesting—and mutually exclusive—candidate explanations for this unusual period focus on inefficient selling method design (failure of the fix-priced book-building procedure to properly account for the expected rise in retail investor demand) and investor irrationality (post-offering pricing ‘bubble’). Additional work on the use and effect of IPO auctions, and on the uniquely identifying characteristics of a pricing ‘bubble,’ is needed to resolve this issue.

Multidivisional (conglomerate) firms may exist in part to take advantage of internal capital markets. However, in apparent contradiction of this argument, the early literature on conglomerate firms identified a ‘conglomerate discount’ relative to pure-play (single-plant) firms. In Chapter 8, “Conglomerate Firms and Internal Capital Markets,” Vojislav Maksimovic and Gordon Phillips present a comprehensive review of how the literature on the conglomerate discount has evolved to produce a deeper economic understanding of the early discount evidence. They argue that issues raised by the data sources used to define the proper equivalent ‘pure-play’ firm, econometric issues arising from firms self-selecting the conglomerate form, and explicit model-based tests derived from classical profit-maximizing behavior, combine to explain the discount without invoking agency costs and investment inefficiencies. As they explain, a firm that chooses to diversify is a different type of firm than one which stays with a single segment—but either type may be value-maximizing. They conclude that, on balance, internal capital markets in conglomerate firms appear to be efficient in reallocating resources.

After reviewing internal capital markets, bank financing, and public securities markets, Volume 1 ends with the survey “Venture Capital” in Chapter 9. Here, Paul Gompers defines venture capital as “independent and professionally managed, dedicated pools of capital that focus on equity or equity-linked investments in privately held, high-growth companies.” The venture capital industry fuels innovation by channeling funds to start-up firms and, while relatively small compared to the public markets, has likely had a disproportionately positive impact on economic growth in the United States where the industry is most developed. The empirical literature on venture capital describes key features of the financial contract (typically convertible preferred stock), staging of the investment, active monitoring and advice, exit strategies, etc., all of which affect the relationship between the venture capitalist and the entrepreneur. While data sources are relatively scarce, there is also growing evidence on the risk and return of venture capital

investments. Paul Gompers highlights the need for further research on assessing venture capital as a financial asset, and on the internationalization of venture capital.

Part 3 (Volume 2): Dividends, Capital Structure, and Financial Distress

The first half of Volume 2 is devoted to the classical issue of capital structure choice. This includes the effect of taxes, expected bankruptcy costs, agency costs, and the costs of adverse selection in issue markets on the firm's choice of financial leverage and dividend policy. More recent empirical work also links debt policy to competition in product markets and to the firm's interaction with its customers and suppliers. There is also substantial empirical work on the effect on expected bankruptcy and distress costs of the design of the bankruptcy code, where claim renegotiation under court supervision (such as under Chapter 11 of the U.S. code) and auctions in bankruptcy (such as in Sweden) are major alternatives being studied.

In Chapter 10, "Payout Policy," Avner Kalay and Michael Lemmon refer to payout policy as "the ways in which firms return capital to their equity investors." Classical dividend puzzles include why firms keep paying cash dividends in the presence of a tax-disadvantage relative to capital gains, and why dividend changes have information contents. In contrast to increases in debt interest payments, dividend increases are not contractually binding and therefore easily reversible. So, where is the commitment to maintain the increased level of dividends? While there is strong evidence of a positive information effect of unanticipated dividend increases, they argue that available signaling models are unlikely to capture this empirical phenomenon. Moreover, there is little evidence that dividend yields help explain the cross-section of expected stock returns—which fails to reveal a tax effect of dividend policy. Recent surveys indicate that managers today appear to consider dividends as a second order concern after investment and liquidity needs are met, and to an increased reliance on stock repurchase as an alternative to cash payouts.

In Chapter 11, "Taxes and Corporate Finance," John Graham reviews research specifically relating corporate and personal taxes to firms' choice of payout policy, capital structure, compensation policy, pensions, corporate forms, and a host of other financing arrangements. This research often finds that taxes do appear to affect corporate decisions, but the economic magnitude of the tax effect is often uncertain. There is cross-sectional evidence that high-tax rate firms use debt more intensively than do low-tax rate firms, but time-series evidence concerning whether firm-specific changes in tax status affect debt policy is sparse. Many firms appear to be "underleveraged" in the sense that they could capture additional tax-related benefits of debt at a low cost—but refrain from doing so. Conclusions concerning "underleverage" are, however, contingent on a model of the equilibrium pricing implications of the personal tax-disadvantage of interest over equity income, a topic that has been relatively little researched. Graham also points to the need for a total tax-planning view (as opposed to studying tax issues one by one) to increase the power of tests designed to detect overall tax effects on firm value.

In Chapter 12, “Tradeoff and Pecking Order Theories of Debt,” Murray Frank and Vidhan Goyal review the empirical evidence on firms capital structure choice more generally. Under the classical tradeoff theory, the firm finds the optimal debt level at the point where the marginal tax benefit of another dollar of debt equals the marginal increase in expected bankruptcy costs. This theory is somewhat challenged by the evidence of underleverage surveyed by Graham. However, corporate leverage ratios appears to be mean-reverting over long time horizons, which is consistent with firms trying to maintain target leverage ratios. This target may reflect transaction costs of issuing securities, agency costs, and information asymmetries as well as taxes and bankruptcy costs, and the available evidence does not indicate which factors are the dominant ones. They report several stylized facts about firms leverage policies. In the aggregate for large firms (but not for small firms), capital expenditures track closely internal funds, and the “financing deficit” (the difference between investments and internal funds) track closely debt issues. This is as predicted by the “pecking order” hypothesis, under which debt is preferred over equity as a source of external finance. For small firms, however, the deficit tracks closely equity issues, which reverses the prediction of the pecking order. The authors conclude that “no currently available model appears capable of simultaneously accounting for the stylized facts.”

In Chapter 13, “Capital Structure and Corporate Strategy,” Chris Parsons and Sheridan Titman survey arguments and evidence that link firms’ leverage policies to structural characteristics of product markets. Capital structure may affect how the firm chooses to interact with its non-financial stakeholders (customers, workers, and suppliers concerned with the firm’s survival) as well as with competitors. To account for endogeneity problems that commonly arise in this setting, most papers in this survey analyze firms’ responses to a “shock,” whether it be a sharp (and hopefully unanticipated) leverage change, an unexpected realization of a macroeconomic variable, or a surprising regulatory change. This approach often allows the researcher to isolate the effect of leverage on a firm’s corporate strategy, and in some cases, makes it possible to pinpoint the specific channel (for example, whether a financially distressed firm lowers prices in response to predation by competitors or by making concessions to its customers). There is evidence that debt increases a firm’s employment sensitivity to demand shocks (perhaps perpetuating recessions), but can also protect shareholder wealth by moderating union wage demands. Excessive leverage can also inhibit a firm’s ability to compete in the product market, as measured by prices and market shares. Firms that depend crucially on non-fungible investments from stakeholders are most sensitive to these losses, and choose more conservative capital structures as a result.

To avoid formal bankruptcy, financially distressed firms engage in asset sales, equity issues and debt renegotiations. In Chapter 14, “Bankruptcy and the Resolution of Financial Distress,” Edith Hotchkiss, Kose John, Robert Mooradian and Karin Thorburn survey empirical work on the costs, benefits, and effectiveness of out-of-court debt workouts and of formal “one size fits all” bankruptcy procedures. Failing to renegotiate their debt claims out of court, the firm files for bankruptcy, where it is either liquidated piecemeal or restructured as a going concern under court protection. For reasons that are poorly

understood, different bankruptcy systems have evolved in different countries, with a trend toward the structured bargaining process characterizing Chapter 11 of the U.S. code. The U.S. code substantially restricts the liquidation rights of creditors as filing triggers automatic stay of debt payments, prevents repossession of collateral, and allows the bankrupt firm to raise new debt with super-priority (debtor-in-possession financing). In contrast, UK bankruptcy is akin to a contract-driven receivership system where creditor rights are enforced almost to the letter. Here, assets pledged as collateral can be repossessed even if they are vital for the firm, and there is no stay of debt claims. This makes it difficult to continue to operate the distressed firm under receivership, even if the bankrupt firm is economically viable. A third system is found in Sweden where the filing firm is automatically turned over to a court-appointed trustee who arranges an open auction (while all debt claims are stayed). The authors survey the international evidence on bankruptcies (which also includes France, Germany, and Japan). They conclude that it remains an open question whether Chapter 11 in the U.S.—with its uniquely strong protection of the incumbent management team—represents an optimal bankruptcy reorganization procedure.

Part 4 (Volume 2): Takeovers, Restructurings, and Managerial Incentives

Modern corporate finance theory holds that in a world with incomplete contracting, financial structure affects corporate investment behavior and therefore firm value. The Handbook ends with comprehensive discussions of the value-implications of major corporate investment and restructuring decisions (outside of bankruptcy) and of the role of pay-for-performance type of executive compensation contracts on managerial incentives and risk taking behavior.

In Chapter 15, “Corporate Takeovers,” Sandra Betton, Espen Eckbo and Karin Thorburn review and extend the evidence on mergers and tender offers. They focus in particular on the bidding process as it evolves sequentially from the first bid through bid revision(s) and towards the final bid outcome. Central issues include bid financing, strategic bidding, agency issues and the impact of statutory and regulatory restrictions. The strategic arsenal of the initial bidder includes approaching the target with a tender offer or a merger bid, acquiring a toehold to gain an advantage over potential competitors, offering a payment method (cash or stock) which signals a high bidder valuation of the target, and/or simply bid high (a preemptive strike). The survey provides new evidence on the magnitude of successive bid jumps, and on the speed of rival firm entry and the time between the first and the final bids in multi-bidder contests. The survey confirms that the average abnormal return to bidders is insignificantly different from zero, and that the sum of the abnormal returns to targets and bidders is positive, suggesting that takeovers improve the overall efficiency of resource allocation. Takeover bids also tend to generate positive abnormal returns throughout the industry of the target, in part because they increase the likelihood that industry rivals may become targets themselves

(industry “in-play” effect). The evidence strongly rejects the hypothesis that horizontal mergers reduce consumer welfare through increased market power—even when the merger-induced change in industry concentration is non-trivial. However, some input suppliers suffer losses following downstream mergers that increase the downstream industry’s bargaining power.

In Chapter 16, “Corporate Restructuring: Breakups and LBOs,” Espen Eckbo and Karin Thorburn review a number of financial and asset restructuring techniques—other than corporate takeovers and bankruptcy reorganizations. They distinguish between transactions that securitize corporate divisions from those that recapitalize the entire firm. Forms of divisional securitization include spinoff, splitoff, divestiture, equity carve-out and tracking stock. Forms of recapitalizations of the entire firm include leveraged recapitalization, leveraged buyout (LBO), demutualization, going-private transactions, and state privatizations. They show transaction frequency, describe the financing technique, discuss regulatory and tax issues, and review evidence on the associated valuation effects. Announcement-induced abnormal stock returns are generally reported to be positive. Potential sources of this wealth creation include improved alignment of management and shareholder incentives through post-transaction compensation contracts that include divisional stock grants, the elimination of negative synergies, improved governance systems through the disciplinary effect of leverage, the avoidance of underinvestment costs, wealth transfers from old bondholders experiencing claim dilution and risk increase following new debt issues, and an “in-play” effect as divisional securitization increases the probability that the division will become a future acquisition target. Unbundling corporate assets and allowing public trade of securities issued by individual divisions also leads to a general welfare increase from increased market completeness and analyst following. The evidence indicates improved operating performance following spinoffs and LBOs, and increased takeover activity after spinoffs and carveouts, and that a minority of LBO firms goes public within five years of the going-private transaction.

Delegation of corporate control to managers gives rise to costly agency conflicts as the personal interests of managers and owners diverge. The literature on executive compensation seeks to identify the form of the employment contract that minimizes agency costs. In Chapter 17, “Executive Compensation and Incentives,” Rajesh Aggarwal surveys the empirical findings of this literature over the past two decades, focusing in particular on evidence concerning stock options and restricted stock grants. The optimal provision of incentives in managerial compensation contracts depends on factors such as executive risk and effort aversion, managerial productivity, and information asymmetries. A key limitation on incentive provision appears to be the need to share risk between managers and shareholders. Also, while optimal contracting theory implies that firm performance should be evaluated relative to an industry or market wide benchmark, relative performance provisions (e.g., by indexing the exercise price of a stock option to the market) are rarely observed. This puzzle may be explained in part by accounting and tax rules, and in part by the cost to shareholders of indexed options (relative to other forms of compensation) when managers are risk averse. Observed compensation practices may also reflect a governance problem if the CEO has undue influence over the determination

of her own level of pay. Some researchers argue that rent extraction by the CEO is a major issue of concern for shareholders, an issue that remains controversial.

For a given compensation contract, risk-averse managers have a personal incentive to limit risk exposure by lowering the volatility of the firm's cash flow *ex post*. If unchecked, this incentive may lead to value-reducing overinvestment in risk-reducing technologies and projects. However, as reviewed by Clifford Smith in Chapter 18, "Managing Corporate Risk," it is widely accepted that active cash flow risk management can also lead to increased shareholder value. For example, if hedging alters the timing of taxable cash flows, there may be a net tax benefit. Hedging may also reduce expected costs of financial distress which in turn may allow the firm to capture additional benefits from leverage. Hedging opportunities (using various forms of derivatives and hybrid instruments) have increased substantially over the past decade, and their costs have decreased. As a result, today some form of hedging activity is common among large publicly traded firms. The evidence indicates that smaller firms—with greater default risk—tend to hedge a larger percentage of their exposures than larger firms. However, Smith points to several data problems that limit the power of the empirical research in this area.

I would like to thank all the contributors for their hard work and patience in seeing this Handbook to fruition. A special thank goes to the Series Editor William T. Ziemba for his enthusiasm for this project.

B. Espen Eckbo
Dartmouth College, 2008

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PART 3

DIVIDENDS, CAPITAL STRUCTURE, AND
FINANCIAL DISTRESS

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PAYOUT POLICY*

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Abstract

This chapter provides a survey of payout policy—the return of capital by firms to their equity investors through dividends and share repurchases. The modern study of payout policy is rooted in the irrelevance propositions developed by Nobel Laureates Merton Miller and Franco Modigliani. Payout policy is irrelevant when capital markets are perfect, when there is no asymmetric information, and when the firm’s investment policy is fixed. Relaxing these assumptions leads to a role for payout policy to control agency problems and convey information to investors. Although changes in dividend policy are associated with changes in firm value, there is mixed evidence regarding tax effects and little evidence that payout decisions are driven by motives to signal true firm value to investors. The evidence does support a link between payout decisions and conflicts of

interest between the firm's various claimholders. This chapter also surveys the evidence relating to share repurchases as an alternative form of payout and describes recent behavioral theories of payout policy.

Keywords

payout policy, dividends, stock repurchases, asymmetric information, agency problems, taxes

1. Introduction

Payout policy refers to the ways in which firms return capital to their equity investors. Payouts to equity investors take the form of either dividends or share repurchases. The modern study of payout policy is rooted in the irrelevance propositions developed by Nobel Laureates Merton Miller and Franco Modigliani.¹ The irrelevance propositions clearly delineate the conditions under which the method and pattern of the firm's payouts are irrelevant in the sense that the firm's payout decisions do not alter firm value. Miller and Modigliani show that payout policy is irrelevant when capital markets are perfect, when there is no asymmetric information, and when the firm's investment policy is fixed. In practice, however, it appears that payout policy follows systematic patterns and that firm value responds to changes in payout policy in predictable ways.

For example, in a classic study, Lintner (1956) surveyed the managers of 28 firms regarding their dividend policies. Based on the interviews, Lintner established several stylized facts about dividend policy. First, dividends are sticky in the sense that they do not change dollar for dollar with earnings. Specifically, managers exhibited a reluctance either to cut or to raise existing dividends unless they were confident that the new dividend level could be sustained in the future. Second, the level of dividends was tied to sustainable long-term earnings. Third, dividends were smoothed from year to year in order to move toward a long-term target payout ratio. Finally, based on the survey evidence, Lintner developed a simple partial adjustment model of dividend changes. Lintner's model was able to explain 85% of the year-to-year changes in dividends of his sample firms.

Understanding payout policy is important because firms return significant amounts of capital to shareholders in the form of dividends and share repurchases. Table 1 shows summary statistics on the payout policies of U.S. companies via dividend payments and share repurchases for each year from 1972 to 2004. As seen in the figure, the aggregate total payout (TP) has generally been between 40 and 70% of aggregate firm earnings and between 2 and 5% of the aggregate market value of equity. The figure also shows that repurchases have become a more important form of payout over time, particularly since 1983. In addition, the incidence of dividend increases and decreases is seen in the figure to have declined over time, although this decline is largely driven by the fact that the fraction of firms paying dividends has also declined over time.

In this chapter, we survey the academic literature on payout policy and offer some guidance on directions for future research. Following the study by Lintner, a large literature in finance, both theoretical and empirical, has emerged that attempts to understand these systematic patterns in payout policy. Our discussion of the literature is organized around the assumptions underlying the irrelevance propositions of Miller and Modigliani, and around what effect relaxing these various assumptions might have on the firm's payout choices. Because of the scope of this task and limitations on space, our review will undoubtedly be incomplete. We apologize in advance to authors whose work we do not cite.

¹ See Miller and Modigliani (1961).

Table 1
Summary statistics on payout policy of firms, 1972–2003

The table presents summary information on payout policies of firms in the Compustat database.

Year	Number of Firms	Dividends as a % of Earnings	Repurchases as a % of Earnings	Total Payout as a % of Earnings	Dividends as a % of Market Value	Repurchases as a % of Market Value	Total Payout as a % of Market Value	% of Firms with Dividends > 0	% of Firms Decreasing Dividends	% of Firms Increasing Dividends
1972	2794	43.0%	3.5%	46.5%	2.2%	0.2%	2.4%	58.84%	15.50%	22.87%
1973	3000	35.3%	5.5%	40.8%	3.0%	0.5%	3.5%	60.60%	9.17%	63.15%
1974	3096	34.9%	2.3%	37.2%	4.8%	0.3%	5.1%	63.15%	8.85%	63.40%
1975	3292	39.3%	1.3%	40.6%	3.6%	0.1%	3.7%	63.40%	13.79%	37.30%
1976	3329	35.9%	2.1%	38.0%	3.4%	0.2%	3.6%	66.84%	12.86%	43.29%
1977	3283	38.4%	4.0%	42.4%	4.4%	0.4%	4.8%	69.54%	10.47%	50.17%
1978	3318	35.7%	4.1%	39.7%	4.4%	0.5%	4.9%	68.99%	12.31%	47.43%
1979	3495	31.9%	4.1%	36.1%	4.2%	0.5%	4.8%	63.75%	11.94%	42.78%
1980	3557	34.6%	4.7%	39.3%	3.5%	0.5%	3.9%	60.28%	15.21%	35.90%
1981	4090	36.6%	5.2%	41.8%	4.0%	0.6%	4.6%	51.20%	15.90%	25.05%
1982	4118	50.2%	11.2%	61.4%	3.7%	0.8%	4.5%	47.16%	13.79%	22.92%
1983	4354	44.0%	8.5%	52.6%	3.1%	0.6%	3.6%	42.28%	16.56%	15.20%
1984	4437	37.9%	22.4%	60.3%	3.4%	2.0%	5.4%	39.78%	8.93%	20.90%
1985	4354	48.5%	37.4%	85.9%	3.1%	2.4%	5.4%	38.24%	9.94%	18.70%
1986	4596	61.6%	35.3%	96.9%	2.9%	1.7%	4.6%	34.12%	10.95%	14.41%
1987	4772	47.0%	31.3%	78.4%	3.1%	2.1%	5.2%	31.71%	9.44%	15.44%

(Continued)

Table 1 (Continued)

Year	Number of Firms	Dividends as a % of Earnings	Repurchases as a % of Earnings	Total Payout as a % of Earnings	Dividends as a % of Market Value	Repurchases as a % of Market Value	Total Payout as a % of Market Value	% of Firms with Dividends > 0	% of Firms Decreasing Dividends	% of Firms Increasing Dividends
1988	4586	47.8%	26.5%	74.3%	3.5%	1.9%	5.5%	31.86%	6.17%	19.76%
1989	4407	45.2%	27.7%	72.9%	2.8%	1.7%	4.5%	32.77%	7.29%	19.86%
1990	4385	51.5%	21.8%	73.3%	3.1%	1.3%	4.4%	32.16%	7.62%	18.55%
1991	4458	68.0%	16.4%	84.4%	2.4%	0.6%	3.0%	31.16%	8.87%	14.35%
1992	4680	67.4%	19.1%	86.5%	2.4%	0.7%	3.0%	30.77%	9.09%	13.22%
1993	5011	59.0%	17.2%	76.2%	2.1%	0.6%	2.7%	29.44%	7.73%	13.55%
1994	5328	43.1%	14.9%	58.0%	2.1%	0.7%	2.9%	28.10%	5.62%	14.25%
1995	5936	43.7%	20.9%	64.6%	2.0%	0.9%	2.9%	26.45%	4.90%	14.39%
1996	6135	40.1%	24.7%	64.8%	1.8%	1.1%	2.8%	26.00%	5.78%	12.75%
1997	6193	38.0%	33.8%	71.8%	1.4%	1.2%	2.6%	25.22%	6.54%	11.53%
1998	6002	50.2%	48.1%	98.2%	1.4%	1.3%	2.7%	24.43%	6.63%	11.47%
1999	5955	39.3%	40.5%	79.8%	0.9%	0.9%	1.8%	22.15%	6.20%	11.24%
2000	6052	36.8%	41.9%	78.7%	1.0%	1.2%	2.2%	20.42%	6.63%	9.63%
2001	5770	-284.2%	-263.7%	-547.9%	1.3%	1.2%	2.5%	19.79%	6.51%	8.86%
2002	5438	169.1%	156.1%	325.2%	1.6%	1.5%	3.1%	19.24%	5.78%	9.02%
2003	3824	36.6%	30.9%	67.4%	1.5%	1.2%	2.7%	23.77%	3.09%	15.24%

The remainder of the chapter presents a review of the Miller and Modigliani arguments regarding the irrelevance of payout policy; a summary of the literature on the interaction between both corporate and personal taxes and the firm's payout choices; a discussion of how conflicts of interest and agency problems among the firm's various claimants affect payout choices; an examination of the role of asymmetric information in determining the firm's payout decisions; a review of the literature on share repurchase; a study of some alternative theories and new stylized facts regarding payout policy; and a summary of the state of knowledge on payout policy.

2. The Miller and Modigliani irrelevance propositions

Miller and Modigliani (1961) show that in perfect and complete capital markets, payout policy is irrelevant to firm value. Their basic thesis is that investment policy determines firm value and that payout is simply the residual between earnings and investment. Payout policy is irrelevant from the investor's perspective because any desired temporal pattern of payments can be replicated by appropriate purchases and sales of equity. Because investors can create "homemade" dividends, they will not pay a premium for a firm with a particular dividend policy.

In perfect capital markets, the following conditions are assumed to hold:

1. Information is costless and equally available to everyone.
2. There are no taxes.
3. There are no transactions costs associated with purchasing or selling securities.
4. There are no contracting or agency costs.
5. No investor or firm individually can influence the price of securities.

Given the perfect capital markets assumptions noted earlier and the assumption that the firm's investment policy is fixed, it is relatively straightforward to show that dividend policy does not affect firm value.

2.1. Dividend policy irrelevance

Assume that a firm financed completely by equity is established at time $t = 0$. The value of the all-equity firm is the present value of future dividends received by the investors, given by

$$S_0 = \sum_{t=0}^{\infty} \frac{E_0[D_t]}{(1+r)^t} \quad (1)$$

where S_0 is the stock price at time $t = 0$, $E_0[D_t]$ is the expected value of the dividend to be paid at time t conditional on information available at $t = 0$, and r is the risk-adjusted rate of return that investors require to hold the stock.

The sources and uses of funds identity dictate that in each period

$$CF_t + F_t = D_t + I_t + (1+r)F_{t-1} \quad (2)$$

where CF is the firm's operating cash flows, F_t is new financing raised at time t , D_t is the dividend paid, I_t is investment, and $(1 + r)F_{t-1}$ is repayment of financing raised at time $t - 1$.

Solving the sources and uses identity in Equation (2) for dividend payments and substituting the result in Equation (1), we can rewrite the value of the firm as

$$S_0 = \sum_{t=0}^{\infty} \frac{E_0(CF_t - I_t)}{(1 + r)^t} \quad (3)$$

Note that dividend payments do not appear in Equation (3). The value of the firm depends only on the residual of operating cash flows net of investment. This "free cash flow" is available to be paid out as a dividend. If investment needs exceed current cash flows, then the firm must sell additional securities. Because both cash flows and investment outlays are not a function of dividend policy, dividend policy is irrelevant to firm value.

Paying out a dividend that exceeds the difference between current cash flow and investment does not increase owners' wealth; instead, it requires the firm to sell additional securities to fund the optimal investment plan. Because any new financing is done on fair terms (i.e., new financing is zero net present value [NPV]), an increase in today's dividend by a dollar requires the firm to raise additional financing worth a dollar in present value. Thus, dividend policy is irrelevant to the value of the firm under the perfect capital market assumptions used by Miller and Modigliani.

The Miller and Modigliani arguments clearly delineate the conditions under which dividend policy is irrelevant to firm value. If dividend policy is to have an effect on shareholder wealth, then it must be that one or more of the perfect capital markets assumptions are violated. The remainder of this chapter examines the implications of relaxing the various assumptions underlying the Miller and Modigliani irrelevance propositions in order to study the ways in which dividend policy can affect firm value.

3. Dividends and taxes

In the United States and many other countries, dividend income is taxed at a higher rate than is capital gains. Assuming that investors act rationally, the preferential tax treatment of capital gains should have significant effects on the corporate and personal dividend decisions. Yet, as detailed in this section, even after several decades of research, many questions remain unanswered. Our theories tell us that taxes should matter, but the empirical evidence is still difficult to interpret.

For most individuals, capital gains are not taxed until they are realized, and the tax rate applied to realized long-term capital gains of individuals has generally been lower than the tax rate applied to dividend income.² Consequently, by choosing when and what securities to trade, investors can affect the timing and amount of their tax payments. Rational investors can, for example, liquidate mostly losing parts of their

² The definition of "long term" for tax purposes has varied over the years between six months and a year. Both short-term capital gains and dividends are taxed as ordinary income.

portfolio, indefinitely deferring the payment of taxes on their capital gains.³ The savings associated with postponing the payment of taxes can substantially reduce the effective tax rate. For example, deferring tax payments for 20 years when the appropriate annual discount rate is 10% reduces the effective tax rate by 85%. Investors can defer the realization of capital gains while keeping their preferred consumption path. They can do it by borrowing against their portfolio to finance current consumption. Alternatively, they can fund consumption by liquidating losing parts of their portfolio. Finally, investors can finance their current consumption by taking opposite (short and long) positions in similar financial instruments realizing only the losing component of the package.⁴

In the presence of preferential tax treatment of capital gains, rational investors should have a tax-related dividend aversion.⁵ Other things being equal, investors should prefer low-dividend yield stocks.⁶ In equilibrium, dividend aversion results in larger pretax risk-adjusted returns for stocks with larger dividend yields. Tests of this hypothesis—a tax-induced positive correlation between dividend yield and risk-adjusted returns—can be divided into two groups. The first set of tests examines the relationship between dividend yield and risk-adjusted return within a static equilibrium model (most notably Brennan, 1970). The second set examines the dynamic behavior of stock prices around the ex-dividend period.

Our review and analysis starts with the first set of tests. We survey the conflicting empirical evidence of these tests and then relate it to the literature on the ex-dividend period. We show that combining these two strands of research helps resolve the apparent inconsistent empirical results obtained by Black and Scholes (1974) on the one hand and by Litzenberger and Ramaswamy (1979) on the other.

3.1. Tests of the Brennan model

Brennan's (1970) capital asset pricing model (CAPM) states that a security's pretax excess return is linearly and positively related to its systematic risk and dividend yield. Formally,

$$E(r_{it} - r_{ft}) = a_1 + a_2\beta_{it} + a_3(d_{it} - r_{ft}) \quad (4)$$

³ Constantinides (1983, 1984) modeled this feature of the tax code and called it the tax timing option. Financial theory tells us that investors should be willing to pay for this option. The market value of this option captures the tax advantage of the long-term capital gains associated with the option to choose when to realize these gains.

⁴ The IRS imposes some limitations on such strategies. For a strategy to be feasible, the financial instruments should be sufficiently different that the strategy involves business risk. Buying long and selling short IBM, for example, is not a feasible strategy.

⁵ Miller and Scholes (1978) suggest a scheme whereby investors can convert dividend income to tax-deferred capital gains. If it can be done costlessly, investors should not have a dividend aversion. However, the scheme is costly, and the evidence indicates that investors hardly use it.

⁶ Faced with investors' dividend aversion, corporations should avoid paying dividends to the extent possible. Why then do companies continue to pay dividends? The next section presents possible motivations for corporate dividend payments.

where r_{it} is the rate of return on stock i during period t , β_{it} is its systematic risk, d_{it} is the dividend yield, and r_{ft} is the risk-free rate of interest during period t . A significantly positive a_3 is interpreted as evidence of a tax effect. The two most influential tests of the Brennan model—Black and Scholes (1974, hereafter BS) and Litzenberger and Ramaswamy (1979, hereafter LR) present seemingly conflicting results. BS find no evidence of a tax effect, whereas LR find evidence consistent with the tax hypothesis.⁷

3.1.1. The Black and Scholes experiment

To test the Brennan model, BS form portfolios of stocks using a long-run estimate of the dividend yield—the dividends paid in the preceding year divided by the end-of-year share price. They classify stocks with a high estimated dividend yield as having a high expected yield over the following year. They find no difference in pretax risk-adjusted returns across stocks with high- and low-dividend yields. They also find no difference in after-tax risk-adjusted returns as a function of the dividend yield. Based on this evidence, they advise investors to ignore dividends when forming portfolios.

3.1.2. The Litzenberger and Ramaswamy experiment

In contrast to the way that BS estimate the expected dividend yield, LR estimate a short-run measure of the expected dividend yield, computed as follows. If a dividend announcement is made in month $t - 1$ and the stock goes ex-dividend during month t , the estimate of dividend yield is simply d_t/p_{t-1} . In this case, the end of month $t - 1$ stock price, p_{t-1} , contains the information associated with the dividend announcement during the month. When the announcement and the ex day occur in the same month, t , LR estimate the market's time t expected dividend as of the end of month $t - 1$ as the last dividend paid during the previous 12 months. For months in which no dividends are paid, LR assume that the expected dividend yield is zero.

LR use a three-step procedure to test for tax effects. The first step of the LR experiment is the estimation of the systematic risk of each stock for each of the test months. Formally, the following regression is estimated for each month, t

$$R_{ij} - R_{fj} = a_{it} + \beta_{it}(R_{mj} - R_{fj}) + \varepsilon_{ij} \quad j = t - 60, \dots, t - 1 \quad (5)$$

where R_{mj} is the return on a proxy for the market portfolio, R_{ij} is the rate of return on stock i , R_{fj} is the risk-free rate of interest during period j , and ε_{ij} is a noise term. The coefficient β_{it} is the estimated beta for stock i for month t .

The second step uses the estimated beta for stock i during month t , β_{it} , and an estimate of stock i 's expected dividend yield for month t , d_{it} , as independent variables in the following cross-sectional regression for month t :

$$R_{it} - R_{ft} = a_{1t} + a_{2t}\beta_{it} + a_{3t}(d_{it} - R_{ft}) + \varepsilon_{it} \quad (6)$$

⁷ Other studies include Blume (1980), Gordon and Bradford (1980), Morgan (1982), Poterba and Summers (1984), and Rosenberg and Marathe (1979).

The cross-sectional regression is estimated separately for each month during the period from 1936 through 1977, resulting in a time series of estimates of a_{3t} . The third step computes an estimate of a_3 in Equation (4) as the mean of this time series of estimates. LR find a_3 to be significantly positive and interpret this as evidence of a dividend tax effect.

3.1.3. *Litzenberger and Ramaswamy's estimate of dividend yield and potential information-induced biases*

In order to minimize the potential for information-induced biases to affect their inferences, the estimate of the expected short-term dividend yield for month t uses only information available at the end of month $t - 1$. Nevertheless, Miller and Scholes (1982) point out that some information-induced bias can still remain. The LR experiment uses the Center for Research in Security Prices (CRSP) tapes, which do not report announcements of dividend omissions. A dividend omission, when contrasted with a positive expected dividend, is equivalent to an announcement of a drastic dividend reduction to which the market responds negatively. By ignoring omissions, LR's experiment erroneously assumes that the months corresponding to dividend omissions have zero expected dividends. Consequently, the experiment relates the resulting negative excess return to a zero expected dividend yield. Classifying months with dividend omissions as zero expected dividend months can result in a positive cross-sectional relationship between LR's estimate of expected dividend yield and measured stock returns.⁸

Kalay and Michaely (2000) investigate the potential information-induced biases by performing a modified LR experiment using weekly returns. They limit the sample to cases in which the announcement week precedes the ex-dividend week (96.6% of the sample), excluding weeks containing announcements of dividend omissions. The modified experiment results in a significantly positive dividend yield coefficient. Interestingly, the point-estimate of this coefficient is almost identical to the one reported by LR (obtained using monthly returns). Based on this result, they conclude that the positive dividend yield coefficient documented in the LR experiment is not driven by information-induced biases. At this juncture, it seems that the two major tests of the Brennan (1970) model (LR and BS) lead to conflicting results. Later, we will present additional analysis and a possible resolution of this conflict. Before we do so, we examine the other set of tests; namely, the ex-dividend day studies.

3.2. *The ex-dividend day studies*

Studying the ex-dividend period enables a direct comparison of the market valuation of a dollar paid in dividends to the valuation of a dollar of realized capital gains. There are

⁸ LR (1982) address this potential problem by constructing alternative measures of expected short-term dividend yields that are based only on current and past information. These experiments also result in statistically significant and positive dividend yield coefficients.

three important dates in every dividend period: the announcement day, the ex-dividend day, and the payment day. On the announcement day, the firm declares the dividend per share to be paid on the payment date to its stockholders of record at the closing of trade on the last cum-dividend day. The announcement day precedes the ex-dividend day by about two weeks and the payment day by about four weeks. A stock purchased on the last cum- (with) dividend day includes a claim to the dividend declared (to be paid two weeks later), while a stock purchased on the ex-dividend day does not. The ex-dividend price should therefore be lower to reflect the lost dividend.

3.2.1. *The ex-dividend day studies—the theory*

The theoretical analysis of stock price behavior around the ex-dividend day compares the expected price drop to the dividend per share.⁹ In perfect capital markets, assuming complete certainty, the stock price drop should equal the dividend per share. Any other stock price behavior provides potential arbitrage opportunities. A smaller (larger) price drop provides arbitrage profits by buying (selling short) on the cum-dividend day and selling (covering) on the ex-dividend day. A similar analysis can be conducted in the presence of uncertainty if we assume that any excessive ex-dividend period risk is not priced. This is the case if the risk is diversifiable and/or investors are risk-neutral.¹⁰ We will continue our analysis assuming that the ex-dividend period required rate of return is not different from that of any other day.

Elton and Gruber (1970) model the conditions for no profit opportunities around the ex-dividend day in the presence of differential taxation of realized capital gains and dividend income. Denote the realized long-term capital gains tax rate as $t_g < t_d$, where t_d is the tax rate on dividend income. Let D be the dividend per share, P_b the last cum-dividend stock price, and $E(P_a)$ the expected ex-dividend stock price. Equating the after-tax returns from these two sources of income results in

$$(1 - t_g)(P_b - E[P_a]) = (1 - t_d)D \quad (7)$$

⁹ The earlier papers on this issue are Campbell and Beranek (1955) and Barker (1959).

¹⁰ The Introduction of uncertainty requires some modifications. Market participants can form an estimate of the expected ex-day price drop based on past realizations. In general, financial economists expect these estimates to be unbiased. Nevertheless, taking a position (long or short) to exploit profit opportunities around the ex-dividend day involves risk. Thus, a difference between the expected ex-day price drop and the dividend per share can provide profits but not arbitrage opportunities. Indeed, empirically, the ex-dividend period is a time of excessive volatility (see Lakonishok and Vermaelen, 1986). The possible effects of risk on ex-day trading are pointed out in Kalay (1984) and modeled by Heath and Jarrow (1988) and Michaely and Vila (1995). With unusually large and priced risk, the ex-day price drop should be smaller than the dividend per share, giving the stockholders a larger required rate of return. One has to remember, however, that there are several thousand ex-dividend events in a given calendar year. The risk associated with these events should be at least temporally independent, thereby presenting substantial diversification possibilities. Investors can also hedge part of the risk by using options. Given the risk-reduction technology and the short time interval between closing on cum day and opening on ex, one can still expect the ex-dividend price drop to be “almost equal” to the dividend per share.

and

$$\frac{P_b - E[P_d]}{D} \frac{1 - t_d}{1 - t_g} \quad (8)$$

A larger tax rate on dividend income (i.e., $t_d > t_g$) results in an ex-dividend price drop smaller than the dividend per share. In such an economy, one can infer the tax rates from the ex-day relative price drop.¹¹

Elton and Gruber present empirical evidence documenting an ex-dividend price drop smaller than the respective dividend per share. This evidence seems consistent with the hypothesis that investors have a tax-induced preference for capital gains. The tax code, however, is a bit more complex. Short-term capital gains are taxed as ordinary income. Thus, as Kalay (1982a) points out, short-term traders can profit from a difference between the drop in the ex-dividend day stock price and the respective dividend per share. For example, assume the cum-dividend stock price is \$50, the dividend per share is \$2, and the expected ex-day price drop is 70% of the dividend per share—\$1.4. A short-term investor can buy the stock cum-dividend and sell it on the ex day. She would have a capital loss of \$1.4 but would gain \$2 of cash dividends, netting a before-tax gain of 60 cents per share. This corresponds to a before-tax daily percentage excess return of 1.2%, corresponding to an annual excess return of 1,873% (assuming 250 trading days per year).

Kalay (1982a) argues that, without transaction costs, elimination of profit opportunities implies an expected ex-dividend price drop equal to the dividend per share.¹² Although there are limitations on the amount of short-term capital losses individuals can write off to offset dividend income (about \$3000 a year), dealers are not subject to these restrictions. Hence, in the absence of transaction costs, short-term traders are expected to trade as long as there is a difference between the expected ex-day stock price drop and the dividend per share.

Nevertheless, we should not necessarily observe equality between the expected ex-day stock price drop and the dividend per share. Consider the role of corporations investing in other corporations. As stockholders, corporations are taxed only on 30% (up from 15%) of the cash dividends they receive, while realized capital gains are taxed at the corporate income tax rate. Thus, corporations have a preference for cash dividends. For a corporation, equality between the expected ex-day price drop and the dividend per share provides profit opportunities. Assume in the preceding example that the stock price drops by \$2 on the ex day. The firm pays tax only on 30% of the \$2

¹¹ Typically, the long-term capital gains were taxed at a fraction of the respective individual income tax. Hence, the marginal relative and absolute tax rates can be calculated.

¹² This statement assumes that the required rate of return during the cum-ex period is arbitrarily close to zero and thus can be ignored. Also ignored are the trivial effects of the delayed payments of the dividends. The actual payments are received in about two weeks following the ex day; thus, the realized capital losses should be compared to the present value of the dividends. In this case, the appropriate discount rate is the risk-free rate since we know of no default on a promised dividend. The potential effects of such modification are indeed trivial. A \$2 dividend, for example, has a present value of 1.998\$.

dividends it receives, while it can deduct the full \$2 capital loss. If the corporate tax rate is 34%, the per-share after-tax dividend the corporation receives is \$1.796, while its per-share after-tax capital losses are only \$1.32. The net gain is therefore 47.6 cents, or a before-tax return on investment of about 1% per day—equivalent to a 1100% annual return!¹³

What relationship between the dividend per share and the expected price drop would amount to no profit opportunities around the ex-dividend day for a corporate investor? The ex-day price drop should exceed the dividend per share. In our example, a \$2 dividend should correspond to a \$2.721 expected stock price drop. Yet recall that such ex-day stock price behavior provides profits to short-term traders. So is there an ex-dividend stock price drop that will provide no profit opportunities to all the traders? Interestingly, in the absence of transaction costs, the answer is no. The differential tax treatment of major economic players creates a large variety of relative valuations of dividends and capital gains. Any market-relative valuation of these cash flows results in profit opportunities to some groups.¹⁴ One can say that the ex-dividend period provides unavoidable profit opportunities.

Transaction costs enable the existence of an ex-dividend day equilibrium. Transaction costs allow for a variety of relationships between the expected stock price drop and the dividend per share. The only requirement is that the profits from the different relative valuations are smaller than the cost of a round-trip transaction for the inframarginal traders. The relative ex-dividend price drop can be anywhere within the bounds that provide no profit opportunities to all traders. Consequently, as Kalay (1982a) points out, one cannot infer the marginal tax rates of the marginal investors from the relative ex-day price drop.

3.2.2. *The ex-dividend day studies—the evidence*

The existing empirical evidence documents a stock price drop that is significantly smaller than the dividend per share—an unusually large cum-dividend rate of return (see Campbell and Beranek (1955), Durand and May (1960), Elton and Gruber (1970), Kalay (1982a), Lakonishock and Vermaelen (1983), and Eades, Hess, and Kim (1984), among others). Although theory does not predict a specific relationship between the relative ex-day price drop and the preferential long-term capital gains tax rate, this evidence is consistent with the hypothesis that a dollar of capital gains is worth more than a dollar of dividends. However, further investigations of this behavior cast serious doubt on this explanation.

Indeed, the more empirical evidence on stock price ex-day behavior we obtain, the harder it is to interpret. Consider the evidence presented in Eades, Hess, and Kim (1984;

¹³ This common corporate practice is termed *dividend capture*. Dividend capture programs became so widespread in the United States that the government imposed limitations on their use. As of 1984, a corporation has to own the stock for at least 45 days to qualify for the 70% exclusion on its dividend income.

¹⁴ See Dammon and Green (1987) and Dybvig and Ross (1986).

hereafter EHK). They find positive excess returns before and including the ex-dividend day and abnormally negative returns following it. In fact, the abnormal returns on the ex-dividend day are smaller than the excess return on the last cum-dividend day.

Based on Table 2 in EHK, we see that the cumulative excess return from day -5 to (and including) day 0 (the ex day) is 0.43%, while the ex-day excess return is only 0.142%. The cumulative negative excess return from day 1 to day 5 following the ex day is -0.24% . How can theory explain the relatively large and systematic price changes before and after the ex day? What is the reason for cumulative excess returns of 0.288% during the five days prior to the ex day? Why are professional investors with trivial transaction costs unable to time their trades to exploit this phenomenon?

To help quantify the relationship between the excess return and the relative ex-day price drop, note that the mean quarterly dividend yield during EHK's sample period

Table 2

Test of the null hypothesis of zero excess returns for the ex-dividend period with a sample of all taxable distributions by N.Y.S.E. common stocks. Average daily excess and standardized daily excess returns of equally weighed ex-day portfolios for each day in the ex-dividend period for the period July 2, 1962, to December 31, 1980. The number of ex-dividend day portfolios is 4.471; the number of trading days is 4,640; and the average number of stocks in each ex-day portfolio is 18.6.

Trading day relative to ex-day	Average percent excess return ^a	Average standardized excess return ^b	<i>t</i> -statistic	Significance level	Posterior odds ratios ^c	
					Uniform	Normal
-5	0.067	0.0631	4.218	$<10^{-4}$	0.0073	0.0005
-4	0.046	0.0621	4.155	$<10^{-4}$	0.0095	0.0006
-3	0.061	0.0832	5.561	$<10^{-4}$	$<10^{-4}$	$<10^{-4}$
-2	0.066	0.0892	5.968	$<10^{-4}$	$<10^{-4}$	$<10^{-4}$
-1	0.188	0.2340	15.647	$<10^{-4}$	$<10^{-4}$	$<10^{-4}$
Ex-day	0.142	0.1756	11.741	$<10^{-4}$	$<10^{-4}$	$<10^{-4}$
+1	-0.053	-0.0651	-4.355	$<10^{-4}$	0.0041	0.0003
+2	-0.058	-0.0734	-4.911	$<10^{-4}$	0.0003	$<10^{-4}$
+3	-0.036	-0.0405	-2.707	0.0068	1.366	0.0824
+4	-0.046	-0.0627	-4.195	$<10^{-4}$	0.0080	0.0005
+5	-0.043	-0.0553	-3.700	0.0002	0.0569	0.0037

^aExcess return equals the difference between the ex-day portfolio return day t and \overline{RP}_t (the mean portfolio return for day t estimated during the 60 day period surrounding the ex-day).

^bStandardized excess return equals the excess return for the ex-day portfolio divided by the ex-day portfolio standard deviation estimated during the 60 day period surrounding the ex-day (30 days on each side of the ex-day).

^cBoth cases assume that the null hypothesis of no tax premium is true with probability 0.5. The prior beliefs about the alternative hypotheses are represented as a 0.5 probability that (1) the mean ex-day *SER* is between -1 and $+1$ with uniform probability, and (2) the mean *SER* is distributed as normal with a mean of zero and a standard deviation of 0.316.

is about 1%. A relative ex-day price drop of 0.85 corresponds to an excess return of 0.15% for the average stock. A strategy of owning the stock from -5 to 0 gives an excess return of 0.43% (equivalent to a relative price drop of 0.57 for the average stock). A portfolio of stocks held between days -5 to $+5$ gives an excess return of 0.24% (equivalent to a relative price drop of 0.76 for the average stock). This evidence indicates that indeed, as the theory suggests, there are profit opportunities around the ex-dividend day.

EHK's additional tests are even more puzzling. Table 3 of their paper describes the behavior of stock prices around the ex day of stock dividends and of nontaxable cash dividends. Surprisingly, a similar pattern of stock returns emerges. A strategy of buying stocks five days before the ex-dividend day and selling them on day $+5$ yields excess returns of 1.061%. A strategy of buying stocks five days before the ex day of a nontaxable dividend and selling on the first day after ex yields excess returns of 0.52%. Selling short these stocks on the ex day (day 0) and covering five days later (day $+5$) yields almost identical returns. Taxes should be unrelated to this stock price behavior. In addition to documenting the existence of profit opportunities to a short-term trader, this evidence casts doubt on the tax-related explanation of the ex-day empirical regularities.

Michaely (1991) provides additional evidence by investigating the ex-dividend day behavior of stock prices around the 1986 tax reform. He finds no evidence of excess returns around the ex day *before* and *after* the tax reform. It seems that during the latter part of the 1980s, the ex-dividend day price drop was equal to the dividend per share. The change occurred, however, before the Tax Reform Act of 1986, thus providing no evidence of tax effects. A more detailed investigation of the time-series behavior of the ex-dividend day excess return reveals a similar puzzle. Eades, Hess, and Kim (1994) find substantial time-series variation in stock price ex-day behavior. The variation does not correspond to changes in the tax code.

Some studies have found ex-dividend day evidence that seems consistent with the tax hypothesis. Barclay (1987) describes different ex-day stock price behavior before federal income taxes were introduced to the U.S. economy. The ex-dividend stock price drop appears to equal the dividend per share in this time period. One must remember, however, that before 1910 the New York Stock Exchange (NYSE) was a far less liquid market. In such a market, the mechanical reduction (which is equal to the dividend per share) in the ex-day opening stock price can result in such a finding.

In summary, in the absence of transaction costs there is no ex-dividend day relative price drop that provides no profit opportunities to all traders. Consequently, in such an economy taxes cannot be inferred from the size of the ex-day price drop relative to the dividend. The existence of transaction costs enables an equilibrium where the ex-day relative price drop is within the bounds of no profit opportunities. Theory, however, cannot help us in determining the relative ex-day price drop within the bounds of no profit opportunities. Nevertheless, financial economists document excess returns during the ex-dividend period. Can this empirical regularity help explain the LR results? We turn now to integrate the theory and evidence obtained by investigating the ex-dividend period with evidence documented in tests of the Brennan (1970) model.

Table 3

Tests of the null hypothesis of zero excess returns for the ex-dividend period with a sample of non-taxable distributions by N.Y.S.E. common stocks. Average daily excess and standardized daily excess returns of equally ex-day portfolios for each day in the ex-dividend period for the period July 2, 1962 to December 31, 1980.

Trading day relative to ex-day	Average percent excess return ^a	Average standardized excess return ^b	<i>t</i> -statistic	Significance level	Posterior odds ratios ^c	
					Uniform	Normal
Panel A						
Stock dividends and stock splits. The number of ex-dividend day portfolios is 1,550; the number of trading days is 4,640; and average number of stocks in each ex-day portfolio is 1.4.						
-5	-0.016	-0.0258	-1.017	0.3092	18.753	1.1822
-4	0.070	0.0159	0.626	0.5312	25.824	1.6281
-3	0.001	0.0037	0.147	0.8829	31.081	1.9588
-2	0.059	0.0314	1.238	0.2157	14.630	0.9222
-1	0.194	0.0969	3.815	<10 ⁻⁴	0.0217	0.0014
Ex-day	0.387	0.1998	7.866	<10 ⁻⁴	<10 ⁻⁴	<10 ⁻⁴
+1	0.128	0.0666	2.624	0.0088	1.010	0.0637
+2	0.151	0.0748	2.947	0.0032	0.411	0.0259
+3	0.112	0.0632	2.489	0.0128	1.421	0.0896
+4	-0.025	0.0058	0.229	0.8328	30.604	1.9290
+5	-0.004	-0.0029	-0.113	0.9100	31.209	1.9668
Panel B						
Non-taxable cash distributions. The number of ex-dividend day portfolios is 765; the number of trading days is 4,460; and the average number of stocks in each ex-day portfolio is 1.2.						
-5	0.198	0.1296	3.585	0.0030	0.0358	0.0023
-4	0.119	0.0374	1.033	0.3016	12.924	0.8148
-3	0.122	0.1122	3.104	0.0019	0.1789	0.0113
-2	0.042	0.0799	2.209	0.0271	1.920	0.1211
-1	0.232	0.1633	4.517	<10 ⁻⁴	0.0008	<10 ⁻⁴
Ex-day	-0.139	-0.1417	-3.918	<10 ⁻⁴	0.0102	0.0006
+1	-0.275	-0.1496	-4.137	<10 ⁻⁴	0.0042	0.0003
+2	-0.047	-0.0653	-1.807	0.0708	4.319	0.2723
+3	-0.022	-0.0254	-0.703	0.4821	17.242	1.087
+4	-0.031	-0.0260	-0.720	0.4716	17.040	1.074
+5	-0.221	-0.1113	-3.078	0.0021	0.1932	0.0122

^aExcess return equals the difference between the ex-day portfolio return on day t and \bar{RP}_t (the mean portfolio return for day t estimated during the 60 day period surrounding the ex-day).

^bStandardized excess return equals the excess return for the ex-day portfolio divided by the ex-day portfolio standard deviation estimated during the 60 day period surrounding the ex-day (30 days on each side of the ex-day).

^cBoth cases assume that the null hypothesis of no tax premium is true with probability 0.5. The prior beliefs about the alternative hypotheses are represented as a 0.5 probability that (1) the mean ex-day *SER* is between -1 and +1 with uniform probability, and (2) the mean *SER* is distributed as normal with a mean of zero and a standard deviation of 0.316.

3.3. *Ex-day and cross-sectional studies*

In this section, we provide a reconciliation of the seemingly conflicting results documented by BS (1974) and LR (1979, 1982).¹⁵ BS estimate cross-sectional differences of before-tax long-term returns associated with differences in the respective dividend yields. In other words, if an investor owns a stock for a year, would she earn a higher pretax return if the stock held had a higher expected dividend yield? In contrast, the LR experiment documents, for a given stock, time-series differences in pretax rates of returns earned during the ex-dividend period compared to those received during other periods. Because of these differences in the experimental designs, the results of these two types of studies can differ. Investors can receive higher pretax returns during ex-dividend periods even if the stocks' annual returns are not related to their respective dividend yields. More importantly, however, we also argue that the evidence presented in both the LR and BS studies is inconsistent with the tax hypothesis.

As detailed above, Brennan's (1970) capital asset pricing model states that stocks with higher dividend yields should offer larger risk-adjusted pretax returns throughout the year. In contrast, the LR test of the Brennan model is inadvertently designed to discover whether the ex-dividend period offers unusually large risk-adjusted returns (we refer to this seasonal effect as time-series return variation). Time-series return variation per se is not evidence of a tax effect. As detailed later in this chapter, it seems nearly impossible to provide a tax-based explanation for time-series return variation in an economy that shows no cross-sectional return variation.¹⁶

3.3.1. *Tax effects and time-series return variation*

If investors could avoid the dividend tax penalty during non-ex-day periods, they would require a tax premium only during ex periods. This would create time-series return variation. Under U.S. tax law, however, investors attempting to own the stock only during non-ex periods must realize short-term capital gains, which are taxed as ordinary (dividend) income.

To illustrate, consider an investor who is attempting to own stock XYZ without receiving its dividends. Suppose the stock pays quarterly dividends, with the ex-dividend days being the last business day of March, June, September, and December. A possible strategy

¹⁵ This section is based exclusively on Kalay and Michaely (2000).

¹⁶ With unlimited short selling possibilities, one can suggest a tax arbitrage in the multiperiod version of Brennan. Sell a well-diversified low-yield portfolio short and buy a well-diversified high-yield portfolio. Liquidate the positions within six months. In this case, both capital gains and dividend income are treated as ordinary income. The difference between the returns on the high-yield and low-yield portfolios constitutes a profit opportunity. If such trading is allowed, there is no equilibrium. Short-term traders are at equilibrium only when no expected risk-adjusted return differential between high- and low-yield portfolios exists. But, in such a case, the long-term investor benefits from a shift to low-yield stocks. To reach equilibrium, restrictions on the economy must be imposed. The restrictions can be no (or limited) short sales, wealth limitations, and less than perfect diversification possibilities. With such restrictions there is an equilibrium in which the risk-adjusted pretax return is correlated with the dividend yield.

involves buying the stock, say, on January 1 and selling it cum-dividend after the next dividend announcement, thereby realizing only capital gains. On April 1, our investor can buy the stock ex-dividend, keep it until the end of June, and so on. The dividends are paid to the investor's trading partners. But because the attempt to avoid dividend income involves realization of short-term capital gains, the investor pays the same taxes he or she would pay on dividend income and therefore requires an identical tax premium. Thus, even though a long-term investor could prefer capital gains to dividend income, he or she does not require a larger pretax return during the ex-dividend period only.^{17,18}

The economic incentives of the long-term investor should not lead to excess returns during the ex-dividend period. If many long-term investors prefer to sell the stock before the last ex-dividend day, the cum-dividend stock price could be depressed, creating larger returns during the ex period.¹⁹ But if these investors time their trades to economize on the taxes they could pay on the last dividend, they will surely require compensation for the dividends distributed during their holding periods. Thus, if we observe tax-based price pressure that results in excess returns during the ex period, we ought to observe a "tax premium" for stocks with higher dividend yields. It is difficult to provide a tax-based explanation for time-series return variation, but almost *impossible* to explain time-series return variation in an economy that shows no cross-sectional return variation.

3.3.2. *The Litzenberger and Ramaswamy experiment—time-series or cross-sectional return variation*

Based on the preceding discussion, it is important to determine whether LR's documented dividend effect is evidence of time-series or cross-sectional return variation. By its very nature, the LR experiment is likely to uncover time-series return variation and is inefficient in detecting cross-sectional return variation. The LR experiment defines

¹⁷ One can argue that a constant tax premium per unit of time is the preferred compensation. A different premium structure can force the long-term investor (hereafter LTI) to own the stock longer or sell it sooner than his consumption investment decisions dictate. Also, note that the LTI is almost indifferent as to the timing of his *purchase* around the ex day. With quarterly dividends, the investor has to own the stock for at least two ex periods to qualify as an LTI. He can avoid the third ex period just as easily if he buys the stock before the current ex. Finally, Constantinides (1983, 1984) points out that investors have incentives to realize short-term losses and to defer capital gains for as long as they can. Therefore, the long-term buyers and the short-term traders constitute, almost by definition, a larger fraction of the market than the long-term sellers. One would expect them to offset any temporary price pressure resulting from the population of long-term sellers.

¹⁸ The tax-related considerations of short-term traders and tax-exempt institutions cannot lead to time-series return variations. Corporations, on the other hand, have a tax-related preference for cash dividends over short-term capital gains. Seventy percent of the dividends they receive are tax-exempt. Corporations are willing to *pay a tax-related premium* to own the stock during an ex-dividend month.

¹⁹ The empirical evidence is inconsistent with this conjecture. A positive excess return prior to the ex day has been documented by Eades, Hess, and Kim (1984) and Lakonishok and Vermaelen (1986).

a stock as having a positive dividend yield only during its ex-dividend period. Hence, firms that pay quarterly dividends are classified as offering a zero dividend in two-thirds of the months. This experimental design makes it difficult to relate the dividend yield coefficient to taxes.

Consider the following possibility. For reasons that may not be unrelated to taxes, a stock's expected rate of return is higher during the ex-dividend month than in other months. Suppose this difference in returns is unrelated to the dividend yield. An example is presented in Figure 1. All of the stocks in the economy are assumed to have the same risk-adjusted expected returns, but the expected returns in the ex-dividend month are assumed to be higher.

As is evident from Figure 1, an LR experiment performed on this data would result in a positive dividend yield coefficient. In this case, however, the yield coefficient would indicate only that stock returns show seasonal variation. Interestingly, as demonstrated in Figure 2, an LR clientele test (as in their 1980 study) in our assumed economy leads to evidence consistent with a tax-induced clientele effect. Divide the stocks into five subsamples based on their expected dividend yield, as in LR. Group 1 contains the lowest-yield stocks, and group 5 the highest. An LR experiment in our economy would result in a smaller dividend yield coefficient for the higher-yield groups. This result,

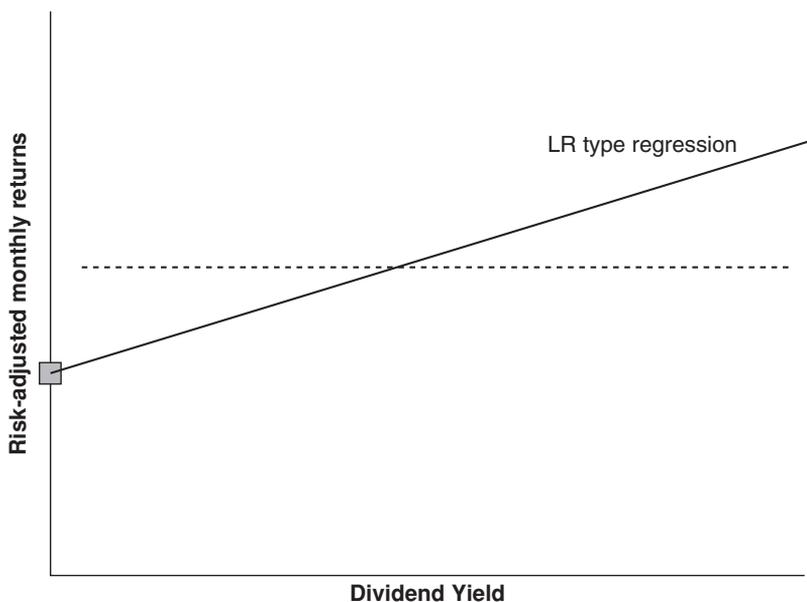


Fig. 1. Plots of risk-adjusted returns and the corresponding dividend yield along the horizontal broken line. The assumption made is that risk-adjusted returns during ex-dividend months are higher but unrelated to the respective dividend yield. The vertical axis intercept, denoted by a square, contains approximately two-thirds of the observations.

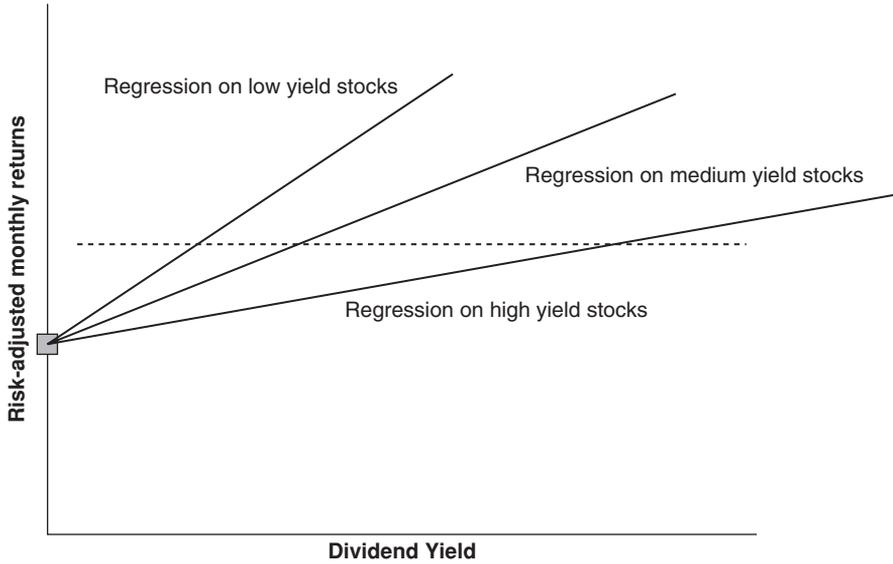


Fig. 2. Plots of risk-adjusted returns and the corresponding dividend yield along the horizontal broken line. The assumption made is that risk-adjusted returns during ex-dividend months are higher but unrelated to the respective dividend yield. The vertical axis intercept, denoted by a square, contains approximately two-thirds of the observations.

however, is not evidence of tax-induced clienteles. The explanation for this empirical regularity is quite simple. In the cross-sectional regression, the same return differential (between the ex and non-ex period) is related to a larger number for the higher-yield groups.

Although the LR experiment will uncover time-series return variation, it is not designed to find cross-sectional return variation. The example detailed in Figure 2 helps to illustrate this point. Assume a Brennan-type economy in which stocks with larger dividend yields are associated with larger pretax returns. Panel A of Figure 2 presents such an economy. Suppose that all firms in this economy pay quarterly dividends. Following the LR methodology, a dividend-paying stock is assumed to have a zero-dividend yield in two out of three months and its own yield during the ex month. As is evident in Panel B of the figure, the expected risk-adjusted return of the zero-yield category includes a “tax premium” that biases the experiment toward the null hypothesis of no tax effect.

3.3.3. *The empirical evidence*

Kalay and Michaely (2000) replicate the LR experiment using weekly and monthly data. They document a positive and statistically significant dividend yield coefficient for both weekly and monthly data. As discussed earlier, this evidence by itself might very well

indicate only time-series return variation that is unrelated to taxes. The ordinary-least-square (OLS) point estimate of the dividend yield coefficient in Kalay and Michaely's experiment is 0.246 for the weekly experiment and 0.226 for the monthly. The two estimates are almost identical. The difference between the ex-dividend week risk-adjusted returns and the returns in other weeks is similar to the difference between ex-dividend-month returns and the returns during other months. One can conclude that almost all of the excess returns occur within the ex-dividend week. This is strong evidence of time-series return variation.

To further test for cross-sectional return variation, Kalay and Michaely (2000) repeat the LR experiment using quarterly data. Expected quarterly dividends are assumed to be equal to the mean quarterly dividend yield of the previous calendar year. This is a direct test of cross-sectional return variation. The outcome is *an insignificant dividend yield coefficient*.²⁰

In summary, during the ex-dividend period, stock returns are unusually high but are unrelated to the dividend yield. Thus, Black and Scholes (1974), who examine whether returns of high-dividend yield stocks are higher throughout the year, find no dividend effect. LR examine whether stocks experience higher risk-adjusted returns during the ex-dividend period and find that returns are higher during the ex-dividend period. The evidence presented in both studies is inconsistent with a tax effect.

3.3.4. Risk and the ex-day returns

If taxes do not explain the higher ex-dividend period returns, what does? Changes in risk or risk premiums are one possible explanation. Indeed, the volume of trade in these stocks during this period is unusually high. One also finds a higher variance of stock returns during the ex-dividend period (see Lakonishok and Vermaelen, 1986). The incremental risk around the ex-dividend period could be priced. Namely, investors could require a larger ex period return to compensate them for the larger per-period risk around the ex day. On average, stocks experience an excess return of 0.24% during the 11 business days surrounding the ex day. The corresponding rate of return of a typical stock is about 0.54%. Therefore, the excess ex-day return constitutes an increase of 44% in the respective holding period returns. A similar increase in risk could explain these differences. To test the hypothesis that changes in risk explain the ex-day stock price behavior, we need a theory to guide us. Lacking a satisfactory theory, we are left with a conjecture.

3.4. The case of citizen utilities

In 1956, Citizen Utilities created two classes of identical shares that differed only in their dividend payout. Series A shares paid cash dividends, and series B shares paid

²⁰ For additional evidence indicating that LR's findings are evidence of time-series return variation, see Kalay and Michaely (2000).

stock dividends. Based on a 1969 IRS ruling, the stock dividends paid on series B stocks were not subject to taxation. In his investigation of the case, Long (1978) compared the payouts and found that the firm paid consistently 8 to 10% more stock dividends than cash dividends. The relationships between these two streams of payouts were found to be extremely stable and predictable. Investors could have easily predicted that this relationship would continue in the future. Contrary to the tax hypothesis, however, Long (1978) found that, if anything, series A stocks receiving cash dividends commanded a slight premium over series B stocks. More recently, Hubbard and Michaely (1997) reexamined the relative valuation of series A and B stocks after the 1986 Tax Reform Act. They found that the reduction in the preferential tax treatment of capital gains did not change the relative valuation of the two series. Although these results are inconsistent with the tax hypothesis, Poterba (1986) has documented different ex-dividend day price behavior for the two series. He finds a smaller stock price drop than the dividends for the series that pays cash dividends and close to an equal price drop for the series that pays stock dividends. It is surprising to find ex-day evidence that, taken at face value, seems consistent with a preference for capital gains when the overall valuation indicates a preference for cash dividends. This evidence should not be taken as definitive, however, inasmuch as we are dealing with only one firm. That this firm is a utility further limits inference, for anecdotal evidence suggests that stockholders of utilities typically prefer cash dividends.

3.5. *Recent evidence on dividends and taxes*

In two recent papers, Sialm (2005, 2006) provides some new evidence on the relationship between asset valuations, stock returns, dividends, and taxes. Rather than relying on the dividend yield as a proxy for the tax consequences of owning a security, Sialm computes a direct estimate of the effective tax burden associated with owning a security that accounts for time-series changes in tax rates on capital gains and dividend income and cross-sectional differences in the proportion of total returns that come in the form of dividends.

Sialm (2005) exploits the time-series variation in this direct measure of the tax burden to test whether expected tax burdens are capitalized into asset prices. Consistent with tax capitalization, he finds a negative relationship between asset valuations and effective tax rates after controlling for various macroeconomic factors. In addition, he also finds a positive association between taxes and aggregate asset returns.

Sialm (2006) provides new tests of the Brennan (1970) model based on the estimated tax yield of the security, rather than relying on the estimated dividend yield. The paper finds an economically and statistically significant relationship between risk-adjusted stock returns and effective personal tax rates using data on a cross section of equity securities between 1927 and 2004. Consistent with tax capitalization, stocks facing higher effective tax rates tend to compensate taxable investors by generating higher before-tax returns.

4. Agency relationships and dividend policy

Miller and Modigliani (1961) demonstrate that in perfect capital markets, assuming a given investment policy, the firm's market value is independent of its dividend decision. The assumption that investment policy is fixed is helpful, for it separates the effects on firm value of investment decisions from those of dividend decisions. In general, however, investment decisions and dividend decisions are often interrelated. For example, by deciding to reduce its dividend payment (holding other forms of payout constant), the firm increases its investment. Similarly, the firm can finance its payment of cash dividends by selling assets. Hence, a more realistic investigation of the dividend decision requires exploration of the effects that alternative dividend decisions have on the firm's investment policy. The motivation to investigate this issue further is enhanced by the modern view of the corporation as a complex structure of contractual arrangements among different parties. This section highlights the important role the dividend decision plays in the complicated relationships among the various parties.

4.1. *The main claimholders of the firm*

There are different types of suppliers of capital, but all share the consequences of the economic activities of the corporation. Stockholders, bondholders, convertible bondholders, and owners of warrants supply capital and receive payouts based on the cash flows generated by the firm. Management and employees supply labor and receive payments. Suppliers of other factors of production and subcontractors also have a stake in the firm's success. Even past customers who continue to purchase maintenance services for equipment bought from the firm rely on the corporation's continued operation. These parties have conflicting interests, but two conflicts stand out as most important in the discussion of payout policy—the conflict between stockholders and bondholders and the conflict between management and stockholders.

4.2. *Stockholder–Bondholder conflict and dividends*

Our investigation of the conflicts of interest between bondholders and stockholders assumes that management's interests are aligned with those of stockholders. Stockholders can hire and fire management, and managers often have significant equity positions in the firm. Moreover, the compensation of managers often contains a significant component that depends on the firm's stock price.²¹ We therefore assume that management decisions are consistent with those the stockholders would make themselves, and we refer to managers and stockholders interchangeably in our discussion. We relax this assumption when we discuss the conflicts of interest between managers and stockholders in Section 4.4.

²¹ Murphy (1999) provides a comprehensive summary of the literature examining managerial compensation.

Stockholders and bondholders share the cash flows generated by the firm.²² Bondholders are entitled to periodic interest (coupon) payments and the payout of the face value (the promised amount) at the maturity of the debt. They are paid first, but the payoffs are limited to the promised coupons and face value. Stockholders, in contrast, receive all the remaining cash flows after the obligations to the bondholders have been met. If the value of the firm exceeds the value of the obligations to the bondholders, the stockholders will choose to pay them off and take the residual value. If, however, the value of the firm's assets is lower than the amount promised to the bondholders, then stockholders, having limited liability, can default. In this case, the bondholders have the right to take over the assets of the firm as partial compensation for their debt. There is a clear asymmetry in how the payoffs are split between the two parties. Stockholders, who receive the residual value after full payment to the bondholders, are the sole beneficiaries of the firm's upside potential; bondholders who will lose a portion of their principal in bad times bear the downside risk.

The asymmetry in the payoffs to the bondholders and the stockholders creates conflicting objective functions. The bondholders will attempt to maximize the likelihood that they will be paid in full. Hence, they will choose to minimize the downside risk and thereby increase the value of their claims. The stockholders will choose an investment policy with as large an upside potential as possible even if by doing so they increase the downside risk. Increasing both the upside potential and the downside risk would increase the market value of the equity with a corresponding reduction in the market value of the debt. The conflicting relationship between the bondholders and the stockholders is illustrated algebraically as follows:

$$B + S = F \quad (10)$$

where

B = the market value of the bonds

S = the market value of the stocks

F = the market value of the firm

Consider an action that changes the market value of the firm by ΔF

$$\Delta B + \Delta S = \Delta F \quad (11)$$

$$\Delta S = \Delta F - \Delta B \quad (12)$$

Stockholders gain from an action that leaves the market value of the firm unchanged if it reduces the market value of the debt. In such a case, stockholders' gains would equal bondholders' losses. Assuming perfect capital markets, the ex-dividend drop in firm value is equal to the dividend paid; $\Delta F = -D$.²³ In this case,

$$\Delta S = -D - \Delta B \quad (13)$$

²² For simplicity we assume only two types of claims—straight debt and equity. The analysis is easily extended to convertible debt, warrants, and preferred stocks.

²³ In this section, cash dividends and payouts to stockholders via share repurchases are treated interchangeably.

If debt value is unchanged by the payment of the dividend, then the market value of the firm's stock falls by the full amount of the dividend, leaving stockholders unaffected by the dividend payment. However, the payment of dividends reduces the pool of assets supporting the debt, potentially increasing the risk of the bonds and reducing the value of the debt. If $\Delta B < 0$, stockholders are better off by paying a dividend.

An unexpected increase in risk will reduce the market value of the bonds. Hence, bondholders prefer smaller (or no) dividends. Stockholders have the opposite incentives. A reduction in the market value of the debt, holding other things constant, implies an increase in stockholders' wealth. Payment of dividends ensures stockholders some payoffs even if the firm eventually defaults on its obligations to the bondholders. Consequently, other things held constant, stockholders would like dividend payments to be as large as possible.

4.2.1. A partial solution to the conflict—dividend Constraints

The incentives of stockholders are well known to market participants. Once debt is raised, the stockholders would choose to pay themselves more dividends than the amount that maximizes the market value of the firm. The potential purchasers of the bonds would assume a larger payout level and price the debt accordingly. Hence, a larger dividend payment does not hurt the bondholders as long as it is anticipated and bond prices reflect it. To the extent that there is a loss of value associated with the suboptimal dividend payment, it is the stockholders who bear the loss. Thus, it is in stockholders' best interests to restrict their future ability to pay dividends if they want to raise debt. Theory tells us that debt indentures should include restrictions on stockholders' ability to pay dividends.

The legal system imposes some restriction on the ability to pay. Dividends can be paid in an amount that does not exceed earned surplus. Uninformed investors are protected by imposing a limitation on stockholders' ability to empty the firm. Yet stockholders themselves offer bondholders additional protection in the debt indentures. Kalay (1982b) examines a large sample of debt indentures and finds all of them to contain covenants restricting dividend payments. As expected, the restrictions apply to all forms of payouts to the stockholders—cash dividends and share repurchases. Kalay finds two types of dividend restrictions, direct and indirect.

4.2.2. The direct dividend constraint

The direct dividend constraint places a maximum on the amount of cash dividends and share repurchases at any given point in time during the life of the bond. The constraint specifies an initial reservoir of payable funds—the amount stockholders can pay out as dividends at the time of the debt issuance. To compute the funds available for dividend payments at any point in time during the life of the bond, one has to add to the initial reservoir an agreed upon fraction of the accumulated net earnings and funds raised by the sale of new stock, and subtract all the dividends paid up to that point in time. Note that if

accumulated earnings are nonnegative, stockholders can pay out all the funds raised by the sale of new equity. Thus, equity-financed dividends are not restricted. If net earnings are negative, stockholders have to defer dividend payments until net earnings turn positive and cover the existing deficit. Finally, the constraint is cumulative—stockholders can forgo payments of dividends without necessarily losing their legal right to pay them in the future. The restriction applies to two types of dividends; those financed by reducing investment (or sale of assets) (hereafter investment-financed dividends) and those financed by the sale of new bonds (hereafter debt-financed dividends). The direct dividend constraint is soft in the sense that it can only stop payment of dividends in bad times, but it does not require any other action.

4.2.3. *The indirect dividend constraint*

Indirect dividend constraints are implied by bond covenants such as stockholders' commitments to maintain a minimum level of net worth, a minimum level of working capital, or a maximum ratio of debt to assets. These restrictions are similar to the direct dividend constraint in that they are cumulative and allow the deferral of dividend payments, they are placed on the sum of dividend payments and share repurchases, and they most often apply only to debt- and investment-financed dividends. They differ from the direct dividend constraints in one important way. If violated, they force the stockholders to contribute new equity capital or give up the firm.

4.2.4. *Stockholders pay less than they are allowed to—the reservoir of payable funds*

Based on the preceding analysis, once the set of dividend constraints is in place, we expect stockholders to pay themselves as much in dividends as they can. The payment of debt- or investment-financed dividends raises the risk of the outstanding bonds, thereby reducing their value. This reduction in debt value is a net benefit to the stockholders. Yet, Kalay (1982b) finds that stockholders do not choose to pay themselves as much dividends as they legally can. Kalay (1982b) reports the funds available for distribution to the stockholders under the most restrictive dividend constraint (defined as the reservoir of payable funds) that stockholders choose to maintain. He finds that for most firms this reservoir is positive and of nontrivial magnitude. It is, on average, 11.7% of firm value. At face value, this finding is very surprising. Stockholders forgo payments of investment- and debt-financed dividends that would substantially increase the risk of the outstanding bonds. Presumably, stockholders can get better prices for their bonds if they commit not to pay the amount maintained as reservoirs of payable funds. Pushing this logic to the extreme, stockholders can pre-commit to pay no dividends and thereby ensure that no reservoir would need to be maintained and eliminate any possible tax-related costs associated with payouts. Yet, stockholders choose a constraint that allows for payouts and pay less than they are allowed to legally.

4.2.5. *Potential explanations*

Stockholders incur costs associated with the forgone wealth transfer from bondholders by maintaining positive reservoirs. Hence, an economic rationale for their existence should point to some benefits. Kalay (1979, 1982b) suggests that one such benefit arises if the supply of investment projects with nonnegative NPV facing the corporation is limited.²⁴ In such a case, a total prohibition on payouts could force the firm to take negative NPV projects (i.e., to overinvest). Alternatively, the firm would thereby be forced to buy back its bonds, deviating from its optimal capital structure. Taking a project with negative NPV or maintaining suboptimal capital structure is costly. Thus, stockholders maintain reservoirs of payable funds to reduce the potential costs of overinvestment. Kalay (1979) documents evidence consistent with this hypothesis—firms with better future investment opportunities and higher leverage ratios maintain smaller reservoirs.²⁵

Stockholders could also choose to maintain reservoirs of payable funds if they derive some benefits from receiving a smooth stream of payouts. The reservoir would allow the stockholders to pay similar dividends to the norm in periods of low or even negative earnings. The particular benefits stockholders derive from the smoothing of dividends are not clear, however. Investors can form portfolios with smooth dividends even if each firm provides a volatile series of payments.

4.2.6. *Additional empirical evidence*

Further examination of the role dividends play in the conflicts of interest between bondholders and stockholders involves the study of stock and bond prices around the announcement of an unexpected change in the dividends that firms pay. Other things held constant, an unexpected increase in dividends should be associated with a reduction in bond prices and an increase in stock prices. However, other things are not held constant. The empirical evidence indicates that unexpected large (small) dividends are associated with better (worse) performance. Even if current earnings are not improved (deteriorated), an increase (decrease) in dividends may reveal to the market management's expectations of future performance. If dividend increases reveal positive information about future performance, then an unexpected dividend payout could also be good news for bondholders—a prediction opposite to that from the conflicts of interest hypothesis. Handjinicolaou and Kalay (1984) examine this issue and find that both stock and bond prices decline around dividend decreases and that stock price rises and bond prices are unaffected by the announcement of dividend increases. This suggests that the information content of dividends is the stronger market force. Dhillon and Johnson (1994) reexamine the issue, focusing only on significant dividend changes. Their sample includes large

²⁴ Corporate investments in financial markets generally provide stockholders negative net present value because of double taxation.

²⁵ John and Kalay (1982) derive the optimal dividend constraint and find that stockholders have incentives to pay less investment-financed dividends than they are permitted. Their model cannot explain, however, stockholders' reluctance to pay as much debt-financed dividends as they are permitted.

dividend changes, dividend initiations, and omissions. They find that bond and stock price behavior around significant dividend changes is consistent with the agency hypothesis. Following announcements of dividend initiations, stock prices increase by an average of 0.72% and bond prices fall by an average of 0.7%. Similarly, following announcements of large dividend increases (of at least 30%), stock prices rise by 1.82% and bond prices fall by 0.5%.

Jayaraman and Shastri (1988) examine the behavior of bond and stock prices around specially designated dividends (SDDs). SDDs are less likely to convey information about the long-run prospects of the firm. A sample with limited information content seems appropriate to search for potential dividend-related wealth transfers between stockholders and bondholders. They find point estimates of average bond and stock price response to dividend announcements consistent with the agency hypothesis, yet the estimates are statistically insignificant.

4.3. Conflicts of interest between stockholders and other senior claimholders

The conflicts of interest between stockholders and other senior claimholders are very similar to those they have with bondholders. Consider the case of holders of convertible bonds. Convertible bond consists of a straight bond and a call option. The holder of a convertible bond has the right to give up his or her bond (whose market value at the time of conversion is the exercise price) in exchange for a fixed number of shares of stock. By paying dividends, stockholders reduce the pool of assets supporting the payment of the straight bond and thus increase the bond's risk. The implied reduction in the market value of the straight bond is the wealth transferred to the stockholders. In addition, by paying dividends, stockholders reduce the ex-dividend price of the stock, thereby reducing the value of the call option. The decrease in the market value of the call option attached to the bond is also wealth transferred to the stockholders. Solutions to this conflict are similar to those used to ease the tension between the bondholders and the stockholders.²⁶

4.4. Ownership versus control and the dividend decision

The modern corporation is run by professional managers who are not the main contributors of capital. Stockholders own the firm, but professional managers exert significant control. Management makes the daily investment and financial decisions subject to oversight by the board of directors. The division of ownership and control is perhaps natural given the economies of scale associated with investment policy and the special skills required to manage a complex organization. Similar to the stockholder–bondholder conflicts described earlier, however, the incentives of management likely differ from those of the suppliers of capital.²⁷ The dividend decision is no exception.

²⁶ For example, convertible bonds typically contain antidilution clauses that limit dividend payments.

²⁷ In this section, we treat the suppliers of capital in all forms (stocks, bonds, convertibles, warrants, etc.) as one group that we call the stockholders.

Managers are often compensated through bonus plans that are proportional to profits. Larger corporations are likely to report bigger earnings. Holding the profitability of the firm constant, the more capital that is contributed to the corporation the bigger it is. In addition, managers' social status is typically tied to the amount of assets they control. Consequently, managers would like to retain as much earnings as they can to avoid reductions in the size of the asset base under their control. Managers are expected to be averse to paying dividends for additional reasons. Their human capital is associated with the success of the firm they run. By retaining a larger fraction of net earnings, they reduce the risk of financial distress. In larger firms, management may also be better able to hide perquisite consumption. Finally, in many firms, executives are granted stock options. To the extent that the exercise prices of these options are not adjusted downward on ex-dividend days, managers have incentives to avoid (or reduce) the payment of dividends. In summary, managers appear to have incentives to pay dividends in an amount that is lower than the dividends that would maximize stockholders' wealth. Paying less than is optimal allows managers to maximize the resources under their control, resulting in overinvestment and reducing the value of the firm's stock. It is therefore in the stockholders' best interest to mitigate these conflicts.

The board of directors is charged with representing the interests of the stockholders and appoints top management. An important part of their responsibilities is to monitor the performance of management and to ensure that the decisions taken are consistent with the maximization of stockholders' wealth. This is not an easy task. Management is privy to better information concerning the firm they run than are members of the board. The board may have a difficult time assessing to what extent management's decisions deviate from the maximization of firm value. The difficulty stems from the public good aspects of the board members' jobs and their limited skills and information. Faced with a significant measurement problem, boards attempt to design compensation packages that align the interests of management with those of the stockholders. Nevertheless, to the extent that imperfect monitoring and contracting by the board fails to eliminate completely the tensions between management and stockholders, conflicts of interest between these two groups will influence the dividend decision.²⁸

4.4.1. Easterbrook's model

Easterbrook (1984) conjectures that dividends play an important role in easing the tensions among the various claimholders of the firm. Dividends, according to Easterbrook (1984), are part of the solution to the agency relationships between management and stockholders. As the optimal size of the firm grows, entrepreneurs need more external funds to finance investment. The result is a larger and more diverse group of stockholders,

²⁸ Analyses by Zweibel (1996), Fluck (1999), and Myers (2000) examine managerial entrenchment in the context of capital structure, but their arguments can be extended to dividend payouts in a straightforward way. In these models, managers voluntarily commit to pay out cash because of the constant threat of discipline. An overview of issues in executive compensation is given by Aggarwal (2007).

most of whom own only a small fraction of the firm. A small stockholder is unlikely to monitor the actions of management. He or she incurs the full costs of monitoring but receives only a fraction of the benefits. Yet, if stockholders can organize and spread the monitoring costs proportionally, they stand to gain from improved decisions. Easterbrook (1984) argues that dividend payments serve such a role.

By paying more dividends, the firm increases the likelihood that it will have to raise external funds. Hence, paying dividends is associated with more frequent scrutiny by professionals such as lawyers, investment bankers, money managers, and public accountants. These professionals have strong incentives to scrutinize the firm and evaluate the management. These professionals can lose their reputation if they manage an unsuccessful stock or bond offering. They would be hurt by mispricing an issue, for market participants would be reluctant to buy their future security offerings. Consequently, management of dividend-paying firms is scrutinized more frequently and can extract less wealth from their stockholders. Recognizing the important role of dividends, stockholders insist that dividends be paid.

Adding to the conflicts of interest between the suppliers of capital and management, tensions between bondholders and stockholders highlight an additional role for dividends. Subject to existing constraints, the stockholders would like more dividends to be paid. As already pointed out, however, stockholders value maintaining a reservoir of payable funds to the extent that it serves to reduce the likelihood of overinvestment. But management has incentives to pay even less. By retaining more earnings, management reduces the firm's debt/equity ratio. Managers can benefit from a lower debt/equity ratio, other things held constant, because this reduces the probability of bankruptcy and thus reduces the likelihood that management will suffer a loss of reputation associated with controlling a bankrupt firm. Furthermore, managers invest a larger fraction of their wealth (including human capital) in the firm they manage than do other stockholders. Hence, reducing firm risk, even at the expense of profitability, can benefit them.

Easterbrook's (1984) analysis leads to the following empirical implications. First, closely held firms, other things held constant, should pay lower dividends. Similarly, firms having a large stockholder do not have to rely on the capital markets to monitor their managers. The large stockholder has more incentives to monitor management, and there is less need for dividends. Second, firms with lower optimal debt/equity ratios, other things constant, should pay less in dividends. Thus, based on Easterbrook's analysis, we expect a positive correlation between dividends and the debt/equity ratio.

4.4.2. *Jensen's model*

The starting point of Jensen's (1986) analysis (which is similar in spirit to Easterbrook) is the limited ability of stockholders to control management. Managers can choose actions that maximize their own utility but are not necessarily consistent with the maximization of shareholders' wealth. The important asset enabling management to depart from

stockholders' interests is the corporation's free cash flows. Jensen defines free cash flows as cash flow in excess of that needed to fund positive NPV investment projects. The free cash flows are available to be used by management in pursuit of their own objectives. Paying out these funds reduces management's ability to shift resources away from the stockholders. Indeed, stockholders should insist that these funds be paid. Increasing leverage is another mechanism for reducing free cash flow as debt involves a commitment to periodic interest payments. Note that Jensen's theory predicts a negative relationship between dividends and the debt/equity ratio.

4.4.3. Empirical evidence

Several studies have investigated the effects of the conflicts of interest between management and stockholders on the dividend decision. Lang and Litzenberger (1989) conjecture that the overinvestment problem associated with free cash flow is likely to be greater in stable, profitable companies with few growth opportunities. They examine the market response to unexpected dividend changes for firms with different investment opportunities, using Tobin's Q (market value of assets/book value of assets) as a measure of corporate investment opportunities. According to Lang and Litzenberger (1989), higher Tobin's Q implies better investment opportunities. Conversely, firms with low Q have poor investment opportunities, and market participants would want them to pay dividends. Consistent with the idea that dividend payments can limit agency problems in firms with poor investment opportunities, Lang and Litzenberger document a much stronger market response to dividend changes for firms with a Q less than one than for those with a Q greater than one. Yoon and Starks (1995) repeat the Lang and Litzenberger experiment using a longer time period. After controlling for additional factors, they find that the market reactions to dividend changes are similar for both high and low Q firms. Their results are not consistent with the free cash flow hypothesis.

Lie (2000) investigates the relation between excess funds and the market reaction to changes in payout policy and finds that firms that increase dividends or repurchase shares have excess cash relative to peer firms. He also finds that the market reaction to the announcement of special dividends is positively related to the firm's excess cash and negatively related to Tobin's Q. The results are consistent with the idea that distributing cash can limit potential overinvestment and increase shareholder wealth.

Along similar lines, DeAngelo, DeAngelo, and Stulz (2005) argue for a life-cycle theory of dividends in which the firm balances the benefits (e.g., reduced flotation costs) and costs (e.g., agency costs of free cash flow) associated with earnings retention. Under this theory, the trade-off between retention and distribution (i.e., payout of earnings) evolves over time as profits accumulate and investment opportunities decline. Consistent with this view, they find that the probability that a firm pays dividends is positively related to its mix of earned and contributed capital. They also find that the earned/contributed capital mix has a substantial effect on the likelihood of dividend initiations and omissions. Finally, they estimate that had the 25 largest long-standing dividend-paying firms in 2002 not paid dividends, their cash balances would total

\$1.8 trillion (51% of assets) compared to their actual cash balances of \$160 billion. In other words, had these firms not paid dividends, they would have huge cash balances and/or little or no leverage; dramatically increasing the potential for managers to pursue policies that benefit themselves at stockholders' expense.

Eckbo and Verma (1994) provide cross-sectional evidence on the relationship between voting rights and dividend payments based on data from Canada, where shareholders have the right to vote on the dividend payments proposed by management. They find that firms pay lower cash dividends when managers have greater voting control of the firm, which is consistent with both agency and tax arguments.

Using international data, LaPorta, Lopez-de Silanes, Shleifer, and Vishny (2000) examine two competing agency-based explanations for the payment of dividends. Under the bonding hypothesis, managers voluntarily pay dividends to commit not to expropriate shareholders. Under what they call the outcome hypothesis, shareholders are able to force managers to pay dividends in order to limit the resources under managers' control. LaPorta et al. use variation in the legal protection of shareholders across countries to examine these two hypotheses. Under the bonding hypothesis, firms in countries with weak legal protection of shareholders should be most likely to pay dividends. Under the outcome hypothesis, the opposite is true; firms in countries with strong legal protection for shareholders should be more likely to pay dividends. Their results support the outcome hypothesis over the bonding hypothesis. They document a strong positive relationship between the level of legal protection and the dividend payout, and they show that low-growth firms have higher payout ratios in countries with strong legal protection. Their findings suggest that investors use their legal power to force companies to pay dividends, particularly when growth prospects are poor. Their evidence does not support the idea that managers voluntarily pay dividends in order to reduce free cash flow problems.

Agrawal and Narayanan (1994) investigate the dividend decisions of a sample of all-equity firms as compared to the decisions of firms with debt in their capital structure. Debt involves commitment to payments of interest, and hence, other things held constant, leveraged firms have less free cash flow. Jensen's theory therefore predicts that firms with higher debt/equity ratios pay lower dividends. Indeed, Agrawal and Narayanan report that the dividend payout ratios of leveraged firms are significantly lower than those of all-equity firms. They examine the issue further by dividing their sample of all-equity firms into two groups. The first consists of firms in which managers have a significant ownership stake that aligns their interests more closely with those of the stockholders. The second contains firms in which managers have small ownership stakes. Consistent with the theory, they find that firms in the first group pay less dividends compared to firms in the second group.

Jensen, Solberg, and Zorn (1992) investigate the joint determination of dividend payouts, debt/equity ratio, and insiders' holdings. Controlling for profitability and investment opportunities, they found that dividend payouts are negatively related to the leverage ratio and insider holdings. The evidence seems to indicate that debt service obligations and significant insider ownership are substitutes for dividends in controlling the

manager–stockholder conflict. Finally, Lambert, Larcker, and Larcker (1989) investigate the dividend policies of firms that granted their executives stock options. In general, exercise prices of executive stock options are not dividend protected, thus providing managers with significant option holdings and incentives to reduce dividend payments. Consistent with this view, they find a reduction in dividend payouts following the adoption of a stock option plan. Overall, the evidence suggests that agency problems between the various claimants of the firm have an effect on payout policy.

5. Asymmetric information and payout policy

Under the perfect capital markets conditions of the Miller and Modigliani dividend irrelevance proposition, all interested market participants have the same information about the firm. In perfect capital markets, the level and pattern of a firm's dividend payments will have no effect on the value of the firm's stock. The irrelevance of dividend policy for a firm's market value seems to be at odds with existing empirical research that documents the significant effects of dividend distributions on stock prices. To study the nature of the information conveyed through dividends, a number of empirical experiments examine whether unanticipated changes in dividends cause share prices to change in the same direction as the dividend change. Pettit (1972) finds that share prices tend to rise following announcements of dividend increases and to fall following announcements of dividend decreases. Aharony and Swary (1980) show that this relation between dividends and stock prices holds even after controlling for contemporaneous earnings announcements. Thus, dividends appear to contain incremental information about firm value beyond the value-relevant information contained in earnings. The variety of studies on announcement effects suggest that share prices tend to rise by about 0.4% following announcements of dividend increases and to fall by over 1% following announcements of dividend decreases.

Studies by Asquith and Mullins (1983), Healy and Palepu (1988), and Michaely, Thaler, and Womack (1995) examine large changes in dividend policy by focusing on the initiations and omissions of dividends. The analyses show that the market reactions to these events are dramatic. Excess returns following dividend initiations are about 3% and those following dividend omissions are over -7% . Kalay and Lowenstein (1986) analyze whether the timing of dividend announcements conveys information to investors. Early announcements of dividends tend to be associated with good news, while delayed announcements are generally associated with bad news.

In summary, unanticipated announcements of dividend changes tend to be associated with revisions in share prices in the same direction as the dividend change. Share prices increase on average following dividend increases and initiations, and they fall on average following dividend decreases and omissions. The evidence clearly shows that dividends convey information that is relevant to investors.

If one relaxes the assumption of symmetric information, then dividend payments might convey information to the market. In this context, dividends might convey information

not previously known to market participants, or dividends might arise as a mechanism for “signaling” the true value of the firm. It is possible that dividend decisions can convey value-relevant information to investors by resolving future uncertainty. Miller and Rock (1985) provide one illustration of this possibility. They note that dividends, investment, and earnings are intrinsically related through the accounting identity that describes the firm’s sources and uses of funds as shown in the following equation.

$$\text{Dividend}_t = \text{Earnings}_t - \text{Investment}_t \quad (14)$$

In this accounting identity, dividends represent any dividends paid net of new financing raised. To illustrate how dividends might convey information, assume that the firm’s investment policy is fixed and known. Further assume that the firm’s earnings are serially correlated through time according to the following:

$$\text{Earnings}_{t+1} = \rho \text{Earnings}_t + \varepsilon_{t+1} \quad (15)$$

In other words, the level of the firm’s current earnings contains information about the future level of earnings. As seen from the sources and uses identity, dividends are the residual of earnings over investment. Thus, larger than expected dividends imply higher earnings both today and in the future if earnings are serially correlated through time. Since the market does not know the current level of earnings, higher than expected dividends, which imply higher earnings, will lead to a positive stock price reaction to the announcement of the dividend.

As shown by Miller and Rock, however, if dividends can be used to convey information to market participants, then the usual rule of investing in all positive NPV projects is no longer consistent because managers have incentives to manipulate investment policy and pay higher dividends today in order to raise the current stock price. To restore consistency, a number of signaling models have been developed that treat dividends as a “costly” mechanism for signaling the firm’s future prospects.

5.1. Dividend-signaling models

Dividend-signaling models provide a logical framework for understanding the role of dividends in communicating relevant new information to the market. In this section, we briefly describe the essential features of several prominent dividend signaling models, such as those developed by Bhattacharya (1979), John and Williams (1985), and Miller and Rock (1985).

The basic feature of all these models is that managers possess private information about the firm’s future earnings prospects and that they use dividend payments to communicate this private information to the market. While some information may be easy to communicate to investors through audited financial statements and other announcements, other crucial information may be more difficult to disseminate to a firm’s investors. For example, a firm whose management is highly confident about the outcome of its ongoing research and development (R&D) may not easily convey this information to investors.

If the firm simply issues a public announcement regarding the likely success of its efforts, there is a likelihood that other firms, whose R&D is not progressing as well, will issue similar statements. Alternatively, if the firm announces too much detail in an effort to support its claims, then it may undermine its competitive advantage.

A second feature present in signaling models is that the firm has incentives to immediately establish its true market value. There are several reasons why this might be the case. For example, the firm may need to issue new equity securities to fund its investments, may have current investors who desire to sell shares for liquidity needs, or may be facing the threat of a takeover. If the private information held by managers is favorable but not reflected in the current market price, then any share sales or issues of new shares will transfer wealth from existing shareholders to new shareholders. Firms with more favorable private information have greater incentives to communicate this information to the market to eliminate this underpricing.

The payment of a dividend may proxy for this favorable information and lead to an upward adjustment of the firm's share price if investors believe that firms paying higher dividends have better future prospects. The signal is credible if other firms, with less optimistic prospects, cannot mimic the dividend policies of the firms with better future prospects. To be a credible signal, the dividend decision must be "costly" in the sense defined by Spence (1977). The "cost" of the dividend signal varies from model to model, and we describe these differences in more detail when we discuss specific signaling models. In the remainder of this section, we describe several different dividend signaling models and survey relevant empirical evidence. The models are discussed in roughly chronological order.

5.1.1. The Bhattacharya model

In Bhattacharya's signaling model (1979), the manager signals private information about the prospects of the firm's investment projects by committing ex ante to a dividend policy. This private information concerns the expected profitability of the project. The model covers two periods. At time 1, the project generates cash flows that are used to pay the dividends committed to at time 0. A crucial assumption of the model is that if the cash flows generated by the project are insufficient to cover the announced dividend payments, then the firm must resort to costly outside financing. After the dividends are paid at time 1, the firm is sold to a new group of shareholders who receive the payoffs generated by the firm at time 2. The payoffs from the project are independent and identically distributed across periods. The price that the new investors are willing to pay depends on their beliefs regarding the profitability of the project. At time 0, the manager can signal the profitability of the project by committing to pay a large dividend at time 1. Because issuing new securities is assumed to be costly, firms with less favorable investment projects will face higher expected financing costs for the same level of dividend payments. This ensures that the low-quality firm will find it unprofitable to mimic the dividend policy adopted by the high-quality firm, implying that the firm's dividend policy can serve as a credible vehicle for conveying management's private information to the market.

Despite its insights, the Bhattacharya model is subject to some criticisms. For one, Bhattacharya was not specific as to how management would commit to a specific dividend policy. Dividends do not represent a contractual obligation, and the firm is not obligated to resort to costly external financing should a cash flow shortfall occur. If market participants recognize this lack of commitment, they will not attach any importance to the existence of dividend payments. A second criticism of the model is that a commitment to a policy of share repurchases could also serve as a valid signaling mechanism. Given that share repurchases generally have more favorable tax consequences for investors compared to dividends, it is not clear why the firm would choose dividends rather than share repurchases to signal favorable information to the market.

5.1.2. *The Miller and Rock model*

Miller and Rock (1985) also developed a signaling explanation for dividends. In their model, firms invest in a project at time 0. At time 1 the project produces earnings, which are used to pay dividends and finance the firm's new investments. Managers possess private information about the firm's realized earnings. Market participants do not directly observe either the level of earnings or the level of new investment. Miller and Rock assume that some shareholders desire to sell their holdings in the firm at time 1, which provides a motivation to establish the true valuation of the firm. Earnings are correlated through time, which implies that the firm has an incentive to convince the market that time 1 earnings are high so that selling shareholders receive a high price for their shares.

The relation between earnings, dividend payments, and investment is governed by the accounting identity that ensures that sources of cash flow are equal to uses of cash flow. Because of the sources and uses identity, all else being equal, a firm that increases its dividend must reduce its current investment. In the Miller and Rock model, "better" firms distinguish themselves by cutting investment to pay higher dividends. In equilibrium, dividend payments are sufficiently high such that lower quality firms will not find it in their interest to forgo profitable investment in order to mimic the dividend policy of higher quality firms. On the one hand, the idea that firms might reduce investment to pay higher dividends is a significant insight of their model. In addition, the Miller and Rock model generates predictions about the announcement effects of dividends. On the other hand, because of the sources and uses identity, the "dividend" payment in the Miller and Rock model is actually the sum of dividend payments and share repurchases net of any new financing. Thus, their model also cannot explain why firms would choose to signal using dividends (which are tax disadvantaged) rather than repurchases.

5.1.3. *The John and Williams model*

John and Williams (1985) have overcome the criticism that share repurchases serve the same signaling role as dividends by developing a model in which the personal tax disadvantage of dividends represents the "cost" of signaling the firm's future prospects to

the market.²⁹ The model can therefore explain why firms pay dividends, even when there are alternative methods of distributing cash to shareholders, such as share repurchases.

In the John and Williams model, shareholders have liquidity needs that must be met by selling shares. Managers act in the interest of existing shareholders and have information that outside investors do not have regarding the true value of the firm. If the firm is undervalued at the time that the existing shareholders need to sell their shares, they will sell at a price that is below fair value. John and Williams show that a “good” firm can signal its true value by paying a taxable dividend. If outside investors interpret the dividend as a positive signal, the share price will rise and stockholders will sell fewer shares in order to meet their liquidity needs. Dividend payments are costly to shareholders, who must pay tax on them. However, there are two benefits: (1) the shareholders sell their shares at a higher price, and more importantly (2), the shareholders maintain a larger fractional share of the firm’s equity. If the firm is undervalued, the gain on the higher fractional share of the firm is valuable. A “bad” firm will not find it profitable to mimic the actions of the “good” firm because shareholders will lose on the fractional share retained when the overvaluation is corrected. Only shareholders in firms that are sufficiently undervalued will benefit enough from their higher fractional ownership to make it worthwhile to bear the tax cost of the dividend payment. The model suggests that firms expecting higher future operating cash flows optimally pay higher dividends, and that the optimal dividend is larger when the tax disadvantage of dividends relative to capital gains is smaller. Finally, the model can also explain why firms sometimes pay dividends and issue new equity securities in the same period. In this case, dividends are used to reduce the underpricing of new securities issued to raise outside financing.

5.2. *Dividend smoothing and dividend clienteles*

Another stylized fact is that corporations smooth dividends relative to cash flows. A firm often will not change its dividend payment over a substantial period of time, even though earnings might change dramatically over this same time period. John and Nachman (1986), using a dynamic version of the John and Williams (1985) model, and Kumar (1988) have developed signaling theories in which dividends are smoothed relative to underlying cash flows.

5.2.1. *The John and Nachman model*

In the John and Nachman model, the equilibrium dividend paid is the product of two terms: the total extent of financing done at the firm and shareholder level, and the degree of optimism in the private information of the firm’s managers. When the firm’s managers possess a high level of optimism about future earnings then, because securities are mispriced, the firm will desire to raise only the amount needed to finance its profitable

²⁹ Bernheim (1991) also provides a signaling theory of dividends based on taxes.

investments. Alternatively, when the level of optimism is relatively low, management will desire to raise a large amount of funds and hold some in reserve to finance future investments. In these two cases, dividend payments can be roughly the same even though the cash flows are quite different.

5.2.2. *The Kumar model*

In the Kumar model, dividend smoothing arises as a way to separate different types of firms when there is a continuum of types ranging from low-quality to high-quality firms. Firm quality is broken into a finite number of discrete intervals, and the firms in each interval pay the same dividend even though they have different earnings.

5.2.3. *The Allen, Bernardo, and Welch model*

Allen, Bernardo, and Welch (2000) have developed a signaling model that can potentially explain both the payment of dividends and the smoothing of dividends based on tax clienteles. In their model, there are two types of investors with different tax rates on dividends: untaxed institutional investors and taxed individual investors. Moreover, they assume that institutional investors, because of their size, have greater incentives to invest resources to become informed about the quality of the firm. They are also more likely to facilitate mechanisms through which shortcomings in management are corrected. They further assume that dividends are a way of attracting institutional investors. In their model, the equilibrium market prices of dividend-paying firms make these securities a relatively better purchase for institutions compared to individual investors because of the relative tax advantage that institutional investors enjoy. This comparative advantage results in institutional investors holding an endogenously determined fraction of dividend-paying stocks in equilibrium.

In the signaling equilibrium derived by Allen, Bernardo, and Welch, taxable dividends exist to signal high-quality firm management because paying dividends increases the chance that the institutions holding the stock will detect firm quality. Poor-quality firms dislike attracting institutional ownership because it increases the probability that firm quality will be revealed. These poor quality firms will not find it worthwhile to incur the dividend tax costs to mimic high-quality firms. In contrast, high-quality firms do not fear detection and are willing to have their shareholders incur dividend taxes in order to signal firm quality.

Another issue surrounding signaling explanations of dividends is why firms use dividends to signal their quality even though share repurchases impose a lower tax burden on investors. As we described earlier, the John and Williams (1985) model can account for why dividends may be favored over share repurchases, because in this model it is the tax consequence of dividends that represents the cost of false signaling by lower quality firms. Firms do not use share repurchases to avoid taxes because it is precisely the tax consequences of dividend payments that support the signaling equilibrium. In contrast, in many other signaling models there is no reason dividends would be favored as a

signaling mechanism relative to share repurchases. In fact, as long as share repurchases are taxed favorably relative to cash dividends, share purchases should be favored as a mechanism for signaling firm quality relative to dividends.

Nevertheless, dividends can sometimes arise as a viable signaling mechanism, even with adverse tax consequences for investors. One important distinction is that dividend payments represent a pro rata distribution of cash to all shareholders, but shares are repurchased only from investors who choose to sell. If some investors are more informed relative both to other investors and management, share repurchases can suffer from an adverse selection problem of their own. Specifically, if some investors possess superior information about the firm's future prospects, only those shareholders who believe that the firm is currently overvalued will tender their shares into the repurchase. Ambarish, John, and Williams (1987), Ofer and Thakor (1987), and Barclay and Smith (1988) develop models that predict the conditions under which share repurchases will be preferred to dividend payments when shareholders are differentially informed. In general, a variety of potential signals are available to management to signal the firm's "true" value to investors. Aside from dividends and repurchases, leverage, insider buying and selling, and capital expenditures, among others, have been suggested as possible mechanisms for communicating management's expectations to investors.

5.3. Empirical evidence on signaling

Signaling models are clearly consistent with the empirical regularity that stock prices change in the same direction as the change in dividends. A second prediction of the dividend-signaling models is that future earnings changes should also be positively correlated with the current change in dividends. A number of studies have examined the relation between changes in dividends and the firm's subsequent earnings. If dividends convey private information about earnings to the market, forecasts of future earnings that include dividend information should be superior to those without dividend information.

Watts (1973) examines whether information in current dividends improves forecasts of future earnings based on current and past earnings alone. Working from a sample of 310 firms for the period 1946–1967, Watts finds little evidence that information about current dividends improve forecasts of future earnings. Similarly, Gonedes (1978) also found only weak evidence that current dividend information improves forecasts of subsequent earnings. Penman (1983) also finds little evidence that dividend changes help to forecast future earnings changes. Penman also finds that many firms with improved future earnings did not adjust their dividends.

A more recent study by Benartzi, Michaely, and Thaler (1997) confirms these findings. Using a large sample of firms over the period 1979–1991, these authors measure earnings changes following dividend announcements relative to the industry averages after adjusting for momentum and mean reversion in earnings. They find a strong positive association between lagged and contemporaneous earnings changes and dividend changes, but no systematic association between current dividend changes and future

changes in earnings over the next two years. Following dividend decreases, Benartzi et al. actually report that earnings increase in the following two years.

DeAngelo, DeAngelo, and Skinner (1996) examine 145 firms with declines in earnings growth that occur after at least nine years of consecutive growth in earnings. The year of the earnings decline is defined as year 0, and DeAngelo et al. examine the year 0 dividend decision. They hypothesize that the year 0 dividend decision should contain significant information regarding the permanent or transitory nature of the current decline in earnings growth. In contrast to their predictions, they find no evidence that increases in dividends are associated with positive future earnings performance.

Ofer and Siegel (1987) further examine the relationship between dividend and earnings changes by focusing on whether unanticipated changes in dividends are associated with changes in the market's expectations of future earnings. In contrast to the studies that examine changes in earnings following dividend changes, Ofer and Siegel do find evidence that analysts change their forecasts about current-year earnings in the same direction as the dividend changes.

Other empirical studies have focused on testing the sufficient conditions for dividends to act as a costly signal. Tax-based dividend-signaling theories are based on the idea that dividends are a more costly payout mechanism compared to repurchases and that managers intentionally use dividend policy to "signal" the quality of the firm. Bernheim and Wantz (1995) examine whether the information contained in the market reaction to dividend changes varies in a systematic manner across different tax regimes. Tax-based dividend signaling models predict that, all else being equal, a dividend change of a given size will convey more information in periods when the relative taxes on dividends compared to capital gains are higher. Consistent with the dividend-signaling hypothesis, Bernheim and Wantz find that the market reaction to dividend changes is larger during periods of high relative taxes on dividends.

In contrast to the findings of Bernheim and Wantz, however, Bernhardt, Robertson, and Farrow (1994) use nonparametric techniques to account for the nonlinear nature of most signaling models and find little evidence in support of dividend signaling. Along similar lines, based on data surrounding the Tax Reform Act of 1986, Grullon and Michaely (2001) have found that market reactions to dividend increases were larger in the post-1986 period when dividends were taxed less heavily than were capital gains. Finally, Amihud and Murgia (1997) study the market reaction to dividend changes in Germany where dividends are favorably taxed relative to capital gains for most classes of investors. In this case, tax-based signaling models predict that dividend changes will have no signaling value. In contrast to the predictions of the signaling models, Amihud and Murgia find a market reaction to dividend changes in Germany similar to that documented in the United States.

In short, there is little evidence that changes in dividends predict future changes in earnings, which is one of the main predictions of dividend-signaling models. If anything, dividend changes tend to lag rather than lead earnings changes. In addition, there is at best only weak evidence in favor of the sufficient conditions of tax-based signaling models. Recent survey data based on the responses of 384 executives from 256 U.S. companies

gathered by Graham, Harvey, and Michaely (2004) also provides little support for the idea that managers view dividends as a costly mechanism for signaling the true value of their firm. Although over 80% of the executives surveyed believe that dividend policy conveys information to investors, only 25% of the executives suggest that they use dividend policy to make their firm look better than their competitors, and only 4.4% of executives state that dividends are used to show that their firms can bear self-imposed costs (as would be required in the costly signaling models).

Given the weak evidence that dividends convey information about future earnings, the question remains as to what information dividend changes convey to the market. One possibility is that dividend changes convey information only about current earnings via the sources and uses identity. Another possibility is that dividend policy might convey information regarding the riskiness of the firm's cash flows. Consistent with this notion, nearly 40% of executives in the Graham et al. survey believe that dividends make the stock less risky. Some recent empirical evidence also supports this view. For example, Grullon, Michaely, and Swaminathan (2002) have shown that systematic risk decreases following increases in dividends and increases following a dividend decrease. They also find that profitability declines following dividend increases, but that the decline in profitability is more than offset by the decline in risk, which is consistent with the positive market reaction to dividend increases. Moreover, they also report that the magnitude of the market reaction is positively related to the reduction in risk, all else equal.

Yet another possibility is that dividend changes convey information about the persistence of past earnings changes. Consistent with this view, Koch and Sun (2004) have found that changes in dividend policy alter investors' assessments of the valuation consequences of past earnings changes, namely, the permanence of past earnings changes. These findings can potentially reconcile the fact that changes in dividends tend to lag past earnings changes (e.g., Benartzi, Michaely, and Thaler, 1997) but still appear to convey valuable information to market participants.

6. Share repurchases

As an alternative to paying cash dividends, a firm can return cash to shareholders by repurchasing some of its shares. There are four main ways to repurchase stock. First, in a repurchase tender offer, the firm offers to buy back a stated number of shares at a stated price—typically, about 20% above the current market price. Individual shareholders then decide whether to tender their shares at this price. Second, in a Dutch auction, the firm states a series of prices at which it is willing to buy back shares. Shareholders submit offers for the quantity of shares that they will sell at each price. The firm aggregates these orders and chooses the lowest price at which it can repurchase the desired number of shares. All tendering shareholders receive this price for their shares. Third, share repurchases can also result from direct negotiation with major blockholders, sometimes in conjunction with a takeover attempt.³⁰ Finally, an open market repurchase, in which

³⁰ For the purposes of this chapter, we ignore privately negotiated repurchases.

the company announces that it will buy back shares in the open market like any other investor, is by far the most common form of repurchase activity.

As shown in Table 1, prior to 1984, repurchases were relatively rare, but repurchase activity has accelerated dramatically since then. Grullon and Michaely (2002) suggest that one reason for the rise in repurchase activity is that the Securities and Exchange Commission (SEC) adopted Rule 10b-18 in 1982. Prior to the adoption of this rule, firms that repurchased shares ran the risk of being prosecuted for manipulating their share price. The rule laid out provisions that provided a safe harbor for firms engaged in repurchase activity. These authors also report that young firms are more likely than they were in the past to initiate cash payouts through repurchases, and that more established firms, while continuing to pay dividends, also exhibit a higher propensity to repurchase shares. They argue that firms have gradually substituted repurchases for dividends over time.

Although both dividends and repurchases return cash to shareholders, there are a number of relevant differences between the two. Perhaps the largest difference is in the tax treatment between dividends and repurchases. In the United States, dividends are taxed as ordinary income, whereas repurchases are taxed at the historically lower capital gains rate. To the extent that shareholders are not able to avoid the higher taxes on cash dividends, the differential taxation of dividends versus repurchases should favor repurchase as a mechanism for returning cash to shareholders. A second difference between repurchases and dividends stems from the strong reluctance to cut or omit dividend payments once they are initiated. In this regard, dividends represent a commitment to continue to pay out cash in the future, whereas repurchases are more likely associated with a one time disbursement of cash. A final difference between dividends and repurchases is that the timing of repurchases is subject to managerial discretion. The survey evidence in Graham et al. (2005) suggests that managers attempt to repurchase stock when they believe it is currently undervalued.

6.1. Empirical evidence on share repurchases

Similar to dividend increases, announcements of repurchases are generally associated with positive stock price reactions. Vermaelen (1981) and Comment and Jarrell (1991) document abnormal returns of approximately 2 to 3% around announcements of open market repurchases. Average abnormal returns are on the order of 11 to 15% when repurchase tender offers are announced and are approximately 8% around the announcements of Dutch auction repurchases. These studies also report that price increases from buyback announcements are larger when insider wealth is at risk and following negative stock price performance. They also find that stock price increases are increasing in the fraction of shares sought in the repurchase. In addition, a number of studies (e.g., Ikenberry, Lakonishok and Vermaelen, 1995) have found that prices of repurchasing firms continue to drift upward following the repurchase announcements and that this long-run drift is more pronounced in stocks with high book-to-market ratios. The results are generally consistent with the idea that repurchases provide information to market participants that the firm is undervalued.

A number of studies provide evidence on the type of information conveyed by repurchase decisions by examining patterns in earnings following repurchase announcements. Vermaelen (1981) finds that earnings per share increase in the years following fixed price tender offers. Dann, Masulis, and Mayers (1991) confirm Vermaelen's results and also show that the initial market reaction is positively related to the subsequent increase in earnings. They interpret their findings as being consistent with a signaling motive for repurchases. More recently, Nohel and Tarhan (1998) show that the improvement in earnings documented in the prior studies was entirely attributable to firms with high book-to-market ratios (i.e., value firms) and that the improvement in operating performance was positively related to asset sales. They believe their evidence supports the idea that tender offer repurchases are used to control free cash flow problems rather than to signal future earnings performance.

Grullon and Michaely (2000) have reported that earnings performance improves following repurchase announcements using a large sample of repurchases between 1980 and 2000. They document a decline in return on assets in the three-year period following the repurchase announcement, and they also find decreases in capital expenditures and cash reserves. These findings are similar to the documented patterns in earnings following dividend announcements. Grullon and Michaely do, however, find that firm risk declines after repurchase announcements. The cost of capital for repurchasing firms in their sample drops from 16.3% prior to the repurchase to 13.7% in the period following the repurchase. The evidence is not generally consistent with traditional signaling stories. Instead, it appears that firms tend to increase their payouts to shareholders following a decline in their investment opportunities and demand for capital.

Jagannathan, Stephens, and Weisbach (2000) have reported that firms with higher permanent operating cash flows pay dividends, whereas firms with higher temporary nonoperating cash flows tend to use repurchases. Similarly, Guay and Harford (2000) hypothesize that dividend increases will be observed following cash flow shocks with a relatively large permanent component, while repurchases will be used to distribute shocks that are primarily transient. Using a large sample of dividend increases and repurchases, they have found that the post-shock cash flows of dividend-increasing firms do not fully revert to pre-shock levels, while those of repurchasing firms completely revert to pre-shock levels, even settling below them. The stock price reactions to the announcements of both repurchases and dividend increases also show strong evidence that the information in a payout announcement is not only the size of the payout, but also the method used to distribute the cash.

Maxwell and Stephens (2003) find some evidence of negative returns to bondholders around repurchase announcements. The loss to bondholders increases in the size of the repurchase and with the riskiness of the firm's debt. They also find that bonds are more likely to be downgraded following repurchase announcements. Their results are consistent with the view that agency conflicts between shareholders and bondholders are also a determining factor in whether to repurchase shares.

In open market repurchases, issues arise in measuring the amount of repurchasing activity because firms are not obligated to repurchase all of the shares that they initially

seek. Stephens and Weisbach (1988) examine several measures of repurchase activity and conclude that over 80% of repurchase programs end within three years and that more than half of the firms in their sample completed their announced repurchase program. However, more than one-tenth of the firms in their sample repurchased less than 5% of the shares they initially sought to repurchase at the announcement. Finally, they showed that the initial market reaction at the announcement of the repurchase is positively related to the intensity of repurchase activity in the following two years.

Another reason that firms may repurchase shares is to avoid the dilution that arises from the exercise of employee stock options. Kahle (2002) documents the fact that repurchase activity is positively correlated with the amount of exercisable stock options held by the firm's employees, but is unrelated to options held by managers. She concludes that managers repurchase both to maximize their own wealth and to fund employee stock option plans. She also finds that the market reacts less positively to announcements of repurchases by firms with high levels of employee options outstanding.

Finally, Barclay and Smith (1988) report that bid-ask spreads widen following repurchase announcements. Their evidence suggests that adverse selection arising from informed trading creates a cost borne by uninformed shareholders. They also show that the additional costs associated with stock repurchases may outweigh their preferential tax treatment relative to dividends and provide a possible explanation of why repurchases are not always substituted for cash dividend payments.

7. Alternative theories and new stylized facts

Thaler and Shefrin (1981) and Shefrin and Statman (1984) suggest that various psychological biases related to self-control, prospect theory, and regret aversion can result in preferences for cash dividends relative to homemade dividends. In general, there is relatively little empirical evidence regarding inherent investor preferences for dividends.

One exception is Baker and Wurgler (2004), who relax the assumption of market efficiency in the Miller and Modigliani irrelevance propositions and propose that, if arbitrage behavior is limited, managers have incentives to cater to investor preferences for dividends. Consistent with their argument, they find that firms are more likely to initiate dividend payments when measures of investor demand for dividends are high and to omit dividend payments when investor demand is low. Li and Lie (2005) extend the catering theory to include decreases and increases in existing dividends. Consistent with catering incentives, they find that the decision to change the dividend and the magnitude of the change depend on the premium that the capital market places on dividends.³¹

Fama and French (2002) have documented some new and interesting facts regarding dividends, showing that the percentage of firms paying cash dividends fell from 66.5% in 1978 to 20.8% in 1999. They report that part of the decline can be explained by the dramatic increase in the listing of small, unprofitable firms with strong growth

³¹ Baker, Ruback, and Wurgler (2007) provide an overview of behavioral applications to corporate finance.

opportunities. After controlling for firm characteristics, however, they still find that firms are less likely to pay dividends than they were in the past. They argue that the benefits of dividends have likely declined through time in part owing to reduced transactions costs for selling stocks, higher stock option holdings by managers who prefer capital gains to dividends, and improved corporate control mechanisms that limit agency problems.

Hoberg and Prabhala (2005) argue that both the disappearing dividend puzzle and the evidence on catering can be explained by firm risk. They show that risk is a significant determinant of the propensity to pay dividends and that changes in risk can explain about a third of the disappearing dividends documented by Fama and French (2002). They also find little support for the view that dividend policies reflect firms' catering to transient fads for dividends. Absent risk controls, catering matters, but it is insignificant after controlling for risk.

8. Conclusion

This chapter surveys the academic research on payout policy—the decision of the firm about whether and how to return cash to its shareholders. More than 40 years have now passed since Miller and Modigliani wrote their seminal paper delineating the conditions under which payout policy can affect firm value. During this time, payout policy has garnered significant attention from both academics and practitioners. Although we now have a better understanding of the factors that should systematically affect firms' payout decisions, many issues remain unsettled and many new questions have been raised.

As an example, the empirical evidence indicates that dividends convey information to the market. The market seems to view dividend increases positively and reacts negatively to decreases in dividends. Nevertheless, our understanding of what information is important and of the mechanism by which the information is conveyed to the market remains incomplete. Are increases in dividends information of superior future performance, or are they conveying information about current profitability or something else? Should we endorse costly signaling models as the description of the equilibrium within which dividends serve as a signaling device? The assumptions required by a costly signaling equilibrium are fairly restrictive. Much of the empirical evidence is inconsistent with costly signaling models. In addition, the dividend decision process described by managers in carefully conducted surveys is also inconsistent with the known signaling models. In summary, we are left with a well-documented empirical regularity—the information content of dividends—without a satisfactory theory to explain it.

An equally important aspect of the dividend decision that has attracted significant attention from financial economists is the effect of taxes on the dividend decision. The generally higher tax rate paid on dividend income should result in investors requiring a higher before-tax risk-adjusted return on dividend-paying stocks. The empirical evidence is, however, mostly inconsistent with this simple prediction. On average, stocks earn higher risk-adjusted returns during the ex-dividend week—there is time-series variation in their expected rate of return. Yet, stocks having higher dividend yields

do not earn a higher risk-adjusted rate of return than those with lower dividend yield—there is no cross-sectional variation in expected return. It is difficult to link the higher risk-adjusted return during ex-dividend weeks to taxes. Investors attempting to avoid the dividends would have to sell the stock prior to ex and buy it back after ex, thereby realizing short-term capital gains taxed as dividends. A tax-related explanation of the time-series return variation is even more difficult to establish when one finds no cross-sectional correlation between before-tax risk-adjusted return and taxes. The obvious question remains—what is the explanation of the higher before-tax rate of return during the ex-dividend week? If taxes are important, why don't stocks exhibit cross-sectional correlation between before-tax risk-adjusted return and dividend yield?

Financial economists provide some explanations for why firms pay dividends even when it is costly to do so. The payment of dividends increases the likelihood that the firm will have to raise external funds. Hence, by paying out dividends, the firm commits to evaluation by external experts in the process of raising funds. By paying out its free cash flows, management reduces its ability to use funds in a suboptimal manner. So, the firm benefits from a better investment decision that offsets the tax-related costs of paying dividends. Finally, the alternative of paying no dividends may be costly too. Without payouts (defined to include share repurchases), the firm would have to reinvest all its net earnings. If corporations face a limited supply of nonnegative NPV projects, they will then be forced to accept bad ones.

In addition, recent empirical evidence indicates that some aspects of limited rationality may bear on the dividend decision. Baker and Wurgler (2004) argue for a “catering theory of dividends” in which firms are more likely to initiate dividend payments in periods when the exogenous demand for dividends is high.

Finally, the survey evidence in Brav et al. (2005) also points to a number of unresolved issues regarding payout policy. Similar to the evidence in the original study by Lintner (1954), Brav et al. find that managers are very reluctant to cut dividends once they are initiated. This reluctance leads to dividends that are sticky, smoothed from year to year, and tied to the long-run profitability of the firm. Beyond maintaining the current dividend level, Brav et al. find that payout policy is a second-order concern for most corporations in the sense that payout policy is considered after investment and liquidity needs are met. In contrast to Lintner's results, Brav et al.'s findings show that present-day managers are more reluctant to increase dividends in tandem with earnings increases and that they do not set dividend policy based on a target percentage of earnings. In addition, repurchases are now used more extensively, and managers view repurchase activity as being more flexible than dividend policy. Executives tend to accelerate repurchase decisions when they view their stock as undervalued and are very conscious of how repurchases affect earnings per share.

Executives believe that dividends are attractive to individual investors but that dividends and repurchases are equally attractive to institutions. However, they find no evidence that payout policy is used as a tool to alter the proportion of institutional investors in the firm. Moreover, despite being aware of the tax advantage of repurchases relative to dividends, managers maintain that this is not an important factor either in their decisions about whether to pay out or increase dividends or in their decision as to the form of the payout—repurchase versus dividends. Surprisingly, in a follow-up survey conducted after the Bush administration announced a proposal to eliminate dividend taxation, more than two-thirds of the executives surveyed said that this would definitely not or probably not affect their dividend decisions. Moreover, among firms

not currently paying dividends, 70% say that they never plan to initiate dividends, and more than half say they do not intend to repurchase shares. Among firms that state they will eventually pay out cash to shareholders, the majority maintain that they will use repurchases.

Clearly, the story has not ended. We expect the research on payout policy to continue and to broaden our understanding of the factors that affect this policy. Writers of reviews decades from today will undoubtedly have much more to say.

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TAXES AND CORPORATE FINANCE

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Abstract

This chapter reviews tax research related to domestic and multinational capital structure, debt maturity, payout policy, compensation policy, risk management, earnings management, leasing, pensions, R&D partnerships, tax shelters, transfer pricing, and organizational form. For each topic, the theoretical arguments explaining how taxes can affect corporate decision making and firm value are reviewed, followed by a summary of the related empirical evidence and a discussion of unresolved issues. Tax research generally supports the hypothesis that high-tax rate firms pursue policies that provide tax benefits. Many issues remain unresolved, however, including understanding whether tax effects are of first-order importance, why firms do not pursue tax benefits more aggressively, and whether investor-level taxes affect corporate actions.

Keywords

capital structure, corporate finance, compensation, dividends, payout policy, taxes

1. Introduction

Modigliani and Miller (1958) and Miller and Modigliani (1961) demonstrate that corporate financial decisions are irrelevant in a perfect, frictionless world. Modigliani and Miller (MM) assume that capital markets are perfect, which implies that there are no corporate or personal taxes, among other things. During the past 45 years, research has focused on whether financial decisions become relevant if capital markets are not perfect. The research reviewed in this chapter investigates the consequences of allowing corporate and personal taxation, highlighting the role of corporate and investor taxes in corporate policies and firm value.¹ This role is potentially very important, given the sizable tax rates that many corporations and individuals face (see Fig. 1).

Modigliani and Miller argue that corporate financial policies do not add value in equilibrium, and therefore firm value equals the present value of operating cash flows. Once imperfections are introduced, however, corporate financial policies can affect firm

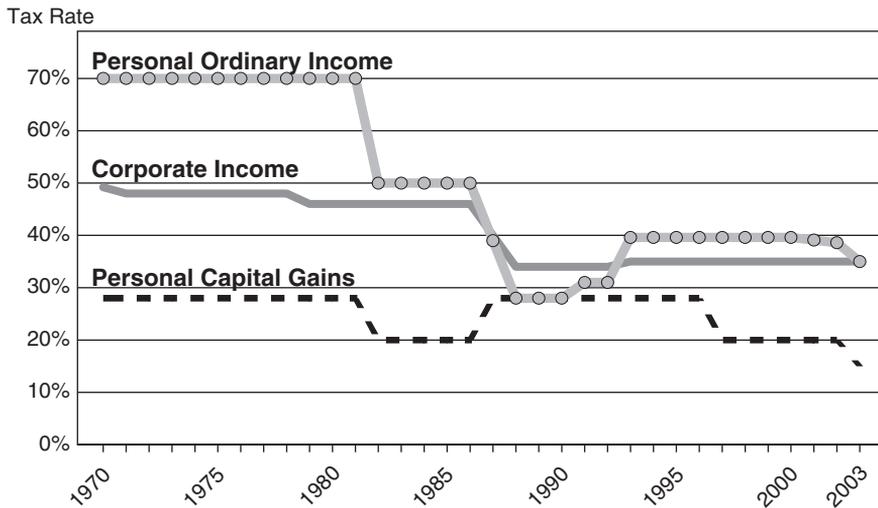


Fig. 1. Corporate and Personal Income Tax Rates. The highest tax bracket statutory rates are shown for individuals and C-corporations. The corporate capital gains tax rate (not shown) was equal to the corporate income tax rate every year after 1987. In May 2003, President Bush signed into law a reduction in the top personal income tax rate to 35% in 2003. This same law reduced top personal tax rates on capital gains and dividends to 15%.

Source for pre-2003 numbers: Commerce Clearing House, annual publications.

¹ The interested reader can find excellent reviews of how taxes affect household investment decisions (Poterba, 2001) and the current state of tax research from the perspective of accountants (Shackelford and Shevlin, 2001) and public economists (Auerbach, 2002). Articles reviewing how nontax factors such as agency and informational imperfections affect corporate financial decisions can be found in the other chapters of this handbook.

value, and firms should pursue a given policy until the marginal benefit of doing so equals the marginal cost. A common theme in tax research involves expressing how various tax rules and regulations affect the marginal benefit of corporate actions. For example, when tax rules allow interest deductibility, a \$1 interest deduction provides tax savings of $\$1 \times \tau_C(\cdot)$; $\tau_C(\cdot)$ measures corporate marginal tax benefits and is a function of statutory tax rates, nondebt tax shields, the probability of experiencing a loss, international tax rules about dividend imputation and interest allocation, organizational form, and various other tax rules. A common theme that runs throughout this chapter is the demonstration of how various tax rules affect the $\tau_C(\cdot)$ benefit function, and therefore how they affect corporate incentives and decisions. A second but less common theme in tax research is related to how market imperfections affect costs. Given that this chapter reviews tax research, the emphasis is on research that describes how taxes affect costs and benefits—and the influence of nontax factors is discussed only briefly.

There are multiple avenues for taxes to affect corporate decisions. As outlined above, taxes can affect capital structure decisions, both domestic (Section 2) and multinational (Section 3), organizational form and restructurings (Section 4), payout policy (Section 5), compensation policy (Section 6), risk management (Section 7), and the use of tax shelters (Section 8). For each of these areas, the sections that follow provide a theoretical framework describing how taxes might affect corporate decisions, empirical predictions based on the theory, and summaries of the related empirical evidence. This approach seeks to highlight important questions about how taxes affect corporate decisions, and to summarize and, in some cases, critique the answers that have been thus far provided. Each section concludes with a discussion of unanswered questions and possible avenues for future research. Overall, substantial progress has been made in the investigation of whether and how taxes affect corporate financial decisions, but much work remains to be done. Section 9 concludes and proposes directions for future research.

2. Taxes and capital structure—the U.S. tax system

2.1. Theory and empirical predictions

This section reviews capital structure research that is related to the “classical” tax system found in the United States. (Section 3 reviews multinational and imputation tax systems.) The key features of the classical system are that corporate income is taxed at a rate τ_C , interest is deductible and so is paid out of income before taxes, and equity payout is not deductible but is paid from the residual remaining after corporate taxation. In this tax system, interest, dividends, and capital gains income are taxed upon receipt by investors (at tax rates τ_P , $\tau_{div} = \tau_P$, and τ_G , respectively). Most of the research assumes that equity is the marginal source of funds and that dividends are paid according to a fixed payout policy.² To narrow the discussion, it is assumed that regulations or transactions

² This assumption implies that retained earnings are not “trapped equity” that is implicitly taxed at the dividend tax rate, even while still retained. See Auerbach (2002) for more on the trapped equity or “new” view.

costs prevent investors from following the tax-avoidance schemes implied by Miller and Scholes (1978), in which investors borrow via insurance or other tax-free vehicles to avoid personal tax on interest or dividend income.

In this framework, the after-personal-tax value to investors of a corporation paying \$1 of interest is $\$1(1 - \tau_P)$. In contrast, if that capital were instead returned as equity income, it would be subject to taxation at both the corporate and personal level, and the investor would receive $\$1(1 - \tau_C)(1 - \tau_E)$. The equity tax rate, τ_E , is often modeled as a blended dividend and capital gains tax rate.³ The net tax advantage of \$1 of debt payout, relative to \$1 of equity payout, is

$$(1 - \tau_P) - (1 - \tau_C)(1 - \tau_E) \quad (1)$$

If Equation (1) is positive, debt interest is the tax-favored way to return capital to investors, once both corporate and individual taxation are considered. In this case, in order to maximize firm value, a company has a tax incentive to issue debt instead of equity.

Equation (1) captures the benefit of a firm paying out \$1 as debt interest in the current period, relative to paying out \$1 as equity income. If a firm has \$D of debt with coupon rate r_D , the net benefit of using debt rather than equity is

$$[(1 - \tau_P) - (1 - \tau_C)(1 - \tau_E)]r_D D \quad (2)$$

Given this expression, the value of a firm with debt can be written as

$$\text{Value}_{\text{with debt}} = \text{Value}_{\text{no debt}} + \text{PV}[(1 - \tau_P) - (1 - \tau_C)(1 - \tau_E)]r_D D \quad (3)$$

where the PV term measures the present value of all current and future interest deductions. Note that Equation (3) implicitly assumes that using debt adds tax benefits but has no other effect on incentives, operations, or value.⁴

Modigliani and Miller (1958) is the seminal capital structure paper. If capital markets are perfect, τ_C , τ_P , and τ_E all equal zero, and it does not matter whether the firm finances with debt or equity (i.e., $\text{Value}_{\text{with debt}} = \text{Value}_{\text{no debt}}$). That is, the value of the firm equals the value of equity plus the value of debt, but total value is not affected by the proportions of debt and equity. This implication is used as the null throughout the capital structure discussion.

Null hypotheses: Firms do not have optimal tax-driven capital structures. The value of a firm with debt is equal to the value of an identical firm without debt (i.e., there is no net tax advantage to debt).

³ In mid-2003, Congress passed a law that reduced the tax rate on both dividends and capital gains to 15% for individual investors, thereby simplifying and greatly reducing the level of equity taxation relative to historic levels.

⁴ There are other approaches to modeling the tax benefits of debt that do not fit directly into this general framework. For example, Goldstein, Ju, and Leland (2001) have developed a dynamic contingent-claims model in which firms can restructure debt. They estimate that the tax benefits of debt should equal between 8 and 9% of firm value. See Goldstein et al. for references to other contingent-claims models.

In their “correction article,” MM (1963) consider corporate income taxation but continue to assume that τ_P and τ_E equal zero. In this case, the second term in Equation (3) collapses to $PV[\tau_C r_D D]$: Because interest is deductible, paying $\$r_D D$ of interest saves $\tau_C r_D D$ in taxes each period relative to returning capital as equity. MM (1963) assume that interest deductions are as risky as the debt that generates them and should be discounted by r_D .⁵ With perpetual debt, MM (1963) argue that the value of a firm with debt financing is

$$V_{\text{with debt}} = V_{\text{no debt}} + \frac{\tau_C r_D D}{r_D} = V_{\text{no debt}} + \tau_C D \quad (4)$$

where the $\tau_C D$ term represents the tax advantage of debt. Note that Equation (4) contains a term that captures the tax benefit of using debt ($\tau_C D$) but no offsetting cost of debt term. Equation (4) has two strong implications. First, corporations should finance with 100% debt because the marginal benefit of debt is τ_C , which is often assumed to be a positive constant. Second, if τ_C is constant, firm value increases (linearly) with D due to tax benefits

Because the first implication was recognized as extreme, researchers developed models that relax the MM (1958) assumptions and consider costs of debt. In the early models, firms trade off the tax benefits of debt with costs. The first cost proposed in the literature was the cost of bankruptcy, or more generally, costs of financial distress. Kraus and Litzenberger (1973), using a state-preference framework, show that firms should trade off bankruptcy costs with the tax benefits of debt to arrive at an optimal capital structure that involves less than 100% debt. Scott (1976) shows the same thing with continuous variables. The bankruptcy cost solution does not appear empirically to ex ante offset the benefits of debt.⁶ Therefore, other papers have proposed non-bankruptcy costs that could be traded off against the tax benefits of debt. For example,

⁵ The assumption that debt should be discounted at r_D is controversial because it requires the amount of debt to remain fixed. Miles and Ezzell (1985) demonstrate that if the dollar amount of debt is not fixed but instead is set to maintain a target debt-equity ratio, then interest deductions have equity risk and should be discounted with the return on assets, r_A , rather than r_D . (Miles and Ezzell, 1985, allow first-period financing to be fixed, which requires adjusting the discount rate by $(1+r_A)/(1+r_D)$). In contrast, Grinblatt and Titman (2002) argue that firms often pay down debt when things are going well and stock returns are high, and do not alter debt when returns are low. Such behavior can produce a low or negative beta for debt and hence a low discount rate for the tax benefits of debt. In either the Miles and Ezzell or Grinblatt and Titman case, however, the value of a levered firm still equals the value of the unlevered firm plus a “coefficient times debt” term—the discounting controversy only affects the coefficient.

⁶ Warner (1977) show that direct costs of bankruptcy average no more than 5.3% ex post in railroad bankruptcies. More recently, Andrade and Kaplan (1998) show that the ex-post costs of distress brought about by financing choice amount to 20% of firm value for a group of industrial firms. Miller (1977) note that firms choose optimal debt policy by considering ex-ante costs of distress, indicating that the costs mentioned above need to be multiplied by the conditional probability of distress to measure ex-ante costs. Miller point out that the ex-ante costs of financial distress appear to be very small compared to the apparently large tax benefits of debt.

Jensen and Meckling (1976) introduce agency costs of equity and leverage-related dead-weight costs.⁷ Myers (1977) introduces underinvestment costs that can result from too much debt.

Regardless of the type of cost, the basic trade-off implications remain similar to those in MM (1963): (1) the incentive to finance with debt increases with the corporate tax rate, and (2) firm value increases with the use of debt (up to the point where the marginal cost equals the marginal benefit of debt). Note also that in these models, different firms can have different optimal debt ratios depending on the relative costs and benefits of debt (i.e., depending on differing firm characteristics).

Prediction 1: All else constant, for taxable firms, value increases with the use of debt because of tax benefits (up to the point where the marginal cost equals the marginal benefit of debt).

Prediction 2: Corporations have a tax incentive to finance with debt that increases with the corporate marginal tax rate. All else equal, this implies that firms have differing optimal debt ratios if their tax rates differ.

Prediction 1 is based directly on Equation (4), whereas Prediction 2 is based on the first derivative of Equation (4) with respect to D .

Miller (1977) argues that personal taxes can eliminate the “100% debt” implication, without the need for bankruptcy or agency costs. (Farrar and Selwyn, 1967, took first steps in this direction.) Miller’s argument is that the marginal costs of debt and equity, net of the effects of personal and corporate taxes, should be equal in equilibrium, so firms are indifferent between the two financing sources. In essence, the corporate tax savings from debt is offset by the personal tax disadvantage to investors from holding debt, relative to holding equity. All else equal (including risk), this personal tax disadvantage causes investors to demand higher pretax returns on debt, relative to equity returns. From the firm’s perspective, paying this higher pretax return wipes out the tax advantage of using debt financing.

Figure 2 illustrates Miller’s point. The horizontal line in Panel A depicts the supply curve for debt; the line is horizontal because Miller assumes that the benefit of debt for all firms equals a fixed constant τ_C . The demand for debt curve is initially horizontal at zero, representing demand by tax-free investors, but eventually slopes upward because the return on debt must increase to attract investors with higher personal income tax rates. By making the simplifying assumption that $\tau_E = 0$, Miller’s equilibrium is reached when the marginal investor with $\tau_p^* = \tau_C$ is attracted to purchase debt. In this equilibrium, the entire surplus (the area between the supply and demand curves) accrues to investors subject to personal tax rates less than τ_p^* .

Miller’s (1977) analysis has several implications. The first two are new:

⁷ Parrino and Weisbach (1999) use simulations to conclude that the agency costs of debt are too small to offset the tax benefits, and Esty (1998) empirically examines the effects of agency costs on capital structure in the banking industry.

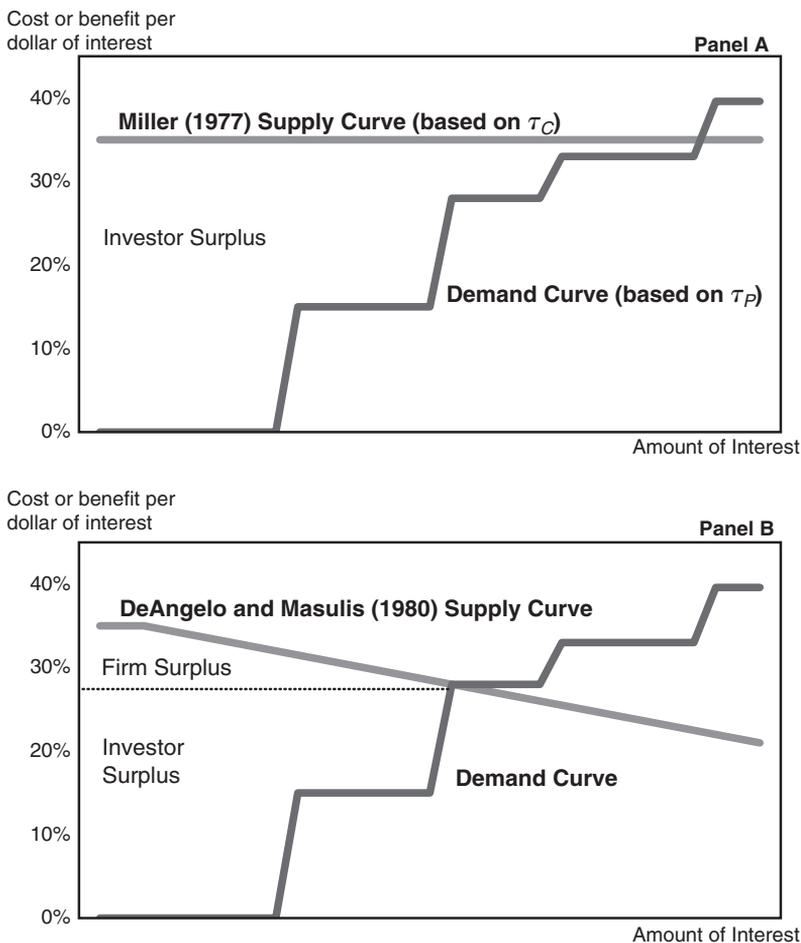


Fig. 2. Equilibrium Supply and Demand Curves for Corporate Debt. The supply curve shows the expected tax rate (and therefore the tax benefit of a dollar of interest) for the firms that issue debt. The demand curve shows the tax rate (and therefore the tax cost of a dollar of interest) for the investors that purchase debt. The tax rates for the marginal supplier of and investor in debt are determined by the intersection of the two curves. In the Miller Equilibrium (panel A), all firms have the same tax rate in every state of nature, so the supply curve is flat. The demand curve slopes upward because tax-free investors are the initial purchasers of corporate bonds, followed by low-tax-rate investors, and eventually followed by high tax-rate-investors. In the Miller Equilibrium, all investors with tax rates less than the marginal investor's (i.e., investors with tax rates of 33% or less in Panel A) are inframarginal and enjoy an "investor surplus" in the form of an after-tax return on debt higher than their reservation return. In Panel B, the supply curve is downward sloping because firms differ in terms of the probability that they can fully utilize interest deductions (or have varying amounts of nondebt tax shields), and therefore have differing benefits of interest deductibility. Firms with tax rates higher than that for the marginal supplier of debt (i.e., firms with tax rates greater than 28% in Panel B) are inframarginal and enjoy "firm surplus" because the benefit of interest deductibility is larger than the personal tax cost implicit in the debt interest rate.

Prediction 3: High personal taxes on interest income (relative to personal taxes on equity income) create a disincentive for firms to use debt.

Prediction 4: The aggregate supply of debt is affected by relative corporate and personal taxes.

The other implications are consistent with the null hypotheses stated above: (1) there is no net tax advantage to debt at the corporate level (once one accounts for the higher debt yields investors demand because of the relatively high personal taxes associated with receiving interest), (2) though taxes affect the aggregate supply of debt in equilibrium, they do not affect the optimal capital structure for any particular firm (i.e., it does not matter which particular firms issue debt, as long as aggregate supply equals aggregate demand), and (3) using debt does not increase firm value.

A general version of Miller's argument (that does not assume $\tau_E = 0$) can be expressed in terms of Equation (3). Once personal taxes are introduced into this framework, the appropriate discount rate is measured after-personal income taxes to capture the (after-personal-tax) opportunity cost of investing in debt. In this case, the value of a firm using perpetual debt is⁸:

$$\begin{aligned} V_{\text{with debt}} &= V_{\text{no debt}} + \frac{[(1 - \tau_P) - (1 - \tau_C)(1 - \tau_E)]r_D D}{(1 - \tau_P)r_D} \\ &= V_{\text{no debt}} + \left[1 - \frac{(1 - \tau_C)(1 - \tau_E)}{(1 - \tau_P)}\right] D \end{aligned} \quad (5)$$

If the investor-level tax on interest income (τ_P) is large relative to tax rates on corporate and equity income (τ_C and τ_E), the net tax advantage of debt can be zero or even negative. Note that Equation (5) is identical to Equation (4) if there are no personal taxes, or if $\tau_P = \tau_E$.

One way that Equation (5) can be an equilibrium expression is for the rightmost term in this equation to equal zero in equilibrium (e.g., $(1 - \tau_P) = (1 - \tau_C)(1 - \tau_E)$), in which case the implications from Miller (1977) are unchanged. Alternatively, the tax benefit term in Equation (5) can be positive, and a separate cost term can be introduced in the spirit of the trade-off models. In this case, the corporate incentive to issue debt and firm value both increase with $[1 - (1 - \tau_C)(1 - \tau_E)/(1 - \tau_P)]$ and firm-specific optimal debt ratios can exist. The bracketed expression specifies the degree to which personal taxes (Prediction 3) offset the corporate incentive to use debt (Prediction 2). Recall that τ_P and τ_E are personal tax rates for the marginal investor(s) and therefore are difficult to pin down empirically (more on this in Section 1.4).

DeAngelo and Masulis (1980; hereafter DM) broaden Miller's (1977) model and put the focus on the marginal tax benefit of debt, represented earlier by τ_C . DM argue that $\tau_C(\cdot)$ is not constant and is always equal to the statutory rate. Instead, $\tau_C(\cdot)$ is a function

⁸ See Sick (1990), Taggart (1991), or Benninga and Sarig (1997) for derivation of expressions like Equation (5) under various discounting assumptions. These expressions are of the form $V_{\text{with debt}} = V_{\text{no debt}} + \text{coefficient} \cdot D$, with the coefficient an increasing (decreasing) function of corporate (personal income) tax rates.

that decreases in nondebt tax shields (e.g., depreciation and investment tax credits) because nondebt tax shields (NDTS) crowd out the tax benefit of interest. Furthermore, Kim (1989) highlights the fact that firms do not always benefit fully from incremental interest deductions because they are not taxed when taxable income is negative. This implies that $\tau_C(\cdot)$ is a decreasing function of a firm's debt usage because existing interest deductions crowd out the tax benefit of incremental interest.

Modeling $\tau_C(\cdot)$ as a function has important implications because the supply of debt function can become downward sloping (see Panel B in Fig. 2). This implies that using debt has a corporate advantage, as measured by the "firm surplus" of issuing debt (the area above the dotted line but below the supply curve in Panel B). Moreover, high-tax-rate firms supply debt (i.e., are on the portion of the supply curve to the left of its intersection with demand), which implies that tax-driven firm-specific optimal debt ratios can exist (as in Prediction 2), and that the tax benefits of debt add value for high-tax-rate firms (as in Prediction 1). The DeAngelo and Masulis (1980) approach leads to the following prediction, which essentially expands Prediction 2:

Prediction 2': All else equal, to the extent that they reduce $\tau_C(\cdot)$, nondebt tax shields and/or interest deductions from already-existing debt reduce the tax incentive to use debt. Similarly, the tax incentive to use debt decreases with the probability that a firm will experience nontaxable states of the world.

2.2. Empirical evidence on whether the tax advantage of debt Increases firm value

Prediction 1 indicates that the tax benefits of debt add $\tau_C D$ (Equation 4) or $[1 - (1 - \tau_C)(1 - \tau_E)/(1 - \tau_P)]D$ (Equation 5) to firm value. If $\tau_C = 40\%$ and the debt ratio is 35%, Equation (4) indicates that the contribution of taxes to firm value equals 14% ($0.14 = \tau_C \times \text{debt-to-value}$). This calculation is an upper bound, however, because it ignores costs and other factors that reduce the corporate tax benefit of interest deductibility, such as personal taxes, nontax costs of debt, and the possibility that interest deductions are not fully valued in every state of the world. This section reviews empirical research that attempts to quantify the net tax benefits of debt. The first group of papers study market reactions to exchange offers, which should net out the various costs and benefits of debt. The remainder of the section reviews recent analyses based on large-sample regressions and concludes by examining explicit benefit functions for interest deductions.

2.2.1. Exchange offers

To investigate whether the tax benefits of debt increase firm value (Prediction 1), Masulis (1980) examines exchange offers made during the 1960s and 1970s. Because one security is issued and another is simultaneously retired in an exchange offer, Masulis argues that exchanges hold investment policy relatively constant and are primarily changes in capital structure. Masulis's tax hypothesis is that leverage-increasing (-decreasing) exchange offers increase (decrease) firm value because they increase (decrease) tax deductions.

Note that Masulis implicitly assumes that firms are underlevered. For a company already at its optimum, a movement in either direction (i.e., increasing or decreasing debt) would decrease firm value.

Masulis (1980) finds evidence consistent with his predictions: leverage-increasing exchange offers increase equity value by 7.6%, and leverage-decreasing transactions decrease value by 5.4%. Moreover, the exchange offers with the largest increases in tax deductions (debt-for-common and debt-for-preferred) have the largest positive stock price reactions (9.8% and 4.7%, respectively). Using a similar sample, Masulis (1983) regresses stock returns on the change in debt in exchange offers and finds a debt coefficient of approximately 0.40 (which is statistically indistinguishable from the top statutory corporate tax rate at that era). This is consistent with taxes increasing firm value as in Equation (4) (and is also consistent with some alternative hypotheses discussed below), but it is surprising because such a large coefficient implies near-zero personal tax and nontax costs to debt. That is, the debt coefficient in Masulis (1983) measures the average benefit of debt (averaged across firms and averaged over the incremental net benefit of each dollar of debt for a given firm) *net of the costs*. An average net benefit of 0.40 requires that the costs are much smaller than the benefits for most dollars of debt. For the post-exchange offer capital structure to satisfy the $MB = MC$ equilibrium condition, the benefit or cost curves (or both) must be very steeply sloped near their intersection.

Myers (1984) and Cornett and Travlos (1989) argue that Masulis's (1980) hypothesis is problematic. If firms optimize, they should only adjust capital structure to move toward an optimal debt ratio, whether that involves increasing debt or equity. In other words, increasing debt will not always add to firm value, even if interest reduces tax liabilities. Graham, Hughson, and Zender (1999) point out that if a firm starts at its optimal capital structure, it will only perform an exchange offer if something moves the firm out of equilibrium. They derive conditions under which stock price-maximizing exchanges are unrelated to marginal tax rates because market reactions aggregate tax and nontax informational aspects of capital structure changes. Therefore, nontax reactions might explain Masulis's (1980) results. As described next, several papers have found evidence of nontax factors affecting exchange offer market reactions. It is important to note that these post-Masulis papers do not prove that the tax interpretation is wrong—but they do offer alternative interpretations.

First, some papers find evidence of positive (negative) stock reactions to leverage-increasing (leverage-decreasing) events that are unrelated to tax deductions: Asquith and Mullins (1986), Masulis and Korwar (1986), and Mikkelson and Partch (1986) find negative stock price reactions to straight equity issuance, and Pinegar and Lease (1986) find positive stock price reactions to preferred-for-common exchanges. Second, Mikkelson and Partch (1986) and Eckbo (1986) report that straight debt issuance (without equity retirement) produces a stock price reaction that is indistinguishable from zero. Third, some papers find that exchange offers convey nontax information that affects security prices, perhaps due to asymmetric information problems along the lines suggested by Myers and Majluf (1984) or due to signaling (Ross, 1977) and Leland and Pyle, 1977). For

example, Shah (1994) correlates exchange offers with information about reduced future cash flows (for leverage-decreasing offers) and decreased risk (for leverage-increasing offers). Finally, Cornett and Travlos (1989) provide evidence that weakens Masulis's (1983) conclusions. Cornett and Travlos regress event stock returns on the change in debt and two variables that control for information effects (the ex-post change in inside ownership and ex-post abnormal earnings). They find that the coefficient on the change in debt variable is insignificant while the coefficients on the other variables are significant, which implies that the positive stock price reaction is related to positive information conveyed by the exchange.⁹ Cornett and Travlos conclude that equity-for-debt exchanges convey information about the future—but find no evidence of increased value due to tax benefits.

Two recent papers examine the exchange of traditional preferred stock for monthly income preferred stock (MIPS). These two securities differ primarily in terms of their tax characteristics, so any market reaction should have minimal nontax explanations. MIPS interest is tax deductible for corporations (like debt interest), and preferred dividends are not. On the investor side, corporate investors enjoy a 70% dividends received deduction (DRD) for preferred dividends, but recipients of MIPS interest receive no parallel deduction.¹⁰ When issuing MIPS to retire preferred, corporations gain the tax benefit of interest deductibility but experience two costs: underwriting costs and possibly an increased coupon due to the personal tax penalty (because investors are fully taxed on MIPS interest in contrast to corporate investors, who receive the DRD on preferred dividends). Engel, Erickson, and Maydew (1999) compare MIPS yields to preferred yields and conclude that the tax benefits of MIPS are approximately \$0.28 per dollar of face value, net of the aforementioned costs. Irvine and Rosenfeld (2000) use abnormal announcement returns to estimate the value at \$0.26. Given that MIPS and preferred are nearly identical in all legal and informational respects, these studies provide straightforward evidence of the positive contribution of taxes to firm value, net of underwriting and personal tax costs.

2.2.2. Cross-sectional regressions

Fama and French (1998; hereafter FF) attempt to estimate Equation (4) and Prediction 1 directly, by regressing V_L on debt interest, dividends, and a proxy for V_U . They argue that a positive coefficient on interest is evidence of positive tax benefits of debt. FF measure V_L as the excess of market value over book assets. They proxy V_U with a collection of control variables, including current earnings, assets, and R&D spending, as well as future changes in these same variables. (All the variables in the regression are deflated by assets.)

⁹ Cornett and Travlos do not report whether they get a significant positive tax coefficient (like Masulis, (1983, did) when they exclude the information variables. Therefore, their results could be driven by their use of a sample different from the one Masulis used.

¹⁰ A 70% DRD means that a corporation that owns another firm's stock only pays tax on 30% of the dividends received. Note that evidence in Erickson and Maydew (1998) implies that corporations are the marginal investor in preferred stock (see footnote 27).

If these control variables provide adequate proxy for V_U , the regression coefficient on interest will measure the tax benefit of debt (which is hypothesized to be positive). The main difficulty with this approach is that if the control variables measure V_U with error, the regression coefficients can be biased. FF perform a series of regressions on a broad cross section of firms, using both level-form and first-difference specifications. In all cases, the coefficient on interest is either insignificant or negative. Fama and French interpret their results as being inconsistent with debt tax benefits having a first-order effect on firm value. Instead, they argue that interest provides information about earnings that is not otherwise captured by their controls for V_U . In other words, V_U is measured with error, which results in the interest coefficient picking up a negative valuation effect related to financial distress or some other cost.

Kemsley and Nissim (2002) attempt to circumvent this measurement problem. They perform a switch of variables, moving the earnings variable (which they assume proxies V_U with error) to the left-hand side of the regression and V_L to the right-side. Therefore, their regression tests the relation $V_U = V_L - \text{coeff} * D$.

When Kemsley and Nissim regress EBIT on V_L and debt, the debt coefficient is negative, which they interpret as evidence that debt contributes to firm value. The coefficient also changes through time in conjunction with changes in statutory tax rates. The Kemsley and Nissim analysis should be interpreted carefully. First, their regression specification can be interpreted as measuring the effect of debt on earnings, just as well as it can be interpreted as a switch-of-variables that fixes a measurement error problem in Fama and French (1998). Second, the debt coefficient has the correct sign for the full sample only in a nonlinear specification in which all the right-hand side variables are interacted with a crude measure of the discount rate. Finally, the coefficient that measures the net benefit of debt has an absolute value of 0.40. While consistent with Masulis (1983), such a large coefficient implies near-zero average debt costs and a near-zero effect of personal taxes.

2.2.3. *Marginal benefit functions*

Using a different approach, Graham (2000, 2001) simulates interest deduction benefit functions and uses them to estimate the tax-reducing value of each incremental dollar of interest expense. For a given level of interest deductions, Graham essentially integrates over possible states of the world (i.e., both taxable and nontaxable states) to determine a firm's expected τ_C , which specifies the expected tax benefit of an incremental dollar of interest deduction. Marginal tax benefits of debt decline as more debt is added because the probability increases with each incremental dollar of interest that it will not be fully valued in every state of the world. Using simulation methods (described more fully in Section 1.3.2) and various levels of interest deductions, Graham maps out firm-specific interest benefit functions analogous to the supply of debt curve in Panel B of Figure 2.

By integrating under these benefit functions, Graham (2000) estimates that the tax benefit of debt equals approximately 9 to 10% of firm value during 1980–1994 (ignoring

Table 1

Annual calculations of the mean benefits of debt and degree of debt conservatism

Before-financing MTR is the mean Graham (1996) simulated corporate marginal tax rate based on earnings before interest deductions, and *after-financing MTR* is the same based on earnings after interest deductions. *Kink* is the multiple by which interest payments could increase without a firm experiencing reduced marginal benefit on incremental deductions (i.e., the amount of interest at the point at which a firm's marginal benefit function becomes downward sloping, divided by actual interest expense) as in Graham (2000). The *tax benefit of debt* is the reduction in corporate and state tax liabilities occurring because interest expense is tax deductible, expressed as a percentage of firm value. *Money left on the table* is the additional tax benefit that could be obtained, ignoring all costs, if firms with kink greater than one increased their interest deductions in proportion with kink.

	Before-Financing MTR	After-Financing MTR	Kink	Tax Benefit of Debt	Money Left on Table
1980	0.415	0.324	3.10	10.1	27.7
1981	0.413	0.319	2.98	11.4	28.6
1982	0.397	0.286	2.69	11.0	23.2
1983	0.388	0.282	2.68	10.7	22.5
1984	0.380	0.275	2.75	10.9	21.6
1985	0.366	0.255	2.51	11.1	21.8
1986	0.356	0.241	2.39	11.6	20.5
1987	0.296	0.198	2.35	10.7	19.5
1988	0.259	0.172	2.30	9.9	16.7
1989	0.258	0.169	2.24	10.6	15.8
1990	0.258	0.164	2.08	10.7	15.3
1991	0.257	0.160	1.99	9.6	11.7
1992	0.258	0.165	2.07	8.7	9.7
1993	0.236	0.175	1.71	7.7	8.0
1994	0.249	0.183	1.94	7.3	8.5
1995	0.260	0.207	1.99	7.8	9.8
1996	0.261	0.185	2.05	9.8	12.2
1997	0.261	0.188	2.08	9.1	10.9
1998	0.252	0.165	2.00	9.5	10.7
1999	0.252	0.170	1.90	7.7	8.9

all costs). Updating Graham's estimates, we find that the tax benefit of debt is 7.8%, 9.8%, 9.1%, 9.5%, and 7.7% of firm value in 1995–1999, respectively (see Table 1). The fact that these figures are less than the 14% estimated (at the beginning of Section 1) with the back of the envelope " $\tau_C D$ " calculation reflects the reduced value of interest deductions in some states of the world. When personal taxes are considered, the tax benefit of debt falls to 7–8% of firm value during 1980–1994 (i.e., this is Graham's estimate of the "firm surplus" in Panel B of Fig. 2).

Graham also estimates the "money left on the table" that firms could obtain if they levered up to the point where their last dollar of interest deduction is valued at the full statutory tax rate (i.e., the "kink," which is the point just before incremental tax benefits

begin to decline).¹¹ The money left on the table calculations in Graham (2000, his Fig. 2) is updated. If all firms lever up to operate at the kink in their benefit functions, they could add 10.5% to firm value over the 1995–1999 period (see Table 1). This number can be interpreted either as a measure of the value loss due to conservative corporate debt policy, or as a lower bound for the difficult-to-measure costs of debt that would occur if a company were to lever up to its kink. In the former interpretation, these estimates imply that large tax benefits of debt appear to go unexploited and that large, profitable firms (which would seem to face the lowest costs of debt) are the most conservative in their use of debt.¹² In general, these implications are hard for a trade-off model to explain. Graham (2000), Lemmon and Zender (2001) and Minton and Wruck (2001) try to identify nontax costs that are large enough in a trade-off sense that perhaps these firms are not in fact underlevered.

To sum up, a fair amount of research has found evidence consistent with tax benefits adding to firm value. However, some of this evidence is ambiguous because nontax explanations or econometric issues cloud interpretation. Additional research in three specific areas would be helpful. First, we need more market-based research along the lines of the MIPS exchanges, where tax effects are isolated from information and other factors and therefore the interpretation is fairly unambiguous. Second, additional cross-sectional regression research that investigates the market value of the tax benefits of debt would be helpful in terms of clarifying or confirming the interpretation of existing cross-sectional regression analysis. Finally, if the tax benefits of debt do in fact add to firm value, an important unanswered question is why firms do not use more debt, especially large, profitable firms.¹³ We need to better understand whether this implies that some firms are not optimizing, or whether previous research has not adequately modeled costs and other influences.

2.3. Empirical evidence on whether corporate taxes affect debt vs. equity policy

Trade-off models imply that firms should issue debt as long as the marginal benefit of doing so (measured by τ_C) is larger than the marginal cost. $\tau_C(\cdot)$ is a decreasing function of nondebt tax shields, existing debt tax shields, and the probability of

¹¹ For example, if during 1995–1999 all firms levered up to just before the point of declining benefit, simulations performed for this chapter indicate that the average company would have total tax benefits of debt of around 18% of firm value. That is, by levering up, the typical firm could add interest deductions with tax benefit equal to 10% of firm value, above and beyond their current level of tax benefits.

¹² McDonald (2002) argues that the prevalence of writing puts or purchasing calls on their own shares is also evidence that many firms pass up potential interest deductions. For example, writing a put (which involves implicit borrowing) can be replicated by explicitly borrowing today to purchase a share on the open market and repaying the loan in the future. The cash flows are identical in these two strategies, but the latter results in the firm receiving a tax deduction. The fact that many firms write puts is consistent with them passing up interest tax deductions.

¹³ Shyum-Sunder and Myers (1999), Lemmon and Zender (2002), and related papers investigate whether the trade-off model is the correct model of capital structure, which has implications for interpreting these results.

experiencing losses, so the incentive to use debt declines with these three factors (Prediction 2'). In general, high-tax rate firms should use more debt than low-tax rate firms (Prediction 2). The papers reviewed in this section generally use reduced-form cross-sectional or panel regressions to test these predictions, and they ignore personal taxes altogether. For expositional reasons, we start with tests of Prediction 2'.

2.3.1. Nondebt tax shields, profitability, and the use of debt

Bradley, Jarrell, and Kim (1984) perform one of the early regression tests for tax effects along the lines suggested by DeAngelo and Masulis (1980). Bradley et al. regress firm-specific debt-to-value ratios on nondebt tax shields (as measured by depreciation plus investment tax credits), R&D expense, the time-series volatility of EBITDA, and industry dummies.¹⁴ The tax hypothesis is that nondebt tax shields are negatively related to debt usage because they substitute for interest deductions (Prediction 2'). However, Bradley et al. find that debt is positively related to nondebt tax shields, opposite the tax prediction. This surprising finding, and others like it, prompted Stewart Myers (1984) to state in his presidential address to the American Finance Association (p. 588): "I know of no study clearly demonstrating that a firm's tax status has predictable, material effects on its debt policy. I think the wait for such a study will be protracted."

One problem with using nondebt tax shields, in the form of depreciation and investment tax credits, to explain debt policy is that nondebt tax shields are positively correlated with profitability and investment. If profitable (i.e., high-tax rate) firms invest heavily and also borrow to fund this investment, this can induce a positive relation between debt and nondebt tax shields and overwhelm the tax substitution between interest and nondebt tax shields (Dammon and Senbet, 1988; Amihud and Ravid, 1985). Another issue is that nondebt tax shields (as well as existing interest deductions or the probability of experiencing losses) should only affect debt decisions to the extent that they affect a firm's marginal tax rate. Only for modestly profitable firms is it likely that nondebt tax shields have sufficient impact to affect the marginal tax rate and therefore debt policy.¹⁵

MacKie-Mason (1990) and Dhaliwal, Trezevant, and Wang (1992) address these issues by interacting Non-debt Tax Shields (NDTS) with a variable that identifies firms near "tax exhaustion," at which point the substitution between nondebt tax shields and interest is most important. Both papers find that tax-exhausted firms substitute away from debt when nondebt tax shields are high.¹⁶ Even though these papers find a negative relation

¹⁴ An alternative test would be to match NDTS-intensive firms to companies that are similar in all ways except for their use of nondebt tax shields and to examine whether the NDTS-intensive firms use less debt.

¹⁵ The marginal tax rate for unprofitable firms will be close to zero whether or not the firm has NDTS. The tax rate for highly profitable firms will be near the top statutory rate, unless a firm has a very large amount of NDTS.

¹⁶ Ekman (1995) finds the same for Swedish firms. Trezevant (1992) finds that Compustat PST firms most likely to be tax-exhausted decreased debt usage the most following the 1981 liberalization of tax laws that increased nondebt tax shields.

between the interacted NDTs variable and debt usage, this solution is not ideal. For one thing, the definition of tax exhaustion is ad hoc. Moreover, Graham (1996a) shows that the interacted NDTs variable has low power to detect tax effects and that depreciation and investment tax credits (the usual components of nondebt tax shields) have a very small empirical effect on the marginal tax rate. Ideally, researchers should capture the effects (if any) of nondebt tax shields, existing interest, and the probability of experiencing losses directly in the estimated marginal tax rate, rather than including these factors as stand-alone variables.

A similar issue exists with respect to using profitability as a measure of tax status. Profitable firms usually have high tax rates, and therefore some papers argue that the tax hypothesis implies they should use more debt. Empirically, however, the use of debt declines with profitability, which is often interpreted as evidence against the tax hypothesis (e.g., Myers, 1993). Profitability should only affect the tax incentive to use debt to the extent that it affects the corporate marginal tax rate¹⁷; therefore, when testing for tax effects, the effects (if any) of profitability should be captured directly in the estimated Marginal Tax Rate (MTR). Researchers would then interpret the stand-alone profitability variable as a control for potential nontax influences.

2.3.2. Directly estimating the marginal tax rate

One of the problems that led to Myers's capital structure puzzle is related to properly quantifying corporate tax rates and incentives. For example, many studies use static MTRs that ignore important dynamic features of the tax code related to net operating losses carryback and carryforwards, investment tax credits and other nondebt tax shields, and the alternative minimum tax. Static MTRs miss the fact that a company might be profitable today but expect to experience losses in the near future. This firm might erroneously be assigned a high current-period tax rate, even though its true economic tax rate is low.¹⁸ Conversely, an unprofitable firm might have a large current economic marginal tax rate if it is expected to soon become and remain profitable (because extra income earned today increases taxes paid in the future: an extra dollar of income today reduces losses that could be carried forward to delay future tax payments, thereby increasing present value tax liabilities).

Shevlin (1987, 1990) uses simulation techniques to capture the dynamic features of the tax code related to net operating loss carrybacks and carryforwards.¹⁹ The first step in simulating an MTR for a given firm-year involves calculating the historic mean and variance of the change in taxable income for each firm. The second step uses this historic

¹⁷ Keep in mind that a marginal tax rate is bound between zero and the top statutory rate, while profitability is not bounded, which can introduce difficulties into interpreting profitability as a proxy for the tax rate.

¹⁸ Scholes and Wolfson (1992) define the *economic marginal tax rate* as the present value of current and future taxes owed on an extra dollar of income earned today, which accounts for the probability that taxes paid today will be refunded in the near future.

¹⁹ Auerbach and Poterba (1987) and Altshuler and Auerbach (1990) simulate tax rates using first-order Markov probabilities that weight the probability of transition between taxable and nontaxable states.

information to forecast future income for each firm. These forecasts can be generated with random draws from a normal distribution, with mean and variance equal to that gathered in the first step; therefore, many different forecasts of the future can be generated for each firm. The third step calculates the present value tax liability along each of the income paths generated in the second step, accounting for the tax-loss carryback and carryforward features of the tax code. The fourth step adds \$1 to current-year income and recalculates the present value tax liability along each path. The incremental tax liability calculated in the fourth step, minus that calculated in the third step, is the present value tax liability from earning an extra dollar today, in other words, the economic MTR. A separate marginal tax rate is calculated along each of the forecasted income paths to capture the different tax situations a firm might experience in different future scenarios. The idea is to mimic the different planning scenarios that a manager might consider. The fifth step averages across the MTRs from the different scenarios to calculate the expected economic marginal tax rate for a given firm-year. Note that these five steps produce the expected marginal tax rate for a single firm-year. The steps are replicated for each firm for each year, to produce a panel of firm-year MTRs. The marginal tax rates in this panel vary across firms and can also vary through time for a given firm. The end result is greater cross-sectional variation in corporate tax rates (and hence tax incentives) than implied by statutory rates.

One difficulty with simulated tax rates is that they require a time series of firm-specific data. Moreover, they are usually calculated using financial statement data, even though it would be preferable to use tax return data. With respect to the first problem, Graham (1996b) shows that an easy-to-calculate trichotomous variable (equal to the top statutory rate if a firm has neither negative taxable income nor net operating loss (NOL) carryforwards, equal to one-half the statutory rate if it has one but not the other, and equal to zero if it has both), is a reasonable replacement for the simulated rate. With respect to the tax return issue, Plesko (2003) compares financial-statement-based simulated rates for 586 firms to a static tax variable calculated using actual tax return data. He finds that simulated rates (based on financial statements) are highly correlated with tax variables based on tax return data. Plesko's evidence implies that the simulated tax rates are a robust measure of corporate tax status.

Note that by construction the simulated tax rates capture the influence of profitability on the corporate marginal tax rate. Graham (1996a) extends the simulation approach to directly capture the effects of nondebt tax shields, investment tax credits, and the alternative minimum tax. Graham (1996b) demonstrates that simulated tax rates are the best commonly available proxy for the "true" marginal tax rate (when "true" is defined as the economic tax rate based on realized taxable income, rather than simulations of the future). Using the simulated corporate marginal tax rates, Graham (1996a) documents a positive relation between tax rates and changes in debt ratios (consistent with Prediction 2), as do Graham, Lemmon, and Schallheim (1998) and Graham (1999) for debt levels. Since that time, numerous other studies have also used simulated tax rates to document tax effects in debt decisions. These results help to resolve Myers's (1984) capital structure puzzle; when tax rates are properly measured, it is possible to link tax status with corporate debt policy.

2.3.3. Endogeneity of corporate tax status

Even if measured with a very precise technique, tax rates are endogenous to debt policy, which can have important effects on tax research. If a company issues debt, it reduces taxable income, which in turn can reduce its tax rate. The more debt issued, the greater the reduction in the marginal tax rate. Therefore, if one regresses debt ratios on marginal tax rates, the endogeneity of corporate tax status can impose a negative bias on the tax coefficient. This could explain the negative tax coefficient detected in some specifications (e.g., Hovakimian, Opler, and Titman, 2001, and Barclay and Smith, 1995b). Note that endogeneity can affect all sorts of tax variables, including those based on NOLs, or that use an average tax rate (i.e., taxes paid/taxable income).

There are two solutions to the endogeneity problem. MacKie-Mason (1990) proposed the first solution by looking at (0,1) debt versus equity issuance decisions (rather than the debt level) in his influential examination of 1747 issuances from 1977 to 1987. Debt levels (such as debt ratios) are the culmination of many historical decisions, which may obscure whether taxes influence current-period financing choices. Detecting tax effects in the incremental approach only requires that a firm make the appropriate debt-equity choice at the time of security issuance, given its current position, and not necessarily that the firm rebalance to its optimal debt-equity ratio with each issuance (as is implicit in many debt-level studies). To avoid the endogenous effect of debt decisions on the marginal tax rate, MacKie-Mason uses the lagged marginal tax rate to explain current-period financing choice.²⁰ He finds a positive relation between debt issuance and tax rates. Graham (1996a) follows a similar approach and examines the relation between changes in the debt ratio and lagged simulated MTRs. He finds positive tax effects for a large sample of Compustat firms.²¹

If taxes exert a positive influence on each incremental financing decision, the sum of these incremental decisions should show up in an analysis of current debt levels—if one could fix the endogenous negative effect on tax rates induced by cumulative debt usage.²² The second approach to fixing the endogeneity problem is to measure tax rates “but for”

²⁰ Wang (2000) argues that firms do not consider the level of the marginal tax rate when making incremental decisions but rather consider how far the marginal tax rate is from the “optimal MTR.” Holding the level of the tax rate constant, Wang shows that companies with tax rates above the optimum are those that use the most debt (an action that should endogenously reduce the marginal tax rate and move it closer to the optimum, essentially reducing MB until it equals MC). The difficulty with this approach is that Wang’s “optimal MTR” is ad hoc and is based on the probability of bankruptcy (as measured by Altman’s Z-score).

²¹ A number of other papers corroborate these results. For example, Shum (1996) finds similar evidence for Canadian firms. Alworth and Arachi (2000) show that lagged after-financing simulated tax rates are positively related to changes in debt for Italian firms. Henderson (2001) finds that changes in total liabilities and changes in long-term debt are both positively related to simulated tax rates in a sample of U.S. banks. Schulman et al. (1996) report that debt levels are positively correlated to tax rates in Canada and New Zealand.

²² Dittmar (2002) studies corporate spin-offs, which potentially allows her to avoid the endogeneity problem by observing capital structures that are not the end result of a long history of accumulated debt policy decisions. However, it is still the case that past decisions can influence the parent’s and/or spun-off unit’s new capital structure. Dittmar does not find evidence that corporate tax rates affect spin-off debt ratios.

financing decisions. Graham, Lemmon, and Schallheim (1998) measure tax rates before financing (i.e., based on income before interest is deducted). They find a positive relation between debt-to-value and (endogeneity-corrected) “but-for” tax rates. (They also find a “spurious” negative correlation in an experiment that uses an endogenously affected after-financing tax rate.)

Examining changes in debt answers the question “are incremental decisions affected by tax status?” An alternative approach is to ask: “if tax rates exogenously change, how will a firm alter debt usage?” The Tax Reform Act of 1986 greatly reduced corporate marginal tax rates (see Fig. 1), which in isolation implies a reduction in the corporate use of debt. Givoly, Hahn, Ofer, and Sarig (1992) find that firms with high tax rates prior to tax reform (firms that therefore probably experienced the largest drop in their tax rate) reduce debt the most after tax reform. This finding is somewhat surprising because their corporate marginal tax rate suffers from the negative endogeneity bias described earlier. Moreover, personal taxes are not modeled directly, even though they fell by more than corporate tax rates after the 1986 tax reform.²³ In a paper that examines international evidence during the same time period, Rajan and Zingales (1995) provide weak international evidence that taxes affect debt decisions.

2.3.4. Time-series and small-firm evidence of tax effects

The empirical evidence described thus far confirms cross-sectionally that firms with high tax rates use more debt than those with low tax rates. Presumably, there should also be time-series tax effects. For example, if a firm starts public life with a low tax rate, one would expect increased debt usage if the tax rate increases as the firm matures. There is no known study that documents tax-related time-series effects in debt usage. For example, Graham (1999) uses panel data to document the idea that cross-sectional variation in tax status affects debt usage, but he finds no evidence that time-series variation does.

By studying capital structure decisions among newly formed firms, one might be able to avoid long-lasting effects of past financing decisions. For example, Baker and Wurgler (2001) show that today’s market-to-book ratio and debt-equity issuance decisions continue to affect the firm’s debt ratios for ten or more years. Esty, Qureshi, and Olson (2000) describe various start-up financing issues, including selecting a target debt ratio, as well as how market conditions and collateralization affect the sequence of initial financing choices.

Pittman and Klassen (2001) examine capital structure in the years following an initial public offering (IPO). They perform annual (i.e., years since IPO) cross-sectional regressions and find evidence that taxes have a positive effect on the use of debt in the early years of a firm’s public life—but this relation wanes as the firm ages. Pittman and Klassen attribute this waning to an increase in refinancing transactions costs as firms

²³ Givoly et al. (1992) include lagged dividend yield in their specification to control for personal tax effects, which might allow their tax variable to isolate corporate tax effects. Personal tax effects are examined more fully in Section 1.4.

age. Note that their evidence is not time series in terms of firms altering capital structure as tax rates change through time, though they do link debt policy to firm age. Pittman and Klassen also find that firms use relatively more NDTS as they age.

Almost all capital structure papers study Compustat companies. Ayers, Cloyd, and Robinson (2001) instead examine small companies with less than 500 employees that participated in the 1993 Federal Reserve National Survey of Small Business Finances. A total of 2600 firms meet the Ayers et al. data requirements. The authors regress interest expense divided by pre-interest pre-NDTS income on various variables, including tax expense divided by pre-interest income. They find a positive coefficient on the tax variable in both their outside and inside debt regressions (i.e., interest owed to nonowners and owners, respectively). It is difficult to compare their results to Compustat-based research because Ayers et al. use a different dependent variable than most studies, and they delete firms with a negative value for the dependent variable (which raises statistical issues).

To summarize Section 1.3, once issues related to measuring debt policy and tax rates are addressed, researchers have supplied evidence in response to Myers's (1984) challenge to show that corporate debt usage is positively affected by tax rates. These results are consistent with survey evidence that interest tax deductibility is an important factor affecting debt policy decisions (ranking below only maintaining financial flexibility, credit ratings, and earnings volatility), and is especially important for large industrial firms (Graham and Harvey, 2001). Notwithstanding these empirical results, Myers is still not entirely convinced (Myers et al., 1998); he argues that tax incentives are of "third-order" importance in the hierarchy of corporate decisions. It would be helpful for future research to investigate whether the tax effects on debt versus equity choice are economically important, and if they are not, determine why not.

Several other challenges remain. First, none of the papers cited above provide time-series evidence that firm-specific changes in tax status affect debt policy. It would be quite helpful to examine whether a firm changes its debt policy as it matures and presumably its tax status changes. Second, Fama and French (2001) point out that with few exceptions the panel data examinations do not use statistical techniques that account for cross-correlation in residuals, and therefore, many papers do not allow for proper determination of statistical significance for the tax coefficients. Therefore, it is not clear if all of the tax effects documented above are robustly significant. Finally, most papers ignore the tax cost of receiving interest income from the investor's perspective, an issue that now follows.

2.4. Empirical evidence on whether personal taxes affect corporate debt vs. equity policy

Miller (1977) identifies a puzzle: the benefits of debt seem large relative to expected costs, and yet many firms appear to use debt conservatively. Miller proposes that the personal tax cost of interest income (relative to the personal tax cost of equity) is large enough at the margin to completely offset the corporate tax advantage of debt. The Miller Equilibrium is difficult to test empirically for several reasons, not the least of which is the

fact that the identity and tax-status of the marginal investor(s) between debt and equity are unknown. Anecdotally, we can note that the tax rate on interest income (τ_P) was large relative to tax rates on corporate and equity income (τ_C and τ_E) when Miller wrote his paper, so the Miller Equilibrium was plausible. However, the statutory tax rates shown in Figure 1 imply that Equation (1) has been positive since 1981, so the strict form of the Miller Equilibrium has become less plausible in the last two decades.²⁴

From the corporate perspective, the relatively high investor-level taxation of interest leads to a “personal tax penalty” for debt: investors demand a higher risk-adjusted return on debt than on equity. By rearranging Equation (1), the net tax advantage of debt can be represented as

$$\tau_C - [\tau_P - (1 - \tau_C)\tau_E] \quad (6)$$

where τ_C is the corporate income tax rate, τ_E is the personal tax rate on equity income, and τ_P is the personal tax rate on interest income. The bracketed term in Equation (6) accounts for the personal tax penalty: $\tau_P - (1 - \tau_C)\tau_E$.

To quantify the effect of personal taxes in Equation (5), Gordon and MacKie-Mason (1990) and others implicitly assume that investors form clienteles based on firm-specific dividend payout ratios, and therefore that τ_E is a weighted combination of the tax rates on dividend payout and capital gains income: $\tau_E = (\text{payout})\tau_{\text{div}} + (1 - \text{payout})\tau_{\text{cap gains}}$. This and related papers use historic averages to estimate dividend payout and measure τ_{div} as equaling τ_P , where τ_P is implicitly estimated using the difference between the yield on taxable and tax-free government bonds. $\tau_{\text{cap gains}}$ is often assumed to equal a fraction of the statutory capital gains tax rate (to capture the benefit of reduced effective tax rates due to deferral of equity taxation and omission of equity tax at death).²⁵

Given these assumptions, Gordon and MacKie-Mason (1990) estimate that the tax advantage of debt, net of the personal tax penalty, increased following the Tax Reform Act of 1986. Recall that Miller (1977) implies that the aggregate supply of debt is determined by relative corporate and personal tax rates. Gordon and MacKie-Mason document that aggregate corporate debt ratios increased slightly in response to tax reform (consistent with Prediction 4). This is the only known research that investigates this

²⁴ If the statutory tax rates depicted in Figure 1 are not representative of the tax rates applicable to the marginal investor(s), or if capital gains tax rates are effectively reduced through deferral and/or elimination at death, then the Miller Equilibrium is technically possible even in recent years.

²⁵ Green and Hollifield (2003) simulate an economy to investigate the degree to which capital gains deferral reduces the effective tax rate on equity income (and therefore, from the company’s perspective, increases the personal tax penalty for debt relative to equity). Green and Hollifield find that the ability to defer taxation reduces the implicit tax on capital gains by about 60%. If they were to factor in deferral at death and the lower tax rate on capital gains relative to the rate on dividends and interest, it would reduce the implicit tax rate on capital gains even further. (On the other hand, their calculations ignore the high turnover frequently observed for common stocks and mutual funds, which increases the effective tax rate on equity.) Overall, their evidence suggests that there is a measurable personal tax disadvantage to debt but it does not appear large enough to offset the corporate tax benefits of debt. However, Green and Hollifield find that when coupled with fairly small costs of bankruptcy (e.g., realized bankruptcy costs equal to 3% of pretax firm value), the personal tax penalty is sufficient to offset the corporate tax advantage to debt at the margin and lead to interior optimal debt ratios.

aggregate prediction. Note that Gordon and MacKie-Mason focus on a single point in time, while the Miller Equilibrium has implications for any point in time. Also note that if the marginal investor is taxable at rates like those reflected in Figure 1, then the 2003 reduction in dividend and capital gains tax rates to $\tau_{\text{div}} = \tau_P = 15\%$ should reduce the aggregate amount of debt used in the U.S. economy.

Graham (1999) tests similar predictions using firm-specific data. He finds that between 1989 and 1994 the net tax advantage of the first dollar of interest averaged between 140 and 650 basis points.²⁶ He finds that the firms for which the net advantage is largest use the most debt in virtually every year. Graham also separately identifies a positive (negative) relation between the corporate tax rate (personal tax penalty) and debt usage. These results are consistent with Predictions 2 and 3.

Campello (2001) assumes that a given firm's debt *and* equity are held by a particular clientele of investors (with the clienteles based on investor tax rates). He investigates the capital structure response to the large reduction in personal taxes (relative to the smaller reduction in corporate tax rates) after the Tax Reform Act of 1986. Campello finds that zero-dividend firms (which presumably have high-tax-rate investors and therefore experienced the largest reduction in the personal tax penalty) increased debt ratios in response to tax reform, while high-dividend payout firms (which presumably have low-tax-rate investors and therefore experienced a small reduction in the personal tax penalty) reduced debt usage relative to peer firms.

2.4.1. Market-based evidence on how personal taxes affect security returns

The papers we have cited, though consistent with personal taxes affecting corporate financing decisions in the manner suggested by Prediction 3, are not closely tied to market-based evidence about the tax characteristics of the marginal investor between debt and equity. Instead, these papers assume that dividend clienteles exist, and they also make assumptions about the personal tax characteristics of these clienteles based on a firm's payout policy. For example, these papers implicitly assume that there is a certain marginal investor who owns both equity and debt *and* (to estimate τ_P) that this same investor sets prices between taxable and tax-free bonds. The truth is that we know very little about the identity or tax-status of the marginal investor(s) between any two sets of securities, and deducing this information is difficult.

For example, assume that munis yield 7%, Treasuries 10%, and equities 8% (and assume that this equity return has been adjusted to make its risk equivalent to the risk of munis and Treasuries). In a Gordon/MacKie-Mason/Graham type of equilibrium,

²⁶ I update Graham's (1999) annual tax regressions from his Table 4, Panel B. The tax variable is the tax advantage of debt net of personal taxes, as expressed in Equation (5), with the personal tax penalty based on firm-specific dividend payout ratios. The dependent variable is debt-to-value. The estimated tax coefficients for 1995–1999 are 0.072, 0.046, 0.103, 0.135, and 0.191, respectively, indicating that debt ratios are positively related to net tax incentives. All the tax coefficients are significant at a 1% level, except in 1996 when the *p*-value is 0.026.

$r_{\text{muni}} = r_{\text{Treasury}}(1 - \tau_P) = r_{\text{equity}}(1 - \tau_{\text{equity}}) = 7\%$, which implies that $\tau_P = 30\%$ and $\tau_{\text{equity}} = 12.5\%$. This in turn implies that a large portion of equity returns are expected to come from capital gains (because τ_{equity} is so much lower than τ_P). However, things are rarely so simple. First, it is difficult to determine the risk-adjusted equity return.²⁷ Second, if there are frictions or transactions costs limiting arbitrage between pairs of markets (or if risk adjustments are not perfect), one could observe, say, munis yielding 7%, Treasuries 10%, and equities 12%. In this case, it is not clear which pair of securities should be used to deduce τ_P . If Treasuries and equities are used, the implicit τ_P could be negative. For example, assume that dividend payout is 15%, that $\tau_{\text{effective cap gains}} = 5\%$, and that τ_{equity} is modeled as a weighted average between dividends and retained earnings: $\tau_{\text{equity}} = 0.15(1 - \tau_{\text{div}}) + 0.85(1 - \tau_{\text{effective cap gains}})$, where $\tau_{\text{div}} = \tau_P$. To ensure that $r_{\text{Treasury}}(1 - \tau_P) = r_{\text{equity}}(1 - \tau_{\text{equity}})$, in this example $\tau_P = -30\%$. Clearly, market frictions drive relative returns in this example, so the usual approach cannot be used to deduce the personal tax characteristics of the marginal investor(s).

Williams (2000) points out that when there are more than two assets, different pairs of assets can be arbitrated by different investors, so prices might reflect a mixture of tax characteristics. It is difficult to know which assets are directly benchmarked to each other by the marginal investor(s) and which are “indirectly arbitrated,” and it is even difficult to know whether capital gains or income tax rates are priced into security returns.

It would be helpful if future research could quantify the relative importance of personal taxes on security prices, with an eye toward feedback into capital structure decisions. One area in which a fair amount of research has been done along these lines involves determining the investor tax rate implicit between municipals and taxable government bonds. Poterba (1989) finds that the yield difference between high-grade one-year munis and government bonds approximates the top statutory personal tax rate, implying that the marginal investor between these two securities is a highly taxed individual. However, even this experiment is not without difficulty. First, returns on long-term munis and taxables imply a tax rate for the marginal investor that is approximately half that implied by the short-term securities. Chalmers (1998) shows that this holds even when the muni interest payments are prefunded by T-bonds held in “defeasement,” and therefore, differences in risk between munis and T-bonds do not explain this conundrum. Green (1993) proposes that taxable bonds might not be “fully taxable” because a portion of their return can come from capital gains (especially for long-term bonds) and also because to some degree the interest income can be offset by investment interest deductions. Mankiw and Poterba (1996) suggest that munis might be benchmarked to equities by one clientele of investors and taxable bonds might be benchmarked to equities by another clientele. In this case, munis and taxables might not be directly benchmarked to each other, which

²⁷ Gordon and MacKie-Mason (1990) and Graham (1999) avoid the issue of adjusting the equity return. Instead, they assume that τ_{div} equals the τ_P implicit between munis and Treasuries and that $\tau_{\text{effective cap gains}} = 0.25 \times \tau_{\text{statutory capital gains}}$, and they weight these two pieces by the portion of earnings returned as dividends and retained, respectively, to deduce τ_{equity} . It would be informative if future research could calibrate this approach to market-driven estimates of τ_{equity} .

could explain the unusual implicit tax rate that is sometimes observed between the two securities.

As an example of trying to link the effects of personal taxes to capital structure issues, consider the implications from Engel et al. (1999) and Irvine and Rosenfeld (2000) about the personal tax penalty.²⁸ Assume that corporations are the marginal investors in preferred stock but not in debt.²⁹ Given the similarity of the securities, in equilibrium, we expect their after-investor-tax returns to be equal, within transactions cost bounds: $r_{\text{preferred}}(1 - \tau_{\text{DRD}}) = r_{\text{MIPS}}(1 - \tau_P)$. Plugging in $r_{\text{preferred}} = 8.14\%$ and $r_{\text{MIPS}} = 8.37\%$ from Engel et al.'s Table 3, and assuming that the marginal corporate investor is taxed at 35% so that $\tau_{\text{DRD}} = 10.5\%$, we can back out the personal tax rate associated with interest income: $0.0814(1 - 0.105) = 0.0837(1 - \tau_P)$ implies that $\tau_P = 13\%$. If we ignore the 30 basis point “yield premium” on MIPS imputed by Engel et al. and use $r_{\text{MIPS}} = 8.67\%$, $\tau_P = 16\%$.

To the extent that results based on MIPS interest carry over to debt interest, finding $\tau_P = 16\%$ for the marginal debt investor is intriguing. First, note that the mean after-financing corporate tax rate in 1993-1999 is approximately 18% (see Table 1), which is a rough estimate of the tax benefit of the *last* dollar of interest deduction (ignoring all costs). If we make Miller's (1977) assumptions that $\tau_E = 0$ and that all firms face the same 18% marginal benefit of debt, then τ_P should equal 18% (i.e., MC should equal MB), quite close to the $\tau_P = 16\%$ MIPS estimate. As argued by Green and Hollifield (2003), it would only take fairly small costs of bankruptcy to equalize the costs and benefits of debt, creating an environment conducive to an equilibrium with internal optimal debt

²⁸ Recall that these authors investigate MIPS for preferred exchanges. These two securities are similar in most respects, except that MIPS interest is tax deductible for issuing corporations and preferred dividends are not. On the investor side, corporate investors can take the 70% dividends received deduction (DRD) for preferred dividends, but recipients of MIPS interest receive no parallel deduction.

²⁹ Erickson and Maydew (1998) provide evidence that corporations are the marginal investors in preferred stock, though they do not precisely identify the numeric value of the marginal investor's tax rate. They study the market reaction to the announced (but never implemented) change in the dividends received deduction (DRD). The DRD allows corporations to deduct a portion of the dividends they receive from other corporations to attenuate “triple taxation” of equity income. Individual investors do not receive the DRD. When the Treasury made a surprise announcement in December 1995 that it was planning to reduce the deduction from 70% to 50%, the typical preferred stock experienced a statistically significant -1% abnormal return, while there was no reaction among common stocks. This implies that corporations are the marginal investors (i.e., price-setters) in preferred stocks but not in common stocks. One advantage of the Erickson and Maydew study is that they are able to control for risk when examining abnormal returns because they compare a security to itself before and after the exogenous announcement. They are unable to precisely deduce the tax rate of the marginal (corporate) investor, however, because they cannot pinpoint the probability assigned by the market that the Treasury would actually implement the proposal.

While Erickson and Maydew (1998) find no evidence that corporations are the marginal investors in common stocks, Geisler (1999) shows that common-stock holdings by insurance companies vary positively with the allocation of the DRD among insurance companies. (The allocation of DRD can vary across insurance companies for regulatory reasons.) Geisler's evidence is consistent with evidence on clientele: insurance companies respond to tax incentives to hold common stocks when their tax rate is low (i.e., when their DRD allocation is high).

ratios. However, τ_E is most likely not zero for the marginal investor in equities. (Green and Hollifield argue that deferral reduces effective τ_E to about half its statutory level.) Another issue is that the estimated MIPS costs and benefits are average, not marginal. Even if the marginal costs and benefits are equal in an equilibrium like that depicted in Figure 2a, there is a firm surplus/benefit to using debt. Therefore, even if personal tax costs are large enough at the margin to equal marginal benefits, there appear to be tax-driven preferred capital structures for some firms. Presumably, the incremental benefit would be near \$0.35 per dollar for high-tax-rate firms, while the personal tax cost is only half that amount. Only if the nontax costs of debt are large for these high-tax-rate firms could a Miller-type equilibrium hold, in which the benefits of debt are zero for all firms in equilibrium.

In sum, the implicit personal tax costs estimated here suggest that at the margin the tax costs and tax benefits might be of similar magnitude. However, they do not explain cross-sectionally why some inframarginal firms (with large tax benefits of interest) do not use more debt. (More details on this issue are presented in Section 1.4.) One other area in which there has been a fair amount of success—though not unambiguously so—in deducing marginal investor tax characteristics is related to ex-day dividend returns. This discussion is deferred to Section 4, which explores how taxes affect corporate dividend policy.

In the most general sense, any research that shows that personal tax rates affect security returns sheds light on Miller's (1977) claims. Using the CAPM-with-taxes specification, Auerbach (1983) finds evidence that tax-related preferences result in clienteles of investors that purchase stocks based on firm-specific dividend-price ratios. Constantinides (1983) and Dammon, Spatt, and Zhang (2001) investigate how favorable capital gains taxation affects investment and consumption choices. Seida and Wempe (2000) show that individual investors accelerated recognizing capital gains (and delayed losses) in anticipation of the increase in capital gains tax rates associated with the 1986 tax act. For a review of articles related to how personal taxation affects the timing and value of asset sales and purchases, see Poterba (2001).

2.4.1.1. Tax capitalization Another group of papers investigates tax capitalization and argue that personal taxes are capitalized into share prices via retained earnings. This in turn affects the relative tax advantage to debt because retained earnings are assumed to be the marginal source of funding. Harris and Kemsley (1999), Collins and Kemsley (2000), and related papers assume that all earnings are eventually paid out as taxable dividends (and none via repurchases or liquidating dividends), which is consistent with the "new view" of the effects of dividend taxation.³⁰ They argue that (nearly) full dividend taxation is impounded into share prices and that, as a result, no incremental personal tax penalty is imposed when a firm pays a dividend. Therefore, personal taxes are large on interest

³⁰ See Auerbach (2002) for cites. The "new view" or "trapped equity" assumptions are in contrast to the assumptions made at the beginning of Section 1 that "equity is the marginal source of funds" and that "dividends are paid out according to a fixed payout policy."

income and small on equity income, and the personal tax penalty to debt financing is large.

Harris and Kemsley (1999) regress stock price on variables, including retained earnings, and they infer that retained earnings are penalized at a dividend tax rate of approximately 47%. Collins and Kemsley (2000) argue that reinvesting current earnings leads to investor capital gains taxation when shares are sold, on top of the already impounded dividend taxation. This implies that there is no personal tax penalty for dividend payments (it is already impounded into share prices, and therefore paying a dividend does not lead to further valuation effects). In fact, this leads to the counter-intuitive argument that paying dividends leads to a reduction in future capital gains payments and therefore, *dividend payments are tax advantageous*. This implication only holds if arbitrage by tax-free investors is restricted to the point that personal investors are the marginal price-setters in stocks. Collins and Kemsley find empirical evidence that they interpret as being consistent with their hypotheses. An untested implication of their argument is that there should be a large value gain in deals that result in firms returning capital to investors in any form other than taxable dividends (such as mergers). Research into this area could be informative.

Rather than dividend taxes, an alternative argument is that capital gains taxes on future earnings are impounded into share prices. Consider a shareholder in a nondividend-paying firm and assume that the firm is expected to pay dividends at some point in the distant future. If the market expects that low-tax investors are likely to be the dominant owners of this company when the dividend payments are initiated, the only (future) tax that current investors face is capital gains. In support of this argument, Lang and Shackelford (2000) show that upon announcement that capital gains tax rates were going to decline, stock prices increased most among firms for which capital gains are most important (i.e., firms with the lowest dividend yield). This reaction is opposite that predicted by lock-in models such as Klein (2001), in which, for firms with substantial accrued retained earnings, returns fall when capital gains rates fall because the required return declines along with the tax rate. For further discussion of the tax capitalization literature, see Shackelford and Shevlin (2001).

Overall, the tax status of the marginal investor, and therefore the empirical magnitude of the personal tax penalty, is an open empirical question. This is an important issue. For one thing, failing to control for personal tax considerations can result in an omitted variable bias. For example, personal tax considerations could cause clientele behavior that is correlated with dividend-payout ratios. In a regression that omits personal tax considerations, the dividend-payout coefficient might erroneously be interpreted as supporting a nontax hypothesis. As another example, business students are often taught that the tax advantage of debt is captured by $\tau_C D$ (see Equation 4), which ignores personal tax effects. If it can be demonstrated that personal tax effects are not particularly important, this simplified view of the world might be justified. In contrast, if investor taxes affect security returns in important ways, more care needs to be taken in modeling these effects in corporate finance research. Investigations of personal tax effects face several challenges, not the least of which is that risk differences between securities

must be properly controlled to allow one to deduce implicit tax rates from market return data.

2.5. *Beyond debt vs. equity*

2.5.1. *Leasing*

The discussion thus far has considered the debt versus equity choice; however, it can be extended to leasing arrangements. In certain circumstances, a high-tax-rate firm can have a tax incentive to borrow to purchase an asset, even if it allows another firm to lease and use the asset. With true leases (as defined by the IRS), the lessor purchases an asset and deducts depreciation and (if it borrows to buy) interest from taxable income. The lessee, in turn, obtains use of the asset but cannot deduct interest or depreciation. The depreciation effect therefore encourages low-tax-rate firms to lease assets from high-tax-rate lessors. This occurs because the lessee effectively “sells” the depreciation (and associated tax deduction) to the lessor, who values it more highly (assuming that the lessee has a lower tax rate than the lessor). This incentive for low-tax-rate firms to lease is magnified when depreciation is accelerated, relative to straight-line depreciation. Furthermore, the alternative minimum tax (AMT) system can provide an additional incentive for a lessee to lease, in order to remove some depreciation from its books and stay out of AMT status altogether.

There are other tax effects that can reinforce or offset the incentive for low-tax-rate firms to lease. Lessors with relatively large tax rates receive a relatively large tax benefit of debt, which provides an additional incentive (to borrow to) buy an asset and lease it to the lessee. Moreover, tax incentives provided by investment tax credits (which have existed at various times but are not currently on the books in the United States) associated with asset purchases are also relatively beneficial to high-tax-rate lessors. In contrast, the relatively high taxes that the lessor must pay on lease income provide a tax disincentive for firms with high tax rates to be lessors (and similarly the relatively small tax benefit that a low-tax-rate firm obtains from deducting lease expense works against the incentive for low-tax-rate firms to lease rather than buy). The traditional argument is that low-tax-rate firms have a tax incentive to lease from high-tax-rate lessors, though this implication is only true for some combinations of tax rules (e.g., depreciation rules, range of corporate tax rates, existence of investment tax credits or AMT) and leasing arrangements (e.g., structure of lease payments). See Smith and Wakeman (1985) for details on how nontax effects can also influence the leasing decision.

Prediction 5: All else equal, the traditional argument is that low-tax-rate firms should lease assets from high-tax-rate lessors, though this implication is conditional on specifics of the tax code and leasing contract.

There are several complications associated with investigating whether firms lease in response to tax incentives. First, because leasing expense is tax deductible, leasing

endogenously reduces a lessee's effective tax rate, which can bias an experiment in favor of detecting tax effects. Similarly, lessor tax rates could be endogenously increased from the effects of lease income. Second, financial statement definitions of leasing are not one-to-one with IRS definitions, making it difficult to use Compustat data to test Prediction 5. Using endogenously affected tax variables, Barclay and Smith (1995b) and Sharpe and Nguyen (1995) find that low-tax-rate firms use relatively many capital leases. However, capital leases do not meet the IRS definition of true leases. (Instead, they are likely a mixture of true leases and conditional sales contracts, the latter of which are treated like debt so that the lessee deducts interest and depreciation.) Therefore, the documented negative relation between capital leases and taxes is hard to interpret because it might be spurious.

Graham, Lemmon, and Schallheim (1998) address the first issue by measuring tax incentives "but-for financing decisions," that is, calculating tax rates using income before debt interest and the implicit interest portion of lease payments are deducted. They address the second issue by focusing on operating leases, which are defined in a manner similar to the IRS definition of true leases. Graham et al. (1998) find that the use of operating leases is negatively related to before-financing tax rates, consistent with Prediction 5, and that capital leases are unrelated to before-financing tax rates. Graham et al. also show that erroneously using an after-financing tax rate would double the magnitude of the negative tax coefficient for operating leases, and spuriously assign a negative tax coefficient to capital lease usage.

Eades and Marston (2001) find that lessors tend to be high-tax-rate firms (consistent with Prediction 5). Finally, O'Malley (1996) finds no evidence that firms systematically lease in response to tax incentives imposed by the AMT. We need research investigating whether the tax benefit of leasing adds to firm value. The jury is still out on whether debt and leasing are substitutes for the lessee (as they might be in the sense considered by DeAngelo and Masulis, 1980, because both lead to tax deductions).

2.5.2. Pensions

Black (1980) assumes that pension plans and the overall company are a single economic entity that should have an integrated financing and investment strategy. Due to interest tax deductions, the cost of corporate borrowing is the after-tax cost of debt. Because they are tax-free entities, defined benefit pension plans (DBs) earn the before-tax rate of interest on bondholdings. Therefore, Black suggests that DBs should increase (decrease) bond (equity) holdings, while the rest of the firm should do the reverse. This action should not increase firm risk because the increase in corporate debt offerings is offset by the increase in bonds held in the pension plan. In an M&M (1963) world, the net effect is that the company earns τ_C times the amount of bonds held, as in Equation (4). Tepper (1981) argues that there can be a tax advantage to the strategy of corporate borrowing and DBs investing in bonds, even in a Miller (1977) world. In this case, the benefit occurs when the DB is an inframarginal investor in bonds, thereby earning the "extra" return necessary to compensate individual investors for the personal tax penalty associated with

interest income (i.e., DBs capture some of the investor surplus depicted in Fig. 2). The Tepper incentive for DBs to hold bonds increases with the difference between personal tax rates on interest and equity income.

Prediction 6: Defined benefit pension plans have an incentive to hold bonds (equity) that increases (decreases) in the corporate tax rate, while the rest of the firm has the reverse incentive.

Myers (2001) finds evidence consistent with the Black (1980) case: she reports that DB bondholdings increase with a simulated corporate marginal tax rate. She does not find evidence consistent with the Tepper argument. In a less direct test of the same incentives, Thomas (1988) finds time-series evidence that firms decrease DB contributions when their tax rate is falling, and cross-sectional evidence that high-tax firms have larger DB funding levels.

Clinch and Shibano (1996) study pension reversions, which occur when a firm terminates an overfunded pension, settles its liabilities, and reverts the excess assets to the firm, all in one year. The reverted assets are taxable in the reversion year. Clinch and Shibano state that firms with the largest tax benefit of reverting do so, and also that firms' time-reversion decisions occur in years with particularly large tax benefits. One nice aspect of the Clinch and Shibano experiment is that their tax variable equals the tax consequence of reverting relative to the tax consequence associated with the next best alternative (e.g., amortizing the excess assets over several years).³¹

2.5.3. *Debt maturity*

In the spirit of Modigliani and Miller (1958), Lewis (1990) derives an irrelevance null hypothesis for debt maturity. If corporate taxes are the only market imperfection, Lewis shows that the optimal firm-specific debt policy (i.e., optimal level of promised interest payments) can be achieved by various combinations of short- and long-term debt. This implies that firm value is unaffected by debt maturity structure and that capital market imperfections beyond corporate taxes, like costs to restructuring debt or underinvestment, are needed for debt maturity to matter.

Rather than modeling the simultaneous choice of debt level and maturity structure as in Lewis (1990), Brick and Ravid (1985) assume that firms choose debt level before debt maturity. If the expectations theory of interest rates holds, firms pay the same present value of interest in the long run regardless of debt maturity. However, issuing long-term debt accelerates interest payments, thus maximizing the present value of the interest tax

³¹ Chaplinsky and Niehaus (1990) describe the potential tax benefits of Employee Stock Ownership Plans, a form of defined contribution benefit plan. ESOPs offer deferred compensation to employees and a deductible expense to employers. ESOPs are designed to allow firms to borrow to purchase own-company stock on employees' behalf, which provides an interest deduction to the firm. Moreover, half of the interest income received by the lenders is tax-free. Shackelford (1991) finds that lenders keep only 20–30% of the tax benefit associated with this interest, with the remainder being passed along to the ESOP in the form of a lower interest rate on the loan. In late 1989, tax rules changed to restrict the interest exclusion to loans where the ESOP own more than 50% of the stock, which effectively killed the interest exclusion except for a few very unusual cases.

shield. Brick and Ravid (1985) use this logic to argue that debt maturity should increase with the slope in the yield curve.

Prediction 7: Debt maturity increases in the slope in the yield curve.

Most empirical evidence does not support their prediction. Barclay and Smith (1995a) and Stohs and Mauer (1996) include a stand-alone yield curve variable that is either insignificant or has the wrong sign. Guedes and Opler (1996) maintain that the slope of the yield curve should only affect firms with a positive tax rate, and therefore the yield curve variable will interact with the corporate marginal tax rate. Neither Guedes and Opler (using a crude measure of the corporate tax rate) nor Harwood and Manzon (1998, using a simulated corporate tax rate) find a significant coefficient on the yield curve variable. The one exception is Newberry and Novack (1999), who use a dummy variable equal to one during 1992 and 1993 (when the term premium was relatively high) and equal to zero for all other years 1987–1995. Newberry and Novack find a positive coefficient on the yield curve dummy in their public debt regression but not in their private debt analysis.

Kane, Marcus, and McDonald (1985) determine optimal debt maturity in a model that trades off corporate tax benefits with personal tax, bankruptcy, and flotation costs. The implications of their model are that debt maturity decreases with the corporate MTR and increases with the personal tax rate: long maturity implies less frequent recapitalization and relatively low transactions costs, so long-term debt can be desirable even if the net tax benefit is low. Maturity also decreases with the volatility of firm value because volatile firms are more likely to restructure debt.

Prediction 8: Debt maturity decreases with the corporate MTR and the volatility of firm value and increases with the personal tax rate.

Stohs and Mauer (1996) find the following support for Prediction 8: volatile firms generally use shorter term debt. The evidence relating to the tax-rate prediction is weaker. Stohs and Mauer report that debt maturity decreases with corporate tax rates—but their MTR variable is very crude (equal to income tax expense divided by pretax income when this ratio is between 0 and 1, and equal to 0 otherwise). Opler and Guedes (1996) find a negative coefficient on a tax expense divided by assets variable but the wrong sign on an NOL-based tax variable. Finally, Harwood and Manzon (1998) and Newberry and Novack (1999) point to a positive relation between a simulated tax rate variable and debt maturity, opposite the Kane et al. prediction.³² A positive coefficient makes sense if

³² Harwood and Manzon's variable equals the Graham (1996a) simulated tax rate divided by the top statutory tax rate. This variable has a large value for firms that do not currently have NOLs and that do not expect to experience a loss in the near future. Harwood and Manzon predict a positive relation between this tax variable and debt maturity. They contend that firms with large values for the tax variable are likely to fully utilize tax deductions in the future, and therefore lock into long-term debt now. In new analysis for this chapter, I perform a more direct test on the hypothesis that uncertainty about future tax-paying status reduces the use of long-term debt. I use the standard deviation of the simulated marginal tax rate to measure uncertainty about tax-paying status, with the standard deviation calculated across the simulated scenarios for any given firm-year. I do not find any relation between debt maturity and uncertainty about tax-paying status.

large simulated MTRs identify firms that use long-term debt because they are relatively likely to be able to deduct interest in current and future periods.

Finally, debt maturity can affect the tax-timing option for firms to opportunistically retire debt (e.g., Emery, Lewellen, and Mauer, 1988). If the corporate tax function is convex, the expected present value tax benefit of short-term debt declines with interest rate volatility, while the tax deductions with long-term debt are fixed. Therefore, long-term debt is preferred when interest rates are volatile. Long-term debt also increases the value of the timing option for investors to tax-trade securities (Kim, Mauer, and Stohs, 1995) because option value increases with security maturity and long-term bond prices are more sensitive to changes in interest rates.

Prediction 9: Debt maturity increases with interest rate volatility.

Kim et al. (1995) find that debt maturity increases with interest rate volatility, but Guedes and Opler (1996) do not. Nor do Guedes and Opler find significance for a second variable that interacts interest rate volatility with a corporate MTR variable.

The evidence linking tax incentives to debt maturity is mixed. One factor that makes it difficult to draw general conclusions is that debt maturity is defined differently in various papers. Barclay and Smith (1995a) use a dependent variable measuring the portion of outstanding debt that matures in four or more years; Guedes and Opler (1996) use the log of the term to maturity for new debt issues; Stohs and Mauer (1996) use the book value weighted average of the maturity of a firm's outstanding debt; Newberry and Novack (1999) use the same for new issues; and Harwood and Manzon (1998) use the portion of outstanding debt that is long-term. Another issue that might affect inferences about tax variables is the apparently nonlinear relation between debt maturity and nontax influences (Guedes and Opler, 1996). Unless the nonlinearity of the overall specification is properly controlled, it might adversely affect the ability to detect tax effects. Finally, the yield curve was never inverted during the periods studied by most of these papers, so the tests of Brick and Ravid (1985) focus on the steepness of the yield curve rather than on the sign.

3. Taxes and capital structure—international tax issues

Section 1 reviews capital structure choice in the context of a domestic-only firm operating in a classical tax system (in which interest is tax deductible but equity payments are not). Although much academic research focuses on this paradigm, international tax issues have become more important in recent years. This section reviews how international tax law can affect corporate financing decisions in a multinational firm. The perspective is generally for a firm headquartered in the United States, but many of the implications hold if the firm is headquartered elsewhere.

The general framework is still based on taxes affecting firm value via an expression such as $V_{\text{with debt}} = V_{\text{no debt}} + \tau_C(\cdot) * D$. The research in this section demonstrates that

multinational tax rules can affect the $\tau_C(\cdot)$ function and therefore the incentive to use both domestic and foreign debt. So as not to let the reader get bogged down in international tax law, this section only sketches the effects of multinational tax incentives. To focus on the central factors that affect multinational firms, several simplifying assumptions (described below) are presented. For a more detailed description of international tax law, see Hines (1996) or Scholes, Wolfson, Erickson, Maydew, and Shevlin (2002) and the references therein.

3.1. Tax incentives and financial policy in multinational firms: theory and tax rules

A multinational corporation can finance its foreign operations with internal equity (i.e., an equity infusion from a parent or subsidiary to an affiliated subsidiary), internal debt (i.e., a loan from the parent to a subsidiary), external funding, or earnings retained by the foreign subsidiary. If internal equity is used, the parent receives its return on equity when the subsidiary repatriates dividends back to the home country. Dividend repatriations based on active operating earnings can usually be deferred indefinitely, until the parent needs an infusion of cash, or to optimize the worldwide tax situation of the firm.³³ In contrast, interest from internal debt is paid according to a fixed schedule. Like a repatriated dividend, interest counts as “worldwide income” on the U.S. tax return of the parent. Unlike a repatriated dividend, the interest is often deductible on the foreign tax return, allowing for a foreign tax deduction analogous to the tax benefit of debt described in Section 1.³⁴

Two important items affect the financing choices of U.S.-based multinational firms: foreign tax credits and interest allocation rules. The U.S. government taxes individuals and corporations on the basis of residence or place of incorporation, meaning that they are taxed because they are from the United States, regardless of where they earn income. (Note that the United States only taxes “active foreign source income” at the time of repatriation to the U.S. parent.) At the same time, the government recognizes that income earned abroad is usually taxed by a foreign entity, so the United States offers foreign tax credits to offset taxes paid abroad. If the United States did not offer such credits, the foreign operations of U.S. corporations would face double taxation and therefore have

³³ To illustrate the potential economic importance of repatriations and taxes on such transfers, note that in 2003 the Bush administration proposed reducing the tax on all repatriated income to 5%. The goal was to spur a return of capital to U.S.-domiciled firms in hopes that these firms would productively invest the funds and stimulate the U.S. economy. This provision was eliminated during negotiations with Congress over the tax bill.

³⁴ There are restrictions to shifting interest deductions abroad by lending from the domestic parent to the foreign subsidiary: thin capitalization rules (i.e., limits on the magnitude of foreign debt ratios), withholding taxes imposed by the foreign government on interest payments and other repatriations, and netting rules that restrict the effect of interest payments on the determination of foreign source income (Newberry and Dhaliwal, 2001, and Scholes et al., 2002). For example, withholding taxes are above and beyond foreign income taxes and are collected by foreign governments on remittances to parent firms.

a tough time competing with foreign corporations. For the purposes of this analysis, the reader should think of the foreign tax rate (τ_{For}) as a weighted average of tax rates the firm pays in the various countries in which it earns foreign income, with the weights being the relative share of active (i.e., nonpassive) foreign source income repatriated from a particular country.

In simplest terms, if the foreign tax rate is smaller than the U.S. corporate income tax rate (τ_{US}), a firm receives credit for foreign taxes paid but still must remit to the U.S. government taxes equal to $(\tau_{\text{US}} - \tau_{\text{For}}) \times (\text{foreign source income})$. Such a firm is called a *deficit credit* firm because it lacks sufficient foreign tax credits (FTCs) to avoid all U.S. taxes. For example, if repatriated foreign earnings are \$200, $\tau_{\text{For}} = 15\%$, and $\tau_{\text{US}} = 35\%$, the firm must pay \$40 in tax to the United States.

In contrast, if $\tau_{\text{For}} > \tau_{\text{US}}$, the firm does not have to pay U.S. taxes because it receives foreign tax credits proportional to τ_{For} . For example, if $\tau_{\text{For}} = 45\%$ and $\tau_{\text{US}} = 35\%$ and repatriated earnings are \$200, the firm pays \$90 in foreign tax; however, the firm's foreign tax credits are limited to $\text{FTC}_{\text{allow}} = \$70 (= \min[\$200\tau_{\text{US}}, \$200\tau_{\text{For}}])$, which is just enough to shield it from the U.S. tax obligation. The \$20 in unused FTCs can be carried back up to two years or carried forward up to five years to offset taxes on repatriated income (or they can be deducted rather than used as a credit). This firm is an *excess credit* firm because it has more FTCs than it is allowed to use in the current year and accumulates the excess tax credits to potentially shield income in another year. The tax benefit of debt, $\tau_C(\cdot)$, can be modeled as a decreasing function of accumulated FTCs because FTCs can act as nondebt tax shields that are substituted for interest deductions.³⁵

Prediction 10: All else equal, the incentive $\tau_C(\cdot)$ to finance with domestic debt decreases with accumulated foreign tax credits for deficit credit firms.³⁶

Prediction 10 is a static prediction. Considering the dynamic carryback and carryforward features of the tax code, a dynamic prediction is that the tax incentive to finance

³⁵ FTCs can affect tax incentives to use debt in a manner that is not reflected in a one-period model. Assume that a multinational firm has accumulated unused FTCs that it has carried forward to the present (or assume that it anticipates receiving excess FTCs sometime in the next two years). If a firm has carried forward FTCs from previous years, it very likely was excess credit, and therefore subject to $\tau_{\text{For}} > \tau_{\text{US}}$ at some point in the past. For the most part, a firm can use these accumulated FTCs only if the foreign tax rate becomes smaller than the U.S. corporate income tax rate. This can occur if there is an exogenous shift in relative tax rates (τ_{For} and τ_{US}) or if a firm repatriates more foreign-source income from low-tax countries, thereby reducing the average τ_{For} (i.e., the latter case is an example of a firm endogenously reducing its τ_{For}). If a firm expects to use accumulated FTCs to reduce taxes, the FTCs compete with interest deductions in a DeAngelo and Masulis sense and reduce the incentive to finance with debt.

³⁶ Consider a firm with \$1 in pretax foreign earnings that it will repatriate back to the United States to pay investors. Assume that the firm has \$0.15 in accumulated FTCs, $\tau_P = 0.40$, $\tau_E = 0.20$, $\tau_{\text{For}} = 0.20$, and the U.S. corporate tax rate is $\tau_{\text{US}} = 0.35$. Ignoring foreign considerations, $\tau_C = 0.35$ and Equation (1) equals 0.08, so it appears that the firm should finance with domestic debt. However, $\tau_C = 0.20$ once the effect of FTCs is considered (the firm pays \$0.20 in foreign tax and no U.S. tax because the FTCs offset any potential tax owed to the United States); therefore, Equation (1) equals -0.04 , and the firm should finance with equity. This implication holds for deficit credit firms but not for excess credit firms (because an excess credit firm would not pay U.S. tax at repatriation, regardless of whether they have accumulated FTCs).

with debt decreases with the probability of a firm being deficit credit and the probability of accumulating FTCs.

The second important tax principle affecting multinational corporate financing decisions is the allocation of debt interest between domestic and foreign operations. Via the allocation of domestic interest, the United States limits allowable foreign tax credits, thereby possibly reducing the tax benefit of domestic debt. (The United States does this to limit tax deductions on debt that might possibly be used to finance foreign operations and produce foreign profits.) To implement this policy, the United States allocates domestic interest to foreign operations based on the proportion of total assets that are in foreign subsidiaries. In rough terms, if two-thirds of a company's worldwide assets are held by foreign subsidiaries, then two-thirds of domestic interest deductions are allocated to foreign income when determining the allowable-FTC calculation. Note that this is a U.S. government ruling and does not mean that foreign governments recognize the allocated interest as a deduction against foreign income. Also note that the allocation of a portion of domestic interest abroad technically affects only the allowable-FTC calculation; that is, ignoring FTC, domestic interest deductions are not directly affected.

The interest allocation procedure can reduce the tax incentive for U.S. firms to use domestic debt because $\tau_C(\cdot)$ also declines with the degree of interest allocation. When a firm is an excess credit firm (i.e., $\tau_{US} < \tau_{For}$) and taxable on both foreign and domestic operations, the interest allocation procedure reduces the tax benefit of domestic interest deductions by setting $\tau_C(\cdot)$ equal to $\tau_{US}(\cdot) \cdot [\text{domestic assets/worldwide assets}]$. Thus, for excess credit firms the incentive to finance with domestic debt decreases with the proportion of assets held abroad.³⁷ One implication of the interest allocation rules is that debt policy research cannot assume that financial statement (or Compustat) "domestic interest expense" is fully beneficial to U.S. multinationals.

Table 2 summarizes the tax incentives to use external domestic or foreign debt in a one-period model. The table is self-explanatory, so only the main points need be emphasized here. The model ignores personal taxes, carryforwards, and carrybacks, and assumes that all foreign income is repatriated each year. The worldwide tax liability (Tax_{World}) is equal to the sum of U.S. tax on worldwide income (Tax_{US}) and foreign tax on foreign income (Tax_{For}), less allowable FTCs. The table shows the change in Tax_{World} that occurs, for various tax credit and interest allocation situations, when an additional dollar of domestic or foreign interest is deducted.³⁸

For the most part, the results in Table 2 are what you would expect without thinking too deeply about the complexities of foreign taxes. If Tax_{US} is zero (rows 1 and 3) or

³⁷ If a U.S. multinational is deficit credit (i.e., $\tau_{US} > \tau_{For}$) and taxable both in the United States and overseas, $\tau_C(\cdot) = \tau_{US}$ and the incentive to use domestic debt is not affected by interest allocation rules. The interest allocation rules limit the amount of deductions a firm is allowed to use to offset repatriated foreign income. When a firm is deficit credit, it pays tax at the rate τ_{US} regardless of the amount of FTCs applied to foreign-source income, so reducing allowable FTCs via interest allocation does not affect the current-year tax liability.

³⁸ This model ignores many techniques by which firms can minimize worldwide taxes. See Scholes et al. (2002) for more information on these alternative mechanisms.

Table 2

Tax incentive to use debt in a U.S. multinational firm with foreign tax credits and allocable domestic interest

Assume that a U.S. multinational firm currently returns \$1 of pre-corporate-tax earnings to its marginal investor as domestic equity. The one-period model in this table shows the tax effect of instead paying the \$1 as foreign interest (rightmost column in each panel) or as \$1 of domestic interest (second-to-rightmost column). The model is adapted from Collins and Shackelford (1992) and assumes that all foreign income (Inc_{For}) is repatriated every year and that tax rules are the same worldwide, except that only the United States allocates interest. The model ignores the AMT, carrybacks and carryforwards, personal taxes, and allocable items other than interest. Because the real-world tax-code is dynamic (i.e., it allows for carrybacks and carryforwards), the one-period nature of this model might overstate (understate) the largest (smallest) tax benefits. Note that foreign losses (i.e., $Inc_{For} - Int_{For} < 0$) cannot be repatriated as losses back to the United States. FTC_{allow} is allowable foreign tax credit (sometimes referred to as $FTC_{limitation}$), FA is foreign assets net of foreign debt, WA is worldwide assets net of foreign debt, and FSI is foreign source income, which equals $Inc_{For} - Int_{For} - \frac{FA}{WA} Int_{US}$.

$$Tax_{World} = Tax_{US} + Tax_{For} - FTC_{allow} = (Inc_{US} - Int_{US} + Inc_{For} - Int_{For})\tau_{US} + (Inc_{For} - Int_{For})\tau_{For} - FTC_{allow}, \text{ where}$$

$$FTC_{allow} = \text{Max}\{0, \text{Min}[Tax_{For}, FSI\tau_{US}, Tax_{US}]\} = \text{Max}\{0, \text{Min}[(Inc_{For} - Int_{For})\tau_{For}, (Inc_{For} - Int_{For} - \frac{FA}{WA} Int_{US})\tau_{US}, (Inc_{US} - Int_{US} + Inc_{For} - Int_{For})\tau_{US}]\}$$

	If Tax_{US}	and Tax_{For}	then $FTC_{allow} =$	and $Tax_{World} =$	$\delta(Tax_{World})\delta(Int_{US})$	$\delta(Tax_{World})\delta(Int_{For})$
(1)	$= 0$	> 0	0^*	$(Inc_{For} - Int_{For})\tau_{For}$	0	$-\tau_{For}$
(2)	> 0	$= 0$	0	$Inc_{US} - Int_{US}\tau_{US}$	$-\tau_{US}$	0
(3)	$= 0$	$= 0$	0	0	0	0

Otherwise, if $Tax_{US} > 0$ and $Tax_{For} > 0$ and

	if $Inc_{US} - Int_{US}$	and τ_{US}	then $FTC_{allow} =$	referred to as	$\delta(Tax_{World})\delta(Int_{US})$	$\delta(Tax_{World})\delta(Int_{For})$
(4)	> 0	$> Tax_{For}/FSI$	$(Inc_{For} - Int_{For})\tau_{For}$	deficit credit	$-\tau_{US}$	$-\tau_{US} - \tau_{For} + \tau_{For} = -\tau_{US}$
(5)	> 0	$< \tau_{For}$	$(Inc_{For} - Int_{For} - \frac{FA}{WA} Int_{US})\tau_{US}$	excess credit *	$-\tau_{US} (1 - \frac{FA}{WA})$	$-\tau_{US} - \tau_{For} + \tau_{US} = -\tau_{For}$
(6)	< 0 , and $< Inc_{For} - Int_{For}$ in absolute value, so some taxes paid	not applicable	$(Inc_{US} - Int_{US} + Inc_{For} - Int_{For})\tau_{US}$	domestic losses but worldwide profits (excess credit)*	0	$-\tau_{US} - \tau_{For} + \tau_{US} = -\tau_{For}$

* In a multiperiod model, FTCs above the allowable amount could be carried back or accumulated and carried forward. For example, in the excess credit case with interest allocation (row 5), $\frac{FA}{WA}$ of unused FTCs accumulate per incremental dollar of domestic interest.

domestic income is negative (row 6), there is no tax benefit from issuing domestic debt; there is, however, a benefit of τ_{For} to deducting \$1 of foreign interest when foreign income is positive (rows 1 and 6).³⁹ If foreign income is negative but domestic income is positive (row 2), there is no tax incentive to issue foreign debt but an incremental dollar of domestic interest provides a benefit of τ_{US} .

Two situations are more subtle. If a U.S. multinational is deficit credit (i.e., τ_{US} is greater than τ_{For}) and profitable both in the United States and overseas (row 4), a dollar of domestic or foreign interest produces a tax benefit of τ_{US} . To see how foreign interest produces a tax benefit proportional to τ_{US} , consider a case in which a multinational earns \$2 of income in a country with $\tau_{\text{For}} = 45\%$ and \$4 of income in a country with $\tau_{\text{For}} = 25\%$, and assume that $\tau_{\text{US}} = 35\%$. The \$2 of high-tax foreign income produces $\text{Tax}_{\text{For}} = \0.90 . The firm receives $\text{FTC}_{\text{allow}} = \0.70 on this income and has \$0.20 of unused FTCs. The \$4 of low-tax foreign income produces $\text{Tax}_{\text{For}} = \1 . As a stand-alone item, this income produces \$0.40 of U.S. tax at repatriation [$\$4 \times (35\% - 25\%)$]; however, the \$0.20 of extra FTC offsets half of this U.S. tax liability. On net the firm pays the United States \$0.20 in tax on foreign earnings and has a total tax liability of $\text{Tax}_{\text{World}} = \2.10 ($\$2.10 = \0.90 in high-tax country, \$1.00 in low-tax country, and \$0.20 on income repatriated from low-tax country).⁴⁰ If this firm deducts \$1 of interest in the low-tax country, it reduces its tax bill by \$0.35 (\$0.25 reduction in Tax_{For} and \$0.10 in U.S. tax owed on that dollar). If the firm uses \$1 of interest in the high-tax country, it reduces its tax bill by \$0.35 (\$0.45 reduction in Tax_{For} , but \$0.10 less FTC is available to offset taxes owed on the income repatriated from the low-tax country.) Either way, the tax benefit of deducting \$1 of foreign interest is τ_{US} when a firm is deficit credit and profitable both in the United States and overseas.

The second subtle situation involves the tax benefit of deducting domestic interest when a firm is excess credit and Tax_{US} and Tax_{For} are both positive (row 5). In this case, a portion of domestic interest is allocated to foreign-source income, thereby reducing the benefit of a dollar of interest by the ratio of foreign assets to worldwide assets. (Recall that this allocated interest will not reduce Tax_{For} .) The allocation of domestic interest reduces the incentive of an excess credit firm to issue domestic debt, especially when the firm has substantial foreign assets. Altshuler and Mintz (1995) note that more than 60% of firms were excess credit during the late 1980s, so interest allocation is potentially important.

³⁹ If there is a positive probability that tax losses will be used if carried backward or forward, the tax benefit can be positive even in row (1), (3), or (6). Conversely, if there is a positive probability that losses will occur and be carried back from the future, positive tax benefits might be smaller than those shown in the table. Also, in a more complicated model, one could also net out the personal tax costs associated with interest income. Finally, see Altshuler and Newlon (1993) for the marginal tax costs of repatriations when there are also withholding taxes.

⁴⁰ In most situations, the income from the high- and low-tax country would be summed and treated as income from one "basket," with $\tau_{\text{For}} = (4 \times 25\% + 2 \times 45\%) / 6 = 31.67\%$. The countries are treated separately in this example to highlight how income from one country can lead to FTCs that shield income repatriated from another country.

Prediction 11: Due to interest allocation, the tax benefit of domestic interest deductions declines with the probability that a firm will operate as excess credit and with the proportion of assets held in foreign subsidiaries.

The analysis can be modified to examine the tax incentives associated with the parent supplying the foreign subsidiary with internal debt. The incentive is similar to that for external foreign debt shown in the rightmost column in Table 2, with one difference: with internal debt, the interest is taxable to the parent at rate τ_{US} when $Tax_{US} > 0$. Thus, in some cases τ_{US} should be added in the rightmost column. Specifically, if the debt is internal rather than external, the entries in the rightmost column are $-\tau_{For} + \tau_{US}$, 0 , 0 , $\tau_{US} - \tau_{For}$, and $\tau_{US} - \tau_{For}$ in rows (1)–(6), respectively. (Recall that a negative term means tax savings.) First consider the deficit credit case (row 4) where the tax incentive to fund a foreign subsidiary with internal debt is nil: there is no tax incentive to use internal debt because the net benefit of deducting in the foreign country is exactly offset by the increased tax in the home country. In the excess credit case (rows 5 and 6), the net tax benefit is $\tau_{For} - \tau_{US}$. For these rows, there is a tax incentive to issue debt increases with τ_{For} , but it is offset by taxes owed by the domestic parent. In row (2), when $Tax_{For} = 0$ and $Tax_{US} > 0$, there is a tax disincentive of τ_{US} per dollar of internal interest: the extra foreign interest does not further reduce Tax_{For} , and yet there is a positive tax liability of τ_{US} on the remitted interest. In contrast, when $Tax_{US} = 0$ (rows 1 and 3) using internal rather than external debt does not change the entries in Table 2: there is no tax on the interest received by the parent because the firm otherwise has domestic losses.

Prediction 12: The tax incentive to fund a foreign subsidiary with internal debt generally increases with τ_{For} ; however, this incentive is offset in several situations, as shown in Table 2.

Prediction 13: The tax incentive to issue external foreign debt increases with τ_{For} , although this incentive can be affected by the relative taxation of interest and equity income at the investor level.

Note that the incentive to save on foreign taxes might be tempered by investor-level taxes along the lines suggested in Miller (1977).

Other than in this paragraph, the results in this section are derived for the case where the domestic parent operated under a classical tax system in which interest is tax deductible but equity payments are not. If instead there is an imputation or integrated tax system (as in the UK, France, or many other countries), equityholders receive a credit for taxes paid at the corporate level, which partially or fully eliminates the double taxation of equity income. This at least partially reduces the net tax advantage to debt. For example, ignoring personal taxes, Cooper and Nyborg (1999) show that the value of a levered firm in an imputation tax system equals

$$V_{\text{with debt}} = V_{\text{no debt}} + \frac{(\tau_C - \tau_I)}{(1 - \tau_I)} D \quad (7)$$

where τ_I is the rate of imputation tax. In a full imputation tax system, dividend recipients receive a tax credit for income taxed at the corporate level, which they can use to offset their personal tax liability. If imputation results in a full tax credit at the corporate rate, then $\tau_I = \tau_C$ in Equation (7) and there is no tax advantage to debt. In a partial imputation system, stockholders only receive a partial credit for taxes paid at the corporate level, which is analogous to making equity (at least partially) tax deductible, which in turn reduces the net tax advantage of debt. Whether there has been any research that investigates the following prediction is not known.

Prediction 14: The tax incentive to issue debt decreases with the degree of dividend imputation dictated by the tax law under which a company operates

3.2. Empirical evidence related to multinational tax incentives to use debt

Testing multinational tax hypotheses is difficult because the data are hard to obtain and noisy. Most of the international capital structure tests are based on implications found in row (4) and especially row (5) of Table 2. Table 3 summarizes some empirical evidence related to multinational debt policy.

With respect to Prediction 11 (due to interest allocation, the tax benefit of domestic interest deductions declines with the probability that a firm will operate as excess credit and with the proportion of assets held in foreign subsidiaries), Froot and Hines (1995) observe that debt usage is reduced for excess credit firms, with the reduction proportional to the fraction of assets that are foreign. Altshuler and Mintz (1995) also show that the use of foreign debt increases with the proportion of assets held overseas (presumably because domestic interest would be allocated abroad). Newberry (1998) and Newberry and Dhaliwal (2001) find that the likelihood of issuing domestic debt is highest when a firm is not excess credit and when less interest is allocated abroad. A related prediction is that firms shift away from debt financing when interest is allocated abroad. Collins and Shackelford (1992) show that firms increase their use of preferred stock when domestic interest allocation is unfavorable. Froot and Hines (1995) point out that, unlike interest, lease payments are not allocable, and they show that excess credit firms rely more heavily on leasing.

Several papers provide evidence with respect to Prediction 12 (the tax incentive to fund a foreign subsidiary with internal debt increases with τ_{For}) and Prediction 13 (the tax incentive to issue external foreign debt increases with τ_{For} , although this incentive can be affected by the relative taxation of interest and equity income at the investor level). Examining a cross section of countries with differing foreign tax rates, Desai (1997) indicates that the net internal debt infusion into foreign subsidiaries increases with τ_{For} (Prediction 12). Newberry and Dhaliwahl (2001) find that the propensity to issue bonds in foreign markets increases in τ_{For} (Prediction 13). Hines (1995) demonstrates that royalty payments increase when they are a cheaper form of repatriation than are dividends. Finally, Grubert (1998) finds that an increase in the price of one form of

Table 3
Summary of predictions and empirical evidence for multinational capital structure

Prediction	Empirical Evidence
Firm uses less debt when it has accumulated FTCs	None
Excess credit firms should have less incentive than deficit credit firms to use domestic debt.	Debt usage declines when firm is excess credit. The reduction is increasing in the fraction of assets that are foreign (Froot and Hines, 1995).
The incentive for excess credit firms to use domestic debt declines with the proportion of assets that are foreign.	Likelihood of issuing domestic debt is highest when deficit credit and decreases as FTC limitations increase (Newberry, 1998, and Newberry and Dhaliwal, 2001).
The incentive to use foreign debt increases in the foreign tax rate.	Excess credit firms' use of foreign debt increases in τ_{For} and in the share of foreign assets (Altshuler and Mintz, 1995). Debt ratios of foreign affiliates increase in τ_{For} (Desai, 1997, and Altshuler and Grubert, 2000).
If domestic losses, use foreign debt.	U.S. multinationals borrow in foreign subsidiary when they have domestic NOL carryforwards (Newberry and Dhaliwal, 2001).
Use a different financing source than domestic debt, especially when foreign assets are substantial. For example, use leases instead of debt because lease payments are not allocated to foreign operations.	Weak evidence that excess credit firms lease more than other firms (Froot and Hines, 1995). U.S. firms' incentive to finance with preferred stock rather than debt increases with proportion foreign assets (Collins and Shackelford, 1992, and Newberry, 1998).
Use internal debt infusion rather than internal equity to finance foreign subsidiary, especially when τ_{For} is high.	Net internal borrowing by subsidiary from parent increases in τ_{For} (Desai, 1997).
Similarly, finance via royalty agreement rather than with equity.	Increase royalty payments when cheaper than repatriating dividends (Hines, 1995).
Use transfer pricing to increase (decrease) cash flow to low (high) tax affiliate.	Multinationals overinvoice low-tax affiliates (Lall, 1973). Foreign-controlled U.S. firms' U.S. tax expense is inversely related to difference between the U.S. and global tax rate (Mills and Newberry, 2000).
Repatriate dividends when excess credit.	Excess credit firms repatriate more than deficit credit firms, and repatriation by deficit credit firms is inversely related to the cost of doing so (Hines and Hubbard, 1990)
Repatriation for deficit credit firms negatively related to $\tau_{\text{US}} - \tau_{\text{For}}$.	

(Continued)

Table 3 (Continued)

Prediction	Empirical Evidence
Firm uses less debt when it has accumulated FTCs	None
Remit dividends from high- and low-foreign-tax firms simultaneously, to reduce potential domestic taxes.	Most repatriated dividends are “cross-credited” (Altshuler and Newlon, 1993).
Borrow via U.S. subsidiary that is less than 80% owned by multinational parent.	Example: Ford Motor Co. set up domestic financing subsidiary of which it owned 75% (Scholes et al., 2002).
Use triangle arrangements between subsidiaries in foreign jurisdictions with different tax burdens to reduce domestic taxes owed on remittances.	Low-foreign-tax subsidiaries invest in high-tax affiliate subsidiaries, which in turn remit funds to U.S. parent at low or zero domestic tax liability; or low-foreign-tax subsidiaries are capitalized by high-tax affiliate subsidiary, so repatriations from high-tax subsidiary are assigned a foreign tax rate that is a mixture of the low- and high-tax rates (Altshuler and Grubert, 2000).

remittance does not reduce total payments. Firms hold the total constant and substitute between different forms of remittance, such as dividends, interest, or royalties.

There is no known research that explicitly investigates Prediction 10 (the incentive $\tau_C(\cdot)$ to finance with domestic debt decreases with accumulated foreign tax credits for deficit credit firms) and Prediction 14 (the tax incentive to issue debt decreases with the degree of dividend imputation).

Other than Altshuler and Mintz (1995), most papers use very general specifications to test for foreign tax effects or the influence of interest allocation. For example, when they are considered at all, separate terms indicating excess credit status, τ_{For} , or the ratio of foreign to worldwide assets are used, rather than interacting the variables in the manner suggested by the theory. Also, the sharper predictions are often ignored. Finally, the existence of any multinational tax research that directly links the tax benefits of debt to firm value is not known. To the extent that data are available, variation across countries in tax rules and incentives provides a rich and under-researched environment within which to investigate how variation in tax rules affects $\tau_C(\cdot)$ and, therefore, the financing decisions of multinational firms.

3.3. Other predictions and evidence about multinational tax incentives

Interest allocation can be avoided altogether if the domestic borrowing is performed by a domestic subsidiary that is less than 80% owned by the parent (although this subsidiary must allocate interest on its own books). I am unaware of any systematic

research investigating this issue. Scholes et al. (2002) present an example describing how Ford Motor Co. implemented this strategy.

Besides directly altering where and whether it issues debt, there are many related mechanisms by which a firm might respond to multinational tax law. A company might alter its transfer prices (the prices at which goods and services are transferred between related entities) to shift income from the high-tax to the low-tax affiliate. Although transfer prices are supposed to be “arms-length prices,” the rules are vague enough to allow wiggle room. Properly designed, transfer pricing allows for tax-free dividend repatriation. Consistent with this means of reducing overall taxes, Lall (1973) reports that multinational firms overinvoice their low-tax Colombian subsidiaries. Mills and Newberry (2000) find that shifting income to foreign operations increases the difference between the U.S. tax rate and the global tax rate. Alternatively, multinational firms can use “triangle schemes” in which one subsidiary is capitalized by or invested in by another affiliate subsidiary (Altshuler and Grubert, 2000). These schemes allow firms to optimally mix remittances from high- and low-tax subsidiaries in ways that reduce domestic taxes on foreign-source income.

More generally, firms can time dividend repatriation to coincide with low overall tax cost to the parent and subsidiary. In particular, deficit credit firms owe U.S. tax when they repatriate dividends, so they have the incentive to delay repatriation. In contrast, excess credit firms often do not owe additional tax upon repatriation. Taking debt versus equity choices as given, Hines and Hubbard (1990) find that excess credit firms repatriate more than do deficit credit firms and that repatriation by deficit credit firms is inversely related to the tax cost of doing so. Altshuler and Newlon (1993) show that most repatriated dividends are “cross-credited”; that is, the parent firm simultaneously receives payments from both high- and low-foreign-tax subsidiaries, and can use the extra credits from one source to offset potential domestic taxes from another.

4. Taxes, LBOs, corporate restructuring, and organizational form

4.1. Theory and predictions

Under perfect capital markets, an MM analysis implies a null hypothesis that organizational form and restructurings are irrelevant to firm value. However, imperfections in the tax, legal, and information environments can create situations in which the form of the organization or restructuring can matter.

4.1.1. Leveraged buyouts

There is a tax incentive for corporations to use substantial leverage in the management buyout process. This flows directly from the predictions in Section 1 that high-tax-rate firms have incentive to use debt and that the associated tax benefits add to firm value.

Leveraged buyouts (LBOs) are particularly interesting because they lead to a much larger increase in leverage than do most debt issuances. LBOs also can provide an opportunity to mark assets to market, thereby increasing depreciation and the associated tax savings.

Prediction 15: All else equal, the tax incentive to perform a highly levered buyout increases with the firm's expected post-deal tax rate, $\tau_C(\cdot)$.

4.1.2. Distressed reorganizations and chapter 11

Tax incentives can affect distressed reorganizations. Distressed firms with substantial accumulated net operating losses (NOLs) have incentive to file Chapter 11 because it facilitates reducing debt ratios (Gilson, 1997). Chapter 11 allows the firm that emerges from bankruptcy to have unlimited use of the pre-filing NOLs to shield future income, as long as there is no change in ownership (i.e., a large change in the ensuing two years in ownership of the firm's equity). Reducing the debt ratio during reorganization preserves debt capacity and decreases the likelihood of precipitating an ownership change by future equity issuances.

Prediction 16: The tax incentive for a firm to file Chapter 11 (versus a workout), to better facilitate reducing its debt ratio in reorganization, increases with the firm's accumulated NOL carryforwards and its expected post-deal tax rate.

4.1.3. C-corporations vs. S-corporations

Taxes affect organizational form in general, not just reorganizations. When an entity operates as a common "C-corporation," revenues returned to investors as equity are taxed at both the firm and investor levels. The firm-level taxation is at the corporate income tax rate, and the investor taxation is at the personal equity tax rate. The equity rate is often relatively low because equity income can be deferred or taxed at the relatively low capital gains rate. In contrast, partnership income is passed-through and taxed only at the investor level, at ordinary income tax rates. The tax burden is often disadvantageous to corporate form. For example, at current maximum statutory federal tax rates (Fig. 1), in 2002 an investor would have received \$0.604 in partnership income; in contrast, corporate equity payments would have returned only approximately \$0.52 (assuming equity is taxed at a 20% capital gains tax rate). There are, however, nontax benefits to corporate form that outweigh the tax costs for many firms. Gordon and MacKie-Mason (1994) argue that these nontax benefits are large, annually equaling about 4% of equity value. See Scholes et al. (2002) and Gordon and MacKie-Mason (1997) for details about nontax costs and benefits of corporate form. See Shelley, Omer, and Atwood (1998) for a discussion of the costs.

Prediction 17: All else equal, the tax incentive to operate as a C corporation (versus a partnership or S-corp) increases in $[(1 - \tau_P) - (1 - \tau_C)(1 - \tau_E)]$.

4.1.4. *Divestitures and asset sales*

Tax incentives can also affect the valuation, purchase, and sale of assets. Alford and Berger (1998) argue that high-tax-rate firms prefer spin-offs when they shed assets that lead to taxable gains because spin-offs can be structured to avoid taxes to both the seller and buyer. In contrast, all else equal, sales are preferred when the transaction results in a loss because this loss can be deducted against corporate income. Moreover, when a firm sells an asset, the deal can be structured to benefit the seller or purchaser, possibly by financing the deal with debt (Erickson, 1998).

Prediction 18: There is a tax incentive for high-tax firms to shed assets in spin-offs when the deal is profitable and via sales when the deal is not profitable. When a firm acquires assets, high-tax firms have the incentive to use “taxable deals” financed with debt.

4.1.5. *R&D partnerships*

Leasing allows a low-tax-rate firm to “sell” tax deductions to high-tax-rate lessors. Analogously, research and development limited partnerships (RDLPs) allow low-tax firms to sell start-up costs and losses to high-tax-rate investing partners.

Prediction 19: All else equal, low-tax-rate R&D firms should form research partnerships with high-tax-rate investors.

4.2. *Empirical evidence*

Kaplan (1989) and others investigate tax benefits in leveraged buyouts. LBOs provide large interest tax deductions and also can provide an opportunity for asset value to be stepped up to market value. Note that the tax benefit of \$1 of interest does not necessarily equal the top statutory tax rate. The net benefit is less than the top rate if all of the LBO interest expense cannot be deducted in the current year, if there is a personal tax penalty on interest income, or if there are nontax costs to debt. Assuming that the net tax benefit of \$1.00 of interest is \$0.15 and that LBO debt is retired in eight years, Kaplan estimates that the tax benefit of interest deductions equals 21% of the premium paid to LBO target shareholders.⁴¹ Kaplan also estimates that among firms electing to step up asset value, the incremental depreciation tax benefit equals 28% of the premium. It is not known if there is any research that explicitly investigates whether the probability of choosing a highly levered form of reorganization increases with the expected post-deal MTR (Prediction 15).

Gilson (1997) shows that firms in Chapter 11 reduce their debt ratios more when pre-filing NOLs are large (Prediction 16). He concludes that firms file Chapter 11 (versus a

⁴¹ Graham (2000) accounts for the declining marginal benefit of incremental interest deductions and estimates that the gross tax benefit of debt equaled approximately one-fourth of firm value in the mid-1980s RJR Nabisco and Safeway LBOs.

workout) in part because of tax incentives: Chapter 11 status offers smaller transactions costs to reducing the debt ratio, thereby minimizing the chance of an ownership change that would result in the loss of pre-filing NOLs.

Research centered on tax reforms has linked taxes with organizational form. The Tax Reform Act of 1986 (TRA86) set corporate tax rates above personal income tax rates, and also equalized capital gains and ordinary tax rates, providing a natural environment to test Prediction 17. These tax-rate changes made partnerships attractive by greatly increasing the tax disadvantage of operating as a corporation. Scholes et al. (2002) point out that there was a huge increase in the formation of S-corporations (which are taxed as partnerships) following TRA86. Gordon and MacKie-Mason (1997) show that the increased corporate tax disadvantage due to TRA86 resulted in a reduction in the portion of aggregate profits paid via (and assets held in) corporate form. However, the economic importance of this reduction was modest. Finally, Guenther (1992) investigates how corporations responded to the 1981 Economic Recovery Tax Act reduction in personal income tax rates, which increased the tax disadvantage for corporations. He finds that firms altered policies that contribute to the double taxation of equity payout: firms reduced dividends and instead returned capital by increasing the use of debt, share repurchases, and payments in mergers (which are often taxed as capital gains).

Ayers, Cloyd, and Robinson (1996) study small firms and find that entities choose to operate as S-corps, rather than C-corps, when they experience losses in their early years of operation. These losses can immediately be passed through to S-corp investors, while C-corps must carry losses forward to offset future corporate income. The experiment of studying small firms is especially telling because small firms can generally choose between the S- or C-corp form with little difference in cost or nontax considerations; therefore, the choice highlights tax incentives. Interpreting this result as strong tax evidence is somewhat clouded, however, because Ayers et al. do not find that the choice between C-corp and proprietorship/partnership form is affected by tax losses (though nontax considerations can affect this choice). Erickson and Wang (2002) contend that S-corps can be sold for more than C-corps because of favorable tax treatment. Finally, Hodder, McAnally, and Weaver (2001) conclude that banks convert to S-corp status to eliminate double taxation of dividends and to reduce the onerous burden of the AMT. Research investigating organizational form choices using micro firm- and owner-specific tax information would be helpful. Such papers would most likely require accessing confidential tax returns.

Scholes and Wolfson (1990) describe tax incentives that encouraged merger and acquisition activity in the early 1980s (following the 1981 tax act) and discouraged these activities after TRA86. They provide aggregate evidence that M&A activity surged in the early 1980s and declined in 1987, consistent with tax incentives. See Scholes et al. (2002) for details of how acquisitions vary along the tax dimension depending on whether the deal involves C- or S-corporations, subsidiaries, spin-offs, carve-outs, and so on.

Alford and Berger (1998) show that firms trade off tax and nontax considerations when choosing between spin-offs and asset sales (Prediction 18). They estimate tax benefits as a means of determining the size and nature of nontax costs and argue that

adverse selection, moral hazard, and agency costs are all traded-off against tax benefits to influence how firms structure their deals. Erickson (1998) also demonstrates that the structure of deals is affected by tax concerns. He shows that the probability that a sale is structured as a “taxable deal,” financed with tax-deductible debt, increases with the acquirer’s tax rate; however, he finds no evidence that seller tax characteristics affect deal structure. Erickson and Wang (2000) find that the price of subsidiary sales can be affected by tax considerations. These authors show that premiums (and seller abnormal stock returns) increase when the sale is structured to allow a step-up in subsidiary basis, so that the acquiring firm receives additional depreciation tax benefits. Thus, contrary to a Modigliani and Miller perfect markets null hypothesis, tax considerations affect both the pricing and structure of asset sales.

While taxes appear to affect the structure and price of some deals, the tax-minimizing form is not always selected. Hand and Skantz (1998) maintain that issuing new shares in equity carve-outs can avoid tax liabilities that occur when a firm issues secondary shares (at a price above the firm’s tax basis in the shares). The authors determine that, relative to issuing new shares, secondary carve-outs increase tax liabilities by an amount equal to 11% of the carve-out IPO proceeds. Hand and Skantz are not able to identify benefits associated with secondary carve-outs that are large enough to offset the increased tax payment. Maydew, Schipper, and Vincent (1999) find that incremental taxes incurred when firms perform taxable sales (rather than tax-free spin-offs) amount to 8% of the value of divested assets. The authors argue that firms incur these tax costs (1) because they are smaller than the financial reporting benefits (e.g., larger financial statement earnings) and (2) when selling firms are cash-constrained (sales provide a cash inflow; swaps do not).

Shevlin (1987) investigates whether firms that perform R&D via partnerships have lower tax rates than firms that do R&D in-house (Prediction 19). Two notable features of Shevlin’s careful experimental design are his use of simulated tax rates, and his specification of many explanatory variables in “as-if” form (i.e., defining right-hand-side variables for all firms as if they funded R&D in-house, to avoid the endogenous choice of in-house versus RDLP possibly affecting the variables’ values). Shevlin shows that tax rates exert a significant, negative influence on the probability of choosing an RDLP in two out of three as-if regressions. Using an NOL dummy to measure tax incentives, Beatty, Berger, and Magliolo (1995) find that low-tax firms are more likely to finance R&D via a financing organization both before and after TRA86.

The Research and Experimentation Tax Credit has also influenced corporate R&D spending. In his economically weighted regressions, Berger (1993) finds a positive market reaction to announcements affirming the tax credit. His regression coefficients indicate that three-fourths of the benefit of the credit accrues to shareholders, with the remaining one-fourth increasing product price and therefore flowing to employees or suppliers. This latter finding implies that the tax credit creates an implicit tax in the form of higher prices for tax-favored R&D activity and that this implicit tax offsets some of the intended benefit from the credit (in other words, some of the R&D tax credit is passed along in the form of higher prices to suppliers of R&D inputs). Berger also

detects a negative market reaction among firms that do not use the credit themselves but compete with firms that do. Swenson (1992) finds evidence consistent with low-tax-rate firms pursuing firm-specific R&D tax credits less aggressively than they are pursued by high-tax-rate firms.

Overall, this research indicates that tax considerations affect the structure and pricing of research and development activity in the United States. The cited papers investigate R&D spending associated with pre-TRA86 tax rules. It is not known, if there is any similar research that investigates the influence of the tax credit on R&D activity based on post-TRA86 rules (under which the credit is based on the R&D-to-sales ratio, rather than on nominal R&D spending). Moreover, the R&D tax credit has temporarily expired several times since 1986. It would be interesting to know whether these expirations have affected real R&D activity.

5. Taxes and payout policy

Modern dividend research began with Lintner's (1956) field interviews with 28 firms. Lintner found that dividends are stable, appear to adjust toward an earnings-payout target, and are rarely reduced. Miller and Modigliani (1961) provide the theoretical foundation of payout policy and conclude that dividend policy is irrelevant in a frictionless world with perfect capital markets. Research since that time has explored how market imperfections create an environment in which payout policy affects firm value. This section highlights the tax incentives related to corporate payout policy. For brevity, I narrow the discussion to payout issues that parallel those in Section 1 or that shed light on unresolved capital structure issues (e.g., whether personal taxes affect security prices). For broad reviews of the various tax and nontax imperfections that can lead to payout policy affecting firm value and corporate decisions, see Allen and Michaely (1995, 2001) and Poterba (2001).

5.1. Theory and empirical predictions

Miller and Modigliani (1961) argue that in a perfect economic environment, firm value is determined by operating cash flows, not by whether a company retains or pays out profits, or by the form of payout. This line of reasoning produces the null hypotheses for this section.

Null hypotheses: Firm value is not affected by payout policy. Taxes do not affect corporate payout decisions.

Allen and Michaely (2001) show that the null can also hold if different classes of investors are taxed differently and firms have differing payout policies, as long as the marginal price-setter is tax-free.

Alternatively, firms can have a tax incentive to return equity capital via share repurchases rather than dividends if dividends are taxed more heavily than are capital gains

for the marginal investor(s). Financial executives' statements that repurchases are a "tax efficient means of returning capital to investors" support this point of view (though Brav, Graham, Harvey, and Michaely, 2003, conclude that taxes only play a second-order role in the choice between returning capital as dividends or repurchases).

If dividends are taxed more heavily than repurchases, there can be a negative valuation of dividends (relative to repurchased shares) (e.g., the CAPM with corporate and investor taxation in Brennan, 1970, or Auerbach and King, 1983). All else equal, if a firm were to increase dividends, the pretax return on its stock would need to increase so that after-tax returns did not change. This effect increases as dividend taxation increases relative to capital gains taxation.

Prediction 20: All else equal, tax effects imply that firm value is negatively related to (1) the portion of payout dedicated to dividends, and (2) dividend taxation relative to capital gains taxation. Analogously, required pretax stock returns increase with dividend payout and relative dividend taxation.

Nontax factors also can lead to negative (e.g., reduced funds to pursue positive NPV projects) or positive (e.g., signaling or agency alleviation) dividend valuation (see Allen and Michaely, 2001).

Note that dividend clienteles, in which high-tax-rate investors own stocks with low-dividend payouts, can occur under the null or Prediction 20. Under the null, firms can have different payout policies that do not affect value, even if some investors are taxed more heavily on dividends (capital gains) and have a tax preference for capital gain (dividend) income. Similar clienteles can form under Prediction 20, based on the relative taxation of dividends and capital gains for different groups of investors.

To the extent that transactions are not costless, clientele tax characteristics can affect security prices. For example, the price of a stock changes from P_{cum} to P_{ex} as the stock goes ex-dividend. If the firm issues a dividend Div , its investors receive $Div(1 - \tau_{div})$ but simultaneously avoid capital gains taxes of the amount $(P_{cum} - P_{ex})\tau_{cap\ gain}$. With risk neutrality, continuous prices, and no transactions costs, and clienteles that do not vary before and after ex days, Elton and Gruber (1970) show that $(P_{cum} - P_{ex})(1 - \tau_{cap\ gain}) = Div(1 - \tau_{div})$ in equilibrium, and therefore

$$\frac{P_{cum} - P_{ex}}{Div} = \frac{(1 - \tau_{div})}{(1 - \tau_{cap\ gain})} \quad (8)$$

where $(P_{cum} - P_{ex})/Div$ is referred to as the ex-day premium.

Prediction 21: The ex-day premium reflects the relative taxation of dividends and capital gains for a given stock's clientele of investors.

Allen and Michaely (2001) call dividend clienteles "static" if they do not vary through time. Alternatively, if there are advantages to trade among differentially-taxed investors, dividend clienteles might be dynamic, which can lead to changes in the composition of the clientele around certain dates. Dynamic clienteles might lead to abnormally high

volume around ex days. For example, low-dividend-tax investors might buy stocks just before ex day, capture the dividend, then sell the stock after it goes ex dividend. Through this route, taxes might lead to ex-day behavior that produces trading volume but where the ex-day premium is close to one. Thus, Prediction 21 is a joint prediction about clienteles being static as well as tax effects.

Payout effects should vary with the tax rules of the country under consideration. For example, assuming static clienteles, the ex-day premium should increase with the degree of dividend imputation in a given country (because a tax refund for corporate taxes paid is attached to dividends in imputation countries, which reduces the effect of dividend taxation). The premium can be greater than one if imputation makes dividends tax-favored relative to capital gains (Bell and Jenkinson, 2002).

5.2. *Empirical evidence on whether firm value is negatively affected by dividend payments*

Black and Scholes (1974) test Prediction 20 by adding dividend yield as a right-hand side variable in the market model. They conclude that firm value is not related to dividends. In contrast, Litzenberger and Ramaswamy (1979) find a significant, positive dividend-yield coefficient. Kalay and Michaely (2000) emphasize that the positive dividend effect should show up in cross-sectional (because of cross-firm variation in dividend-payout) long-run returns (i.e., returns for stocks held long enough to qualify for capital gains treatment). They point out that Litzenberger and Ramaswamy (1979) use monthly returns and allow high-dividend yield firms to be considered zero-dividend in nondividend months. Kalay and Michaely (2000) do not find cross-sectional or long-run return evidence that high-dividend stocks earn a tax premium. Kalay and Michaely imply that the effect identified by Litzenberger and Ramaswamy occurs for short-run returns, perhaps only during the ex-dividend week.

Fama and French (1998) test Prediction 20 by regressing (changes in) firm value on (changes in) dividends and “firm value if no dividends.”⁴² If personal taxes reduce the value of dividends, and one could design a clean statistical experiment that isolates tax effects, there should be a negative coefficient on the dividend variable in this specification. In contrast, Fama and French find a positive coefficient, which probably occurs because either their proxy for “firm value if no dividends” is measured with error and/or nontax effects overwhelm the tax influence of dividends. For example, if firms use dividends to signal quality, dividend payments might be positively correlated with firm value. Or if dividends are priced by tax-free investors, one would not expect a negative

⁴² As discussed in Section 1.2.2, FF regress the excess of market value over book assets on dividends, interest, and a collection of variables that are proxy for V_U , with all variables deflated by assets. The variables that are proxy for V_U include current earnings, assets, R&D spending, and interest, as well as future changes in earnings, assets, R&D, interest, and firm value. V_U is probably measured with error, which clouds interpretation of FF's results.

influence of dividends on firm value. Fama and French conduct the only known study that directly regresses firm value on dividend variables in an attempt to determine the tax effect of dividends.⁴³

5.3. Evidence on whether ex-day stock returns and payout policy are affected by investor taxes

5.3.1. Dividend clienteles

Because Prediction 21 is based on the existence of static dividend clienteles, we start by reviewing dividend clientele research. Blume, Crocket, and Friend (1974), Pettit (1977), and Chaplinsky and Seyhun (1987) provide weak evidence that investors hold stocks such that dividend yield is inversely related to personal tax rates; Lewellen, Stanley, Lease, and Schlarbaum (1978) find no such evidence. However, these studies have poor measures for tax, risk, and wealth effects and therefore are hard to interpret. Auerbach (1983) concludes that tax-related preferences result in clienteles of investors that purchase stocks based on firm-specific dividend-price ratios. Scholz (1992) uses self-reported data from the 1983 Survey of Consumer Finances. This survey contains information on retail investor stock holdings, a sophisticated measure of the investor's relative dividend and capital gains tax rates, household wealth, and self-declared risk preferences. Scholz finds a negative relation between the dividend yield for an investor's stockholdings and the relative taxation of dividends, which is consistent with a general preference for dividends by low-tax investors. Graham and Kumar (2004) investigate stockholdings and trades from brokerage house investors during 1991–1996. They find that retail investors as a group prefer nondividend-paying stocks and that institutions prefer dividend-paying stocks. Within the class of retail investors, Graham and Kumar also report evidence of dividend clienteles. Low-income (i.e., low-tax-rate) and older investors prefer dividend-paying stocks, and within the class of dividend-paying stocks, older low-tax-rate investors prefer high-yield stocks. They also show that high-income retail investors decreased their dividend holdings when dividend tax rates increased in 1993.

According to Strickland (1996), mutual funds and money managers hold low-dividend-yield portfolios, while untaxed institutions such as pension funds show no preference. Dhaliwal, Erickson, and Trezevant (1999) find that the percentage of shares owned by institutional investors increases by about 600 basis points in the year after a firm initiates paying a dividend.⁴⁴ Overall, there is weak evidence that the preference for dividends decreases with income tax rates—but no direct evidence that this preference leads to static tax-based clienteles.

⁴³ Another approach to study whether personal taxes affect asset prices investigates tax capitalization. See Section 1.4.1.

⁴⁴ See Del Guercio (1996) and Brav and Heaton (1997) for evidence that institutional investors favor high-dividend stocks for nontax reasons like prudent-man regulations.

Several papers link corporate actions to the (assumed) tax characteristics of their investors. Pérez-González (2000) classifies firms by whether their largest shareholder is an individual or an institution and finds that the individual pays 30% fewer dividends than the institution. He also shows that when tax reform increases (decreases) the taxation of dividends relative to capital gains, firms with large retail shareholders decrease (increase) dividend payout. Poterba and Summers (1985) find a similar result for aggregate dividend behavior in the UK from 1950 to 1983. Lie and Lie (1999) also conclude that investor-level taxes affect payout policy. They find that firms with low-dividend payout (and presumably high-tax-rate investors) use self-tender-offer share repurchases more often than they use special dividends; these firms also use open-market repurchases more often than they increase regular dividends.

Allen and Michaely (1995) point out that the trading volume around ex days provides evidence about whether clienteles are static (which would imply that trading only occurs between investors in the same tax bracket, who always hold stocks with the same dividend characteristics) or dynamic (in which case there might be advantages to trade among differentially taxed investors, potentially involving dividend-capture or arbitrage by low-dividend-tax investors). In the static case, there should be no abnormal volume because there are no abnormal advantages to trade around the ex day. Grundy (1985), Lakonoshok and Vermaelen (1986), and Michaely and Vila (1996) find evidence of abnormal trading volume on the ex day, which is consistent with dynamic tax-related trading on the ex day.⁴⁵

5.3.2. *Ex-day premia and returns*

Elton and Gruber (1970) note that the ex-day premium was 0.78 on average in the 1960s, which they interpret to imply that dividends are priced at a 22% disadvantage relative to capital gains (Prediction 21). Moreover, the premium ranged from 0.70 (for the lowest dividend-yield decile of stocks) to 1.18 (for the highest decile), which is consistent with the highest (lowest) tax-rate investors purchasing the lowest (highest) dividend-yield stocks. The Elton and Gruber evidence is consistent with personal taxes affecting stock prices via dividend payout and dividend clienteles. Their findings are strengthened by Barclay's (1987) evidence that the premium was 1.0 in the early 1900s, before the advent of personal income taxes.

Interpreting the ex-day phenomenon presents several complications. Kalay (1982) points out that absent transactions costs and risk, arbitrage by tax-free investors should push the premium to 1.0. Kalay argues that transactions costs are too large for individual investors to be the marginal price-setters, but instead zero-tax-rate institutions

⁴⁵ Koski and Michaely (2000) find that abnormal volume can be quite large on ex days due to nontax activity. In their case, Japanese insurance companies captured dividends for regulatory reasons, using nonstandard settlement procedures that allowed them to buy just before and sell just after the ex day. Note, however, that this form of nonstandard settlement ended in 1989, so it cannot explain abnormal ex-day volume in recent years.

might fulfill that role at ex-day. Kalay's findings suggest that inferring tax rates from ex-day returns is complicated by transactions costs and the effect of institutional traders. Consistent with this view, Michaely (1991) finds that the mean premium equaled approximately 1.0 in both 1986 (when capital gains tax rates were much lower than dividend tax rates for wealthy individuals) and in 1987–1988 (when statutory dividend and capital gains tax rates were nearly equal), and was relatively invariant across dividend-yield deciles during these years. Michaely's evidence is not consistent with retail investor taxation affecting stock prices, suggesting that prices might have been set by institutional investors in the mid-1980s.⁴⁶

Bali and Hite (1998) contend that discrete stock prices lead to patterns consistent with those observed by Elton and Gruber (1970). Suppose a \$0.20 dividend is paid, and, during the era when stock prices were divisible by one-eighth, the stock price drops by the largest increment less than the dividend: \$0.125. This implies an ex-day premium of 0.625, which occurs in the absence of personal tax effects. Moreover, this effect is strongest for low-dividend stocks. Bali and Hite's (1998) argument might explain some of the observed ex-day phenomenon; however, it does not explain abnormal volume on the ex day, which Michaely and Vila (1996) consider evidence of tax-motivated trading.

Frank and Jagannathan (1998) argue that dividends are a nuisance and that market-makers are well situated to handle their collection and reinvestment. Therefore, investors unload the stock cum-dividend to market-makers, who are compensated for handling the dividend by the dividend itself. This is especially true for low-dividend stocks, for which the nuisance remains relatively the same but for which the reward for handling the dividend is smallest. The implication is that prices should fall by less than the dividend in part because transactions are at the bid when the market-maker buys the stock on the cum date and are at the ask when the market-maker sells the stock ex dividend, and in part due to reduced demand on the cum date. They present evidence consistent with their arguments on the Hong Kong exchange, where the average premium is approximately one-half during 1980–1993, even though dividends and capital gains are not taxed at the personal level. Kadapakkam (2000) strengthens this argument by showing that when the nuisance of handling dividends (i.e., cumbersome physical settlement procedures) was greatly reduced with the onset of electronic settlement, the premium in Hong Kong became indistinguishable from 1.0.

Graham, Michaely, and Roberts (2003) cast doubt on price discreteness (Bali and Hite) or bid-ask bounce (Frank and Jagannathan), explaining ex-day pricing in the United States. Graham et al. note that price discreteness and bid-ask bounce were greatly reduced as pricing increments changed from 1/8ths to 1/16ths (in 1997) to decimals (in 2001) on the New York Stock Exchange. According to the price discreteness and bid-ask bounce hypotheses, the ex-day premium should have moved closer to one as the pricing grid

⁴⁶ This discussion ignores the effect of risk (see Michaely and Vila, 1995) and transactions costs (see Boyd and Jagannathan, 1994; Michaely and Vila, 1996; and Michaely, Vila, and Wang, 1996) on ex-day behavior. For example, Boyd and Jagannathan (1994) regress capital return on dividend yield and find a slope coefficient of one and a negative intercept. They interpret the negative intercept as a measure of transactions costs.

became finer. In contrast, the ex-day premium got smaller (further from one), which is inconsistent with the price discreteness and bid-ask bounce hypotheses. Graham et al. do find evidence consistent with the original Elton and Gruber tax hypothesis, however. They find that the ex-day premium fell in conjunction with the 1997 reduction in capital gains tax rates.

Graham and Kumar (2004) observe that low-tax rate (and older) investors purchase stocks just before they go ex dividend, especially high-dividend-yield stocks, while high-tax-rate (and younger) investors wait until after the ex day. This is consistent with clienteles of investors who have a preference for dividends actively acquiring dividends around the ex day. Graham and Kumar also find that among low-market-capitalization stocks, for which retail investors are plausibly the marginal price-setters, the ex-day premium is lower in absolute magnitude in stocks for which high-tax-rate investors dominate. This is consistent with the implication from Elton and Gruber (1970) that investor tax rates are impounded into ex-day stock returns, and in particular, low-tax-rate investors' tax rates are impounded into the ex-day returns of high-dividend-yield stocks.

Overall, it is not possible to unambiguously interpret the ex-dividend day evidence in terms of personal taxes, though some recent evidence is compelling. Green and Rydqvist (1999) provide convincing evidence of personal taxes being impounded into asset prices. Swedish lottery bonds are taxed like common stock with tax-free dividends (i.e., the coupon is tax-free and capital gains are taxed). Therefore, one would expect prices to be bid up cum-coupon (as high-tax-rate investors purchase the bonds) and drop after the coupon is paid (with the drop leading to a capital loss deduction, which reduces taxes in proportion to the capital gains rate). Because the coupon is tax-free, the ratio of price drop to coupon should be greater than 1.0, reflecting the personal tax advantage of the coupon. Moreover, regulations prohibit coupon capture or arbitrage of the type that might be expected to force the ratio to 1.0, and unlike the case of stock dividends, frictions and price discreteness work in the opposite direction of the proposed tax effect. Green and Rydqvist (1999) state that the ratio of price drop to coupon averages 1.30 for Swedish lottery bonds, implying that the relative tax advantage of coupons relative to capital gains is impounded into bond prices. They also find that this implicit tax rate declined as tax reform reduced the top statutory personal tax rate during the 1980s and 1990s. Florentsen and Rydqvist (2002) report that the ratio averages about 1.46 for similar lottery bonds in Denmark.

McDonald (2001) investigates ex-day behavior in Germany, where the dividend imputation tax system attached to most dividends a tax credit for corporate taxes (until this feature was repealed in late 2000). This tax credit means that dividends are more valuable to German investors than are capital gains, all else equal. McDonald shows that tax considerations imply that the ex-day premium should be 1.43 under these conditions. In his empirical work, McDonald shows that the average premium is 1.26, indicating that about 60% of the dividend tax credit is impounded into the ex-day price. He also finds that 55% (35%) of the tax credit is reflected in futures (options) prices. Finally, McDonald demonstrates that there is abnormal volume for the six days leading up to

and including the ex day, and that abnormal volume increases in the dividend yield. This is consistent with foreigners, who do not enjoy the German tax credit, selling the stock just before ex day.

Bell and Jenkinson (2002) investigate the effects of a July 1997 tax reform in the UK. Prior to 1997, the imputation tax credit attached to dividends was such that tax-free investors received a full tax refund, even though they did not pay taxes on the dividend. In other words, a \$1 dividend was worth more than \$1 to tax-free investors. The tax reform eliminated imputation credits for tax-free investors, implying that a \$1 dividend is now worth only \$1 to these investors. Bell and Jenkinson show that tax-free institutions like pension funds own the majority of UK equities and that they therefore are the marginal price-setters. Bell and Jenkinson find that dividend valuation decreased after the tax reform effectively reduced the imputation tax benefit of dividends. It would be helpful if there were more such research that exploits the rich variation in tax codes around the world.

Overall, some ex-day papers provide clear evidence that personal taxes affect asset prices. This conclusion is not unambiguous across all papers, however, because of potential nontax explanations for abnormal ex-day returns. If these alternative hypotheses completely explain ex-day returns, then in these circumstances personal taxes are not impounded into stock prices. However, even if tax rates do not appear to affect stock returns directly, tax considerations might still affect financial markets if they increase trading volume.

The payout results have implications for capital structure research. If the marginal investor in equities is tax-free but the debt price-setter is not, then the personal tax penalty for using debt might be quite large. If the marginal investor in equities *and* debt is tax-free, there is no personal tax penalty associated with debt financing. Finally, if the marginal price-setter for equities is taxable and his tax rate is impounded into stock returns, this reduces the personal tax penalty on debt relative to the Miller (1977) scenario. Understanding the tax characteristics of the marginal price-setter(s) in various securities is an important issue for future research.

6. Taxes and compensation policy

6.1. Theory and empirical predictions

An MM-perfect capital markets analysis would lead to a null hypothesis that compensation policy does not affect firm value absent market imperfections. There has been a great deal of research investigating how agency costs and informational asymmetry can drive a wedge between employee objectives and shareholder wealth, as well as how compensation policy can improve the situation.⁴⁷ Another group of papers

⁴⁷ See Murphy (1999) for a broad review of compensation research, including pay-performance sensitivity and linking salary, bonuses, and stock compensation to firm performance. See Core, Guay, and Larcker (2002) for a review that focuses on using equity compensation to align executive and shareholder incentives.

investigates how the tax code can affect the choice of when and how to pay employees. Analogous to Miller's (1977) arguments about capital structure, the study by Scholes et al. (2002) argues that to understand compensation policy, one must consider the tax implications for both the employer and employee. Scholes et al. show how different tax rates for the firm and its employees, or changing tax rates for either party, produce trade-offs between salary and bonuses, deferred compensation, compensatory loans, pension contributions, fringe benefits, and stock option compensation. This section reviews compensation research that is most closely linked to taxes and corporate finance: the choice of salary versus equity compensation, the choice between incentive stock options (ISOs) and nonqualified stock options (NQOs), and, linking back to Section 1 of this chapter, the trade-off between compensation deductions and debt tax shields.

The first tax issue is straightforward. Salary payments lead to an immediate deduction that reduces tax liabilities, while employee stock options lead to a corporate deduction only when the options are eventually exercised (if then—see below). Ignoring incentives and other nontax issues, the first compensation prediction is

Prediction 22: All else equal, the tax preference of paying salary compensation instead of option compensation increases with the corporation's tax rate because salary expense is deducted immediately and option expense is delayed.

The second tax issue involves the choice between paying employees with incentive versus nonqualified stock options. ISOs and NQOs are similar in most respects other than tax treatment, allowing researchers to isolate how tax imperfections affect corporate compensation decisions.⁴⁸ With ISOs, the firm never gets a tax deduction, and the employee pays capital gains tax on the amount the share price exceeds the grant price when the stock is eventually sold (assuming that the option is exercised at least 12 months after grant and the share of stock is sold at least 12 months after exercise). With NQOs, on the exercise date the firm gets a deduction equal to the amount by which the price upon exercise exceeds the grant price, and the employee pays ordinary income taxes on this same amount. The tax trade-off between incentive and nonqualified stock options amounts to comparing the relatively light burden of the employee paying capital gains taxes for ISOs to the net NQO benefit (i.e., the corporate deduction less the cost to the employee of paying taxes sooner and at a higher rate with NQOs).

Prediction 23: All else equal, when the corporation is taxed at a higher rate than the employee on ordinary income, nonqualified options are preferred to incentive stock options because they lead to lower "all parties" taxation of option compensation. Incentive stock options are generally preferred if the corporation has a low tax rate relative to the employees.

⁴⁸ Stock appreciation rights are similar except that the net benefit is paid in cash, not shares of stock. With stock appreciation rights, the employee pays tax at ordinary personal tax rates on the cash benefit when it is paid, and the firm contemporaneously deducts the cash benefit.

This section also investigates whether deductions from employee stock options serve as nondebt tax shields that substitute for the use of interest tax deductions by corporations. DeAngelo and Masulis (1980) argue that firms with substantial nondebt tax shields will use less debt. Among papers investigating this hypothesis, most find weak or no evidence that the traditional measure of nondebt tax shields (depreciation) crowds out debt tax shields (see Section 1). Section 7.2 reviews recent research that examines whether option deductions might serve the role of nondebt tax shields as laid out in DeAngelo and Masulis. It is not formally stated as a prediction because it is already stated in Prediction 2'.

Finally, restricted stock is a form of compensation that appears to be gaining popularity as a substitute for stock options (e.g., Microsoft's recent public declaration that it will begin using restricted stock extensively). With restricted stock, the employee is granted the shares of stock but is restricted from selling the shares for a prespecified period. Unless the employee elects (via Section 83(b) of the Internal Revenue Code) to pay ordinary taxes on the shares at the time of the grant, the employee pays ordinary income tax when the restrictions are lifted (typically after a vesting period of several years expires). The company receives a deduction of the same dollar amount upon which the employee pays tax, at the time the employee pays tax. As of this writing, one key difference relative to stock options is that with restricted stock the company *must* take a charge to earnings that is spread over the restriction period (the charge is fixed at the time restricted stock is granted and is based on APB Ruling #25 or the fair value as determined by FASB Ruling #123), while an earnings charge is not required with stock options. The other key difference is that stock options have little value unless the stock price increases, whereas restricted stock is worth the value of a share of stock, and so can have substantial value even if the price falls somewhat after the stock is granted. It is not clear whether there is any empirical research that comprehensively investigates restricted stock.

6.2. Empirical evidence

Several papers that investigate whether corporate and employee tax status affect compensation choice have drawn mixed conclusions. Hall and Liebman (2000) assume that all firms pay the top statutory tax rate, and they report that the use of executive options increased as the corporate tax rate declined from the 1970s to the 1980s. This finding is consistent with Prediction 22 (the tax benefit of options increases as corporate tax rates fall because the forgone opportunity to deduct salary expense immediately is less important). However, when allowing for cross-sectional differences in tax rates and annual fixed effects, the Hall and Liebman tax coefficient becomes insignificant.

In contrast, Core and Guay (2001) examine stock option plans for employees other than the top five executives. Nonexecutives hold two-thirds of outstanding compensation options. Core and Guay find that high-tax-rate firms grant fewer options, consistent with Prediction 22, but that low-tax-rate firms grant more options. Finally, Klassen and Mawani (2000) find that among Canadian firms option use decreases with the corporate marginal tax rate, as in Prediction 22. (Note that option compensation is not deductible

for Canadian corporations, which only strengthens the incentive to deduct salary expense immediately.) Overall, then, the evidence is weakly consistent with Prediction 22.

Several papers investigate whether corporate and employee tax status affect the choice between incentive and nonqualified options. Austin, Gaver, and Gaver (1998) assume that executives are taxed at the highest statutory rate and investigate whether high-tax-rate firms use NQOs. Austin et al., using five different variables to measure the corporate tax rate, show that none of the variables are statistically related to the form of option plan. This conclusion is generally consistent with the finding by Madeo and Omer (1994) that low-rather than high-tax-rate firms switched from ISOs to NQOs following the 1969 tax act, opposite the tax prediction. Apparently, at present no research provides evidence unambiguously consistent with Prediction 23.

Consistent with personal tax incentives, Huddart (1998) finds that some employees accelerated the NQO option exercise in 1992, prior to the anticipated 1993 increase in upper income personal tax rates (from 31 to 39.6%). However, he concludes that only one in five employees took this action, indicating that nontax factors more than offset personal tax incentives in many situations. Goolsbee (1999) finds that in aggregate an abnormally large number of options were exercised in 1992, prior to the tax increase. Hall and Liebman (2000) note that Goolsbee defines abnormal based on a linear trend in exercise activity. When they instead consider the number of vested options and recent changes in stock prices, Hall and Liebman do not find that employees accelerated the options exercise in anticipation of the personal tax-rate increase; nor do they find a delay in exercise in anticipation of personal tax-rate reductions in the 1981 and 1986 tax acts.

Matsunga, Shevlin, and Shores (1992) conclude that tax factors affect the disqualification of ISOs. An ISO plan is disqualified (i.e., treated as an NQO plan for tax purposes) if an employee sells her stock less than 12 months after exercising incentive stock options. A company might want to disqualify an ISO plan to receive the corporate deduction associated with NQOs if the corporate tax-rate increases relative to the personal tax rate and/or if the ordinary personal rate falls relative to the capital gains tax rate, both of which happened after the 1986 tax reform. Matsunga et al. perform a careful “all parties” tax analysis and conclude that firms with the largest net benefit of disqualification were the firms most likely to disqualify.

Overall, there is only modest evidence that taxes are a driving factor affecting corporate or employee compensation decisions. This is perhaps surprising because popular press articles indicate that the size of the corporate deduction provided by NQOs is huge, completely eliminating corporate taxes for many large, profitable firms in the late 1990s (e.g., *New York Times*, June 13, 2000).⁴⁹

Footnote information from financial statements can help us understand whether the magnitude of option compensation deductions is sufficient to affect overall corporate tax planning and to determine whether these deductions are inversely correlated with interest

⁴⁹ Hanlon and Shevlin (2002) present evidence about options deductions for NASDAQ 100 firms. Hanlon and Shevlin provide an excellent summary of the accounting issues related to options deductions.

deductions (and therefore might explain why some firms use little debt). Information on the exercise and grant prices for all options exercised from 1996 to 1998 by employees of Fortune 500 firms has been gathered (see Table 4). Assuming that all of the options are nonqualified implies that the corporate options deduction equals the difference between the exercise and grant prices of the exercised options. Note that these deductions appear on tax returns and reduce taxes owed to the government; they do not appear as a deduction on financial statements,⁵⁰ nor are they collected by Compustat. One could multiply these deductions by τ_C to estimate their tax value.

The average (median) Fortune 500 firm had \$85 (\$16) million of annual deductions resulting from employees exercising stock options during 1996–1998 (Panel A of Table 4). These numbers are skewed: the firm at the 90th (95th) percentile had \$185 (\$379) million in deductions. As a percentage of financial statement tax expense, the deductions average 50%. As a percentage of the amount of interest it takes to lever a firm up until there are declining benefits associated with incremental deductions (i.e., levering up to the kink in the Graham [2000] benefit functions discussed in Section 1.2.3), the option deductions average 49%. Panel B of Table 4 shows the numbers for some specific firms. In the years shown in the table, option deductions are larger than interest deductions for Dell Computer, Intel, Dollar General Corporation, General Motors, and Circuit City. Moreover, options deductions are larger than tax expense for Intel, GM, and Circuit City.

Overall, the magnitude of the compensation deductions are large for some firms; however, they are moderate for many companies and therefore do not appear to provide the final answer to the puzzle of why some firms appear to be underlevered. Nonetheless, Panel C of Table 4 reveals that compensation deductions appear to substitute for interest deductions and so at least partially address the puzzle. The Pearson (Spearman) correlation coefficient between the magnitude of option deductions and the degree to which a firm appears to be conservatively levered (as measured by the amount of interest it would take to lever up to the kink in the benefit function) is 0.33 (0.46).⁵¹

⁵⁰ Option deductions do not reduce financial statement tax expense because the deductions are not treated as a permanent expense. Instead, the deductions are added to stockholders' equity.

Note that the discussion in this section applies to the vast majority of firms because they elect to present their stock option information using the intrinsic value method and therefore do not expense options and reduce net income or earnings per share, but instead present the information in the financial statement footnotes (and never expense the option compensation to reduce net income). In 2002 and 2003, several dozen firms announced that they would begin expensing option costs on financial statements (which has the effect of reducing net income on financial statements). At press time, most other firms appear to be in a holding pattern, waiting to see whether accounting standards change with respect to reporting option compensation, so it is not possible to say whether more firms will elect to expense options in their financial statements. Note that the tax rules have not changed regarding options—this footnote simply discusses whether firms report options expense as a net-income-reducing item on financial statements.

⁵¹ One shortcoming of this analysis is that I measure the tax benefit of *realized* compensation deductions, which are not necessarily the same as the deductions that managers expect *ex ante*, when they plan their capital structure. Nor do I distinguish between ISOs and NQOs, although Hall and Liebman (2000) note that NQOs account for 95% of option grants. Future research should address these issues.

Table 4
Corporate tax deductions resulting from option compensation for Fortune
500 firms, 1996–1998

Panel A Fortune 500 1996–1998	Annual Option Deduction (\$ million)	Deduction/ Interest Expense	Deduction/ Tax Expense		
Mean	85.2	9.371	0.495		
25 th percentile	3.8	0.030	0.029		
Median	16.1	0.153	0.097		
75 th percentile	58.1	0.585	0.283		
90 th percentile	184.7	1.800	0.632		
95 th percentile	378.6	4.088	1.136		

Panel B Specific Firms	Option Deduction (\$million)	Interest Expense (\$million)	Tax Expense (\$million)	Deduction/ Interest Expense	Deduction/ Tax Expense
Dell Comp. (1997)	468.6	3.0	424.0	156.19	1.11
Intel Corp. (1998)	1185.7	40.0	3069.0	29.64	0.39
Dollar Gen. (1997)	57.8	3.7	87.2	15.36	0.66
GM (1998)	157.1	72.8	−44.7	2.16	−3.51
Circuit City (1998)	27.2	9.1	−15.0	3.00	−1.81

Option Deduction is the dollar amount of option compensation expense that a firm can deduct from its taxable income in a given year, which is calculated as the number of options exercised in a given year times the difference between the weighted-average exercise price and the weighted-average grant price. This calculation treats all exercised options as if they are nonqualified options. *Deduction/Interest* is the option compensation deduction divided by interest expense, where *interest expense* is from financial statements. *Deduction/Tax Expense* is the compensation deduction divided by tax expense, where *tax expense* is from financial statements.

Two recent papers investigate whether option deductions displace the use of debt along the lines suggested in DeAngelo and Masulis (1980)—that is, to explore whether option deductions serve as a form of nondebt tax shield that might substitute for interest deductions (Section 1.1). Graham, Lang, and Shackelford (2002) find that the magnitude of option deductions is large enough to reduce the median MTR for NASDAQ 100 and S&P 100 firms from 34% (when option deductions are ignored) to 26% (when option deductions are considered) in 2000.⁵² Documenting a reduction in MTRs is important because, as argued in Section 1.3.1, nondebt tax shields should reduce the use of debt to the extent that the NDTs alter the marginal tax rate. Graham et al. find that debt ratios are positively related to tax rates and negatively related to the amount by which option deductions reduce marginal tax rates (consistent with Prediction 2'). Similarly, Kahle and

⁵² In light of the large reduction in tax rates for some firms, it is surprising that (for tax reasons) some of these firms do not use more incentive and fewer nonqualified stock options. One reason might be restrictions on the total amount of incentive stock options that can be granted in a given year.

Shastri (2002) find that long- and short-term debt ratios are negatively related to the size of tax benefits from option exercise. Finally, Graham et al. show that firms that appear to use debt conservatively when option deductions are ignored appear significantly less underlevered when options are considered.

Overall, the evidence is consistent with managers substituting away from debt when their firm has substantial option deductions. It would be interesting for future research to investigate whether other nondebt tax shields play this role (e.g., R&D tax credits or foreign tax credits), especially in eras during which option deductions were less prevalent. One “secretive” source of such deductions is tax shelters, which are investigated in Section 8.

7. Taxes, corporate risk management, and earnings management

If capital markets were perfect, there would be no benefit to corporate hedging because investors would be able to achieve the same outcome by hedging on personal account. The null hypothesis is therefore that corporate hedging does not increase firm value. And yet, the corporate use of derivatives (presumably) to hedge has increased enormously in the past decade. For example, OTC swaps increased from \$11 trillion in 1994 to \$69 trillion by 2001 (<http://www.isda.org/index.html>). A large number of corporate finance research papers investigate which market imperfections create situations that can make corporate hedging advantageous.

Theory suggests that hedging to reduce volatility can reduce the expected costs of bankruptcy (Smith and Stulz, 1985), reduce underinvestment costs by shifting funds into states where they would otherwise be scarce (Froot, Scharfstein and Stein, 1993), help offset conservative decision making that results from employee risk-aversion (Tufano, 1996), and reduce the effects of information asymmetry between managers, investors, and the labor market (DeMarzo and Duffie, 1991, and Breeden and Viswanathan, 1998). Though narrower in scope, taxes can also provide an incentive to hedge. This section reviews imperfections in the tax code that can lead to corporate hedging being beneficial and also explores how similar imperfections can provide an incentive to manage earnings.

7.1. Theory and empirical predictions

Smith and Stulz (1985) show that if the function that maps taxable income into tax liabilities is convex, a firm can reduce its expected tax liability by hedging to reduce income volatility. The tax function is generally convex because corporate income tax rates are progressive, though the degree of progressivity for positive income is small. The main form of progressivity occurs because profits are immediately taxed at a positive rate, while the tax-reducing effect of losses is effectively spread through time via tax-loss carrybacks and carryforwards and is only valuable in states in which the firm is profitable. Due to the time value of money, therefore, the tax function is convex because the present

value tax benefit of \$1 in losses is less than the tax cost of \$1 in profits.⁵³ With a convex tax function, firms have incentive to use derivatives to shift taxable income from good to bad states in order to reduce volatility and expected tax liabilities.

Prediction 24: All else equal, the corporate incentive to hedge increases with the degree of tax schedule convexity.

The second tax incentive to hedge involves increasing debt capacity by reducing income volatility. To the extent that increased debt capacity leads to greater debt usage, it also results in greater tax benefits and firm value. Alternatively, increased debt capacity might go unexploited, thereby reducing expected bankruptcy costs (Smith and Stulz, 1985). Ross (1997) and Leland (1998) argue that the former effect dominates and therefore that hedging increases firm value via the tax benefits of debt.

Prediction 25: There is a tax incentive to hedge because it increases debt capacity. When firms use this extra debt capacity, the tax benefits of debt increase.

Hedging with derivatives transfers income across states within a given time-period. In contrast, earnings management is usually regarded as smoothing income through time. Like the hedging case, tax function convexity can provide an incentive to smooth income.⁵⁴ However, tax incentives to smooth are more unidirectional: All else equal, companies prefer to delay paying taxes due to the time value of money. Moreover, if tax rates are expected to fall, tax incentives to delay income are strengthened. The following prediction summarizes three conditions that can lead to a convexity-like incentive to smooth that works against the incentive to delay income recognition:

Prediction 26: Unless one or more of the following conditions are met, there exists a tax incentive to delay recognition of taxable income: (1) the tax function is progressive, (2) net operating loss carryforwards and other deductions are less than fully valued due to limitations on use and the time value of money, and/or (3) tax rates are expected to increase.

7.2. Empirical evidence

Many empirical papers measure tax function convexity using variables based on the existence of NOL or tax credit carryforwards (Prediction 24). These papers regress

⁵³ The logic is that the government effectively holds a call option on corporate tax liabilities and writes a put on corporate tax refunds, the net value of which can be reduced by reducing volatility. That is, present value considerations from delayed tax refunds reduce the value of the government's written put, so on net the governmental call option on tax collections is more valuable. Reducing volatility reduces the value of the call and the government's claim on corporate earnings.

⁵⁴ There are numerous nontax explanations for earnings management. Schipper's (1989) review notes that firms might manage earnings to reduce required returns by lowering earnings variance, to impress outside investors who value stock via earnings multiples, because executive compensation is tied to accounting numbers and because insiders cannot credibly convey private information via other means.

corporate derivative usage on a proxy for convexity and several nontax right-hand-side variables, and generally do not find evidence that convexity affects the corporate use of derivatives (e.g., Nance et al., 1993, for Fortune 500 types of firms or Tufano, 1996, for gold-mining firms). Rather than proxying for convexity, Graham and Smith (1999) explicitly map out tax functions and find that they are convex for about half of Compustat firms. They also report that the average among these firms could save approximately \$125,000 in expected tax liabilities by reducing income volatility by 5%. Graham and Rogers (2001) compare this explicit measure of tax function convexity to derivatives usage for a broad cross section of firms and find no evidence that firms hedge in response to tax function convexity. In contrast, Dionne and Garand (2000), using regression coefficients from Graham and Smith (1999) to estimate convexity, show that hedging among gold-mining firms is positively related to estimated convexity.

Graham and Rogers (2001) use simultaneous equations to investigate the joint hedging/capital structure decision and to determine whether firms hedge to increase debt capacity (Prediction 25). In one equation, they regress derivatives usage on variables, including debt ratios, that explain corporate hedging and in the other equation they regress debt ratios on variables, including derivatives usage, that explain debt policy. Graham and Rogers find that hedging leads to greater debt usage. For the average firm, hedging with derivatives increases the debt ratio by 3% and adds tax shields equal to 1.1% of firm value.

Overall, the empirical evidence suggests that the tax incentive to hedge because of tax function convexity is weak at best. The statistical evidence is stronger that the tax incentive to increase debt capacity leads to greater hedging—though the economic importance of this effect appears to be only moderate.

In terms of earnings management, very little research directly investigates the conditions that can lead to a tax incentive to smooth earnings, particularly with respect to the three conditions in Prediction 26. Scholes, Wilson, and Wolfson (1992) state that firms delayed recognizing income in 1986 in anticipation of lower future tax rates. Barton (2001) regresses a measure of earnings management (i.e., discretionary accruals) on a crude convexity variable. Barton's measure of convexity is the excess of a firm's marginal tax rate over its average tax rate (i.e., tax expense divided by taxable income); a positive number indicates a progressive tax function. Barton finds that the absolute value of discretionary accruals is positively related to this measure of convexity, which he interprets as evidence of income smoothing in response to tax incentives. Similarly, using a NOL-based convexity variable, Pincus and Rajgopal (2002) find that profitable oil and gas firms use derivatives to smooth income in response to tax incentives. As with the corporate hedging evidence, tax incentives appear to be a second-order consideration rather than a dominant influence on earnings management.

8. Tax shelters

Tax shelters offer a means of reducing taxes that may displace traditional sources of corporate tax deductions. Three common characteristics of shelters are that they reduce

tax liability without greatly altering financial statement information, they are shrouded in secrecy, and they are often shut down once detected by the Treasury. Tax shelters can take many different forms, and the current “hot product” is always evolving. They usually exploit glitches in the tax system such as asymmetric domestic and foreign tax treatment or a situation in which income is allocated beyond economic income. In the short-run, before detection, shelters can create a money pump for some firms, with benefits far exceeding transactions costs and the probability-weighted cost of audit/detection. One could imagine a long-run equilibrium in which the benefits of shelters are competed away or greatly reduced, but, as a class, their secretive nature and the proliferation of new products appears to make “short-run” benefits continue unabated for those who participate.

One type of shelter, the high-basis low-value variety, involves an untaxed foreign investor and a taxable domestic corporation both participating in a deal. The untaxed investor is allocated a large portion of the income from the deal and then exits the transaction in a manner that leaves a large economic loss. The corporation can deduct the loss against taxable income. To get a feel for the magnitude of the benefit, Bankman (1999) presents an example in which the corporation contributes \$11 million to a deal and receives \$10 million in property and a \$40 million deductible loss. Therefore, the company effectively pays \$1 million (plus maybe \$3 million in transactions costs and a small expected cost of being caught) for a tax benefit of $40\tau_C$ million.

Some recent research investigates tax shelters. Desai (2002) compares taxable income reported on financial statements to actual tax collections and detects a growing wedge between these two series. He argues that traditional explanations such as accelerated depreciation, stock options, and earnings management explain only a portion of the wedge. Desai concludes (p. 1) that new “enhanced opportunities for avoiding and evading taxes through cheaper, more sophisticated, and less transparent mechanisms” (i.e., tax shelters) explain at least one-third of the book-tax income gap as of 1998, and that the portion of the wedge explained by shelters is growing. Graham and Tucker (2004) examine a sample of nearly 50 tax shelter firms. The tax shelters in their sample are huge, producing deductions that average nearly 9% of asset value. These authors find that companies that use tax shelters use less debt than do their nonshelter peers, which is consistent with shelter deductions serving as a nondebt tax shield that is substituted for debt, in the spirit of DeAngelo and Masulis (1980). See Graham and Tucker for references to other recent tax shelter research.

Some forms of shelters, such as the tax-deductible preferred stock (MIPS) discussed in Section 1, receive positive rulings from the Treasury and go on to become accepted financial transactions. Further discussion of tax shelters is beyond the scope of this chapter. The interested reader is directed to Bankman (1999), the source for much of the tax shelter discussion in this section.

9. Summary and suggestions for future research

This chapter reviews research related to how taxes affect corporate activities. The research often finds that taxes affect corporate financial decisions—but the magnitude of the effect is not always large.

With respect to capital structure, there is cross-sectional regression evidence that high-tax-rate firms use debt more intensively than do low-tax-rate firms. There is also evidence that debt tax benefits add to firm value. However, much additional research is needed to improve our understanding of capital structure tax effects.

One gap in our knowledge is the lack of time-series evidence about whether firm-specific changes in tax status affect debt policy. Another important area for future research is to isolate the market value of the tax benefits of debt for the broad cross section of firms. Additional research is also needed to explain the apparently conservative debt policy of many firms. Such analysis might investigate whether nondebt tax shields substitute for interest deductions—and help solve the “conservative leverage puzzle.” Two such nondebt tax shields are employee stock option deductions and accumulated foreign tax credits. Recent research indicates that employee stock option deductions help to (partially) explain apparent underleverage in some firms. Keep in mind, however, that nondebt tax shields should only affect tax incentives to the extent that they affect the corporate marginal tax rate.

We have also only scratched the surface regarding tax-related leasing research. There is currently not much analysis about whether taxes affect the pricing and structure of lease (or other financial) contracts, about whether leases and debt are substitutes for the lessee, or about how lessor tax rates affect leasing. There is also little research into the effect of relative corporate and personal taxes on the aggregate demand and supply of debt. Unambiguous evidence about whether taxes affect debt maturity choices is also lacking. Finally, all of this research should emphasize robust statistical treatment of standard errors and the economic importance of tax effects, in light of the statement by Myers et al. (1998) that taxes are of third-order importance in the hierarchy of corporate decisions.

Though intriguing in theory, the profession has made only modest progress in documenting whether investor taxes affect asset prices and in turn affect the costs and benefits of corporate policies. There is strong evidence that personal taxes drive a wedge between corporate and municipal bond yields. There is also plausible evidence that the personal tax penalty on MIPS interest income is only modest, which might imply that the personal tax penalty on debt is only modest (relative to using equity)—but this implication needs to be verified. Several papers assume that companies have clienteles of investors that have similar tax characteristics, and then link these companies’ policies to the assumed investor tax rates. It would be helpful to make these linkages more direct. In general, we need more market evidence about the importance of personal taxes affecting asset prices, the effective equity tax rate for the marginal investor(s), and information related to the identity of the marginal investor(s) between different securities. One level deeper, we also need evidence that corporate policies are altered in response to these investor tax influences on security prices. Some of this evidence will be difficult to come by and might require access to confidential information or data from countries with unique data or institutional settings.

Progress has been made relating multinational tax considerations to corporate financing decisions, especially in terms of the use of debt by affiliated foreign entities when

foreign tax rates are high. However, there is a need for research that highlights capital structure comparisons between classical and other tax systems and direct tests of multinational tax incentives, including the interaction of explanatory variables when appropriate (e.g., excess credit status interacted with interest allocation considerations). It would be helpful if excess (or deficit) credit tax position were measured more precisely than simply using current-period average tax rates.

Several studies link corporate payout policy to tax considerations. In particular, the ex-day stock return and volume evidence is consistent with investor tax considerations influencing asset markets. The Green and Rydqvist (1999) study of Swedish lottery bonds stands out in terms of presenting clean ex-day evidence documenting personal tax effects and serves as a model for future research that isolates tax effects. Unique insights into some payout issues might be provided by comparing payout policy in classical versus other tax systems. In addition, there currently is no convincing evidence that the interaction of investor tax characteristics and payout policy affects firm value and stock returns. Finally, there is a need for direct evidence that tax-based investor clienteles exist (i.e., that investors hold certain securities because of the investor's tax status and the form of payout)—because many of the payout hypotheses implicitly assume that such clienteles exist.

Some recent evidence documents tax-motivated compensation payments (i.e., the choice between salary and options paid to nonexecutive employees), risk management (i.e., hedging to increase debt capacity and the tax benefits of debt), and earnings management. However, we need more “all parties, all deductions” research in these areas, as well as analysis of whether these forms of nondebt tax shields are substitutes for each other or for debt interest. We also need compensation studies based on firm- and employee-specific tax rates and the choice between ISO and NQO plans. Finally, to date there have been few direct tests of whether earnings management is related to progressive tax schedules, less than full valuation of accumulated NOLs and other deductions, and/or expectations of changes in future tax rates.

Some studies have provided documentation that firms choose organizational form based on relative corporate and personal tax rates, that asset sales are structured in response to tax considerations, and that corporate bankruptcy and highly levered restructurings have tax implications. However, we need more evidence about the choice of corporate form using firm-specific data, evidence that firms choose ex ante to perform highly leveraged buyouts in response to tax incentives, and, in general, more evidence about tax incentives affecting corporate reorganizations, spin-offs, and other forms of restructuring.

Finally, although it is convenient for academic research to investigate these tax issues one by one, there is potential for large gains from investigating how these various policies and tax incentives interact from the perspective of a corporate financial manager or tax planner. Along these lines, some recent progress has been made investigating tax shelters. Additional studies that integrate the murky world of tax shelters into the overall tax planning environment would be helpful, though much of this research might end up being case studies. Overall, there are numerous important areas in which careful

research can contribute to our understanding of how the imperfections created by taxes affect corporate decisions and firm value.

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TRADE-OFF AND PECKING ORDER THEORIES OF DEBT*

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Abstract

Taxes, bankruptcy costs, transactions costs, adverse selection, and agency conflicts have all been advocated as major explanations for the corporate use of debt financing. These ideas have often been synthesized into the trade-off theory and the pecking order theory of leverage. This chapter reviews these theories and the related evidence and identifies a number of important empirical stylized facts. To understand the evidence, it is important to recognize the differences among private firms, small public firms, and large public firms. Private firms use retained earnings and bank debt heavily; small public firms make active use of equity financing; and large public firms primarily use retained earnings and corporate bonds. The available evidence can be interpreted in several ways. Direct transaction costs and indirect bankruptcy costs appear to play important roles in a firm's choice of debt. The relative importance of the other factors remains open to debate. No currently available model appears capable of simultaneously accounting for all of the stylized facts.

Keywords

capital structure, leverage, corporate financing, trade-off theory, pecking order theory, agency costs, partial adjustment, taxes, bankruptcy costs

1. Introduction

How do firms finance their operations? How should firms finance their operations? What factors influence these choices? How do these choices affect the rest of the economy? These are important questions that have guided researchers for a long time. At one time, the complexity of the problem of financing was thought to be so great as to defy development of reasonable theories. Half a century ago, Weston (1955) even felt the need to argue whether it was possible to develop reasonable theories about these matters.¹ Since then, a remarkably large number of ideas and theories have been proposed to answer these questions.

In a particularly influential treatment of the problem, Myers (1984) considers a contest between two perspectives on corporate debt. He calls one of these hypotheses the trade-off theory, which states that firms balance tax savings from debt against deadweight bankruptcy costs. He calls the other hypothesis the pecking order theory, which states that, due to adverse selection, firms first look to retained earnings, then to debt, and only in extreme circumstances to equity for financing. In this review, we consider the literature and evidence that have developed out of Myers's contest.

According to Myers (1984), these theories have at least two key implications. The key implication of the trade-off theory is that leverage exhibits target adjustment so that deviations from the target are gradually eliminated. The key prediction of the pecking order theory is the strict ordering of financing. Myers presents these two theories as broad organizing frameworks that can potentially help account for many facts. But it is also possible to view both theories as part of a much broader set of factors that determine the capital structure of a firm. Many scholars seem inclined to view both theories in this more limited way.

The claim that leverage exhibits target adjustment is in fact neither necessary nor sufficient for a firm to be balancing tax savings against bankruptcy costs. Accordingly, target adjustment is better viewed as being a separate hypothesis. We use the term *static trade-off theory* for the hypothesis that bankruptcy and taxes are the key factors that determine leverage within a static model.

Drawing a distinction between the static trade-off theory and the target adjustment hypothesis is important for both theoretical and empirical reasons. Target adjustment can be implied by a variety of dynamic theories. These theories may reflect taxes and bankruptcy costs, but they may also have other causes. Static models do not make

¹ Many teachers of business finance are skeptical about the existence or possibility of theories of financial policy. To support their position, they emphasize both the wide range of influences on financial decisions and their varying importance from one situation to another. The subjectivity of many factors makes them dependent on the psychological makeup of the decision-maker. Furthermore, it is well known that in the analysis of business cases, two or more solutions usually appear equally defensible. Those who hold to the skeptical position therefore assert that there can be no science of business finance since experts cannot arrive at unique answers (Weston, 1955, p. 130).

predictions about dynamics without some auxiliary assumptions. The target adjustment hypothesis receives much clearer empirical support than does either the static trade-off theory or the pecking order theory.

The empirical literature supports a number of generalizations that appear to be robust and particularly important for an understanding of actual leverage. To draw attention to these key facts, we have highlighted these generalizations using the label “stylized fact.” For ease of reference, these stylized facts are also collected in an appendix.

A model that incorporated all of the stylized facts would be ideal. Not only is such a unifying model not currently available but, even worse, the standard versions of the available models actually contradict some of the known facts. Different models have problems with different facts.²

A particularly important problem for the standard static trade-off theory is provided by the historical record. In the static trade-off theory, the desire to limit tax payments motivates a firm to use debt financing (see Modigliani and Miller, 1963, for an extreme version). As discussed in Section 3.1, it is quite difficult to match the observed leverage ratios in particular decades with the corporate tax rates in those decades. Even more remarkably, corporate income taxes are only about a century old. Debt financing was common long before the introduction of the corporate income taxes.³ Thus, we know that taxes do not provide a complete justification for the use of debt financing. This does not, of course, imply that taxes can be safely ignored when analyzing modern corporate use of debt.

A particularly important problem for the standard version of the pecking order theory concerns the use of equity financing. Firms issue too much equity (Frank and Goyal, 2003) and at the wrong times (Fama and French, 2005; Leary and Roberts, 2007). In the pecking order, it is the financing deficit that drives debt issues. Empirically, however, other factors appear to be more important (Frank and Goyal, 2003).

Thus the standard versions of both the trade-off theory and the pecking order theory appear to be inadequate. Both approaches need to be improved to account for the known facts.

Recently, proponents of the trade-off approach have focused on developing dynamic structural trade-off models. An attractive feature of these models is that they try to provide a unified framework that can simultaneously account for many facts. Examples include Leary and Roberts (2007), Hennessy and Whited (2005), Ju et al. (2005), and Strebulaev (2007).

Proponents of the pecking order theory have focused recently on the development of a satisfactory notion of debt capacity (see, e.g., Lemmon and Zender, 2004) and on more complex adverse selection models (see, e.g., Halov and Heider, 2005).

² Myers (2003) argues that a satisfactory unifying model is unlikely to become available in the foreseeable future. We are somewhat more hopeful.

³ “For example, [in 1731] the French consul in Genoa wrote: ‘Lack of confidence keeps money in short supply; so those who usually do business on credit, which means most of the merchants in the city, are doing very little. The best purses are shut’” (Braudel, 1982, pp. 397–398).

Bankruptcy costs and direct transaction costs clearly play at least some role, and leverage is stationary over the long run. There is room for reasonable differences of opinion regarding the relative importance of many factors, including taxation, adverse selection, and various agency conflicts.

2. Theory

2.1. *Kinds of theories*

Disagreements over the merits of financial theories stem, in part, from different views of the role that theory plays. It is, therefore, helpful to recognize the different kinds of theory.

One kind of theory represents a point of view. A point-of-view theory is not an explicit model, but rather a set of principles that guide the development of specific models and tests. Both the pecking order and the trade-off theories can be understood as point-of-view theories. Each provides a guide for the development of models and tests. But neither is tied to a specific model formulation.

A second kind of theory is an illustrative theory. An illustrative theory shows how a certain idea can be expressed in a coherent manner. The point of this theory is to show an idea in as clear and as simple a manner as possible. Accordingly, strong assumptions are often made to solve specific models in a closed form.

A third kind of theory, a unifying model, is presented as a means of tying together a variety of observations in a coherent manner. A unifying model is supposed to integrate many facts to show that these facts stem from a common underlying structure. Often, though not always, these models have to be numerically calibrated because they do not have closed-form solutions.

Fourth is normative theory, which is intended to offer advice to someone. At this stage of development, very little of the theory in finance is intended as advice to chief financial officers. However, some studies, such as that by Graham (2000), in which he argues that many firms could increase value by leveraging up, seem very interesting from a normative perspective. In the next few years, this kind of analysis will likely become much more common in corporate finance.

Both the pecking order and the trade-off theories provide points of view. Both have been illustrated in specific models with particular simplifying assumptions, and both are often presented as unifying theories.

Moving from a point of view to a specific model requires making assumptions. When the pecking order and the trade-off theories are formulated as specific models, they are easy to reject on a variety of dimensions. But not all rejections of a model are equally serious. The model may still provide a very useful way to think about the data. Even if a model is rejected, it may still fit the evidence better than any other available model. How to balance formal rejection versus insight is not easy. What should count as evidence

against a particular point of view and what should not? Reasonable people can answer this question in differing ways.

Advocates of the trade-off point of view tend to take rational optimizing behavior particularly seriously. Advocates of the pecking order point of view tend to take the dominance of retained earnings and debt over equity with particular seriousness. These are not inherently conflicting considerations, however.

2.2. *The Modigliani-Miller theorem*

The theory of business finance in a modern sense starts with the Modigliani and Miller (1958) capital structure irrelevance proposition.⁴ Until then, there was no generally accepted theory of capital structure. Modigliani and Miller's initial assumption is that the firm has a particular set of expected cash flows. When the firm chooses a certain proportion of debt and equity to finance its assets, all that it does is to divide up the cash flows among investors. Investors and firms are assumed to have equal access to financial markets, which allows for homemade leverage. The investor can create any leverage that was wanted but not offered, or the investor can get rid of any leverage that the firm took on but was not wanted. As a result, the leverage of the firm has no effect on the market value of the firm.

The Modigliani and Miller paper led subsequently to both clarity and controversy. As a matter of theory, capital structure irrelevance can be proved under a range of circumstances. There are two fundamentally different types of capital structure irrelevance propositions. The first, the classic arbitrage-based irrelevance proposition, provides settings in which arbitrage by investors keeps the value of the firm independent of its leverage. In addition to the original Modigliani and Miller paper, important contributions include papers by Hirshleifer (1966) and Stiglitz (1969).

A second kind of capital structure irrelevance is associated with multiple equilibria. In models of this kind, equilibrium conditions pin down the aggregate amount of debt and equity in the market. But the model does not specify how these aggregate quantities get divided up among the firms. The classic paper is by Miller (1977) in which consideration of both personal and corporate tax determines an economywide leverage ratio, but there are multiple equilibria in which debt is issued by different firms. A similar kind of firm-level capital structure irrelevance is found in Auerbach and King (1983).

The 1958 paper stimulated serious research devoted to disproving irrelevance as a matter of theory or as an empirical matter. This research has shown that the Modigliani–Miller theorem fails under a variety of circumstances. The most commonly used elements include consideration of taxes, transaction costs, bankruptcy costs, agency conflicts, adverse selection, lack of separability between financing and operations, time-varying financial market opportunities, and investor clientele effects. Alternative models use

⁴ As is common with important contributions to knowledge, there is some dispute on the origin of the idea. Williams (1938) makes a relatively clear statement of the idea but does not present an explicit arbitrage-based proof. Rubinstein (2003) presents an interesting discussion of the history of ideas.

differing elements from this list. Given that so many different ingredients are available, it is not surprising that many different theories have been proposed. Covering all of these theories would go well beyond the scope of this chapter. Harris and Raviv (1991) provided a survey of the development of this theory as of 1991.

As an empirical proposition, the Modigliani–Miller irrelevance proposition is not easy to test. With debt and firm value both plausibly endogenous and driven by other factors such as profits, collateral, and growth opportunities, we cannot establish a structural test of the theory by regressing value on debt.⁵ But the fact that fairly reliable empirical relations between a number of factors and corporate leverage exist, while not disproving the theory, does make it seem an unlikely characterization of how real businesses are financed.

What then is one to make of the theorem? A popular defense has been as follows. “While the Modigliani–Miller theorem does not provide a realistic description of how firms finance their operations, it provides a means of finding reasons why financing may matter.” This description provides a reasonable interpretation of much of the theory of corporate finance up to perhaps the 1980s. Accordingly, it influenced the early development of both the trade-off theory and the pecking order theory. However, as the next two sections show, current progress in capital structure theory is not based on reexamining the list of assumptions that generate the Modigliani–Miller theorem to find a previously unrelaxed assumption.

2.3. The trade-off theory

The term *trade-off theory* describes a family of related theories. In all of these theories, a decision maker running a firm evaluates the various costs and benefits of alternative leverage plans. Often it is assumed that an interior solution is obtained so that marginal costs and marginal benefits are balanced.

The original version of the trade-off theory grew out of the debate over the Modigliani–Miller theorem. When corporate income tax was added to the original irrelevance proposition Modigliani and Miller (1963), this created a benefit for debt in that it served to shield earnings from taxes. Since the firm’s objective function is linear and there is no offsetting cost of debt, this implied 100% debt financing.

To avoid this extreme prediction, an offsetting cost of debt is needed. The obvious candidate is bankruptcy. Kraus and Litzenberger (1973) provide a classic statement of the theory that optimal leverage reflects a trade-off between the tax benefits of debt and the deadweight costs of bankruptcy. According to Myers (1984), a firm that follows the trade-off theory sets a target debt-to-value ratio and then gradually moves toward the target. The target is determined by balancing debt tax shields against costs of bankruptcy.

Several aspects of Myers’s definition merit discussion. First, the target is not directly observable. It may be imputed from evidence, but that depends on adding a structure. Different papers add that structure in different ways.

⁵ Fama and French (1998) and Kemsley and Nissim (2002) provide related discussions.

Second, the tax code is much more complex than that assumed by the theory. Depending on which features of the tax code are included, different conclusions regarding the target can be reached. Graham (2003) provides a useful review of the literature on the tax effects.

Third, bankruptcy costs must be deadweight costs rather than transfers from one claimant to another. The nature of these costs is also important. Are these fixed costs? Do they increase with the size of the bankruptcy? Are the costs one-time costs such as a lawyer's fees, or are they permanent costs such as the cost of a damaged reputation? Haugen and Senbet (1978) provide a useful discussion of bankruptcy costs.

Fourth, for the analysis to work transaction costs must take a specific form. For the adjustment to be gradual rather than abrupt, the marginal cost of adjusting must *increase* when the adjustment is larger. This assumed form of adjustment cost is rather surprising since one expects to see large fixed costs and perhaps roughly constant marginal costs. This implies a very different adjustment path. Leary and Roberts (2005) describe the implications of alternative adjustment cost assumptions.

For these reasons, we break Myers's definition into two parts. We call the first part the static trade-off theory, and the second part, target adjustment behavior.

Definition 2. 1. A firm is said to follow the static trade-off theory if the firm's leverage is determined by a single period trade-off between the tax benefits of debt and the deadweight costs of bankruptcy.

Definition 2. 2. A firm is said to exhibit target adjustment behavior if the firm has a target level of leverage and if deviations from that target are gradually removed over time.

2.3.1. *The static trade-off theory*

Bradley et al. (1984) provide the standard presentation of the static trade-off theory. The assumed tax structure is not intended to be strictly realistic. For instance, the tax code contains important dynamic aspects that cannot be properly represented in a single-period model. However, the model does contain some important elements of the actual U.S. tax code.

Investors are risk-neutral and face a *progressive* tax rate on end-of-period wealth from bonds. Dividends and capital gains are taxed at a single constant rate. Risk-neutrality induces the investor to invest in whichever security offers the better expected after-tax deal.

The firm faces a constant marginal tax rate on end-of-period wealth. It can deduct both interest and principle payments, but the investor must pay taxes as these payments are received. Nondebt tax shields exist, but they cannot be arbitrated across firms or across states of nature. If the firm is unable to make the promised debt payment, then it incurs deadweight financial distress costs, so that "the pie shrinks."

Let τ_c = the constant marginal tax rate on corporate income, τ_{pb} = the progressive tax rate on investor bond income, τ_{ps} = the tax rate on investor equity income, X = the end-of-period value of the firm before taxes and debt payments, k = the fraction of end-of-period value that is lost if the firm defaults on debt, B = the end-of-period payment promised to bondholders, ϕ = the total after-tax value of nondebt tax shields if fully used, r_f = the risk-free, tax-free rate of return, $f(X)$ = the probability density of X , and $F(\cdot)$ = the cumulative probability density function.

The following table describes the returns to stockholders and bondholders in various states defined by the level of corporate earnings. The column “Total” indicates the firm’s total earnings, denoted as X . If the earnings are negative, then both debt and equity give up their claims; no debt is paid. If the earnings are positive but not enough to cover the promised debt payment, B , then equity defaults, and debt takes over. A deadweight loss of kX is used up in the process.

Total	State	Debt	Equity	Tax	Loss
X	$X < 0$	0	0	0	0
X	$0 < X < B$	$X(1 - k)$	0	0	kX
X	$B < X < B + \phi/\tau_c$	B	$X - B$	0	0
X	$X > B + \phi/\tau_c$	B	$X - B - \tau_c(X - B) + \phi$	$\tau_c(X - B) - \phi$	0

If earnings are large enough for equity not to default, there remains the question of whether the earnings are low enough that the nondebt tax shield is sufficient to cover the tax liability. Thus, the last states in the table differ with respect to taxation. In the last state (high income), the firm is able to utilize fully the nondebt tax shield (ϕ), and equityholders therefore receive $X - B - \tau_c(X - B) + \phi$. In the penultimate range of states, income is not sufficiently high and nondebt tax shields are not fully utilized. As a result, no tax is paid and equityholders receive $X - B$. The dividing line occurs as the point where income is just sufficient to have $X - B = X - B - \tau_c(X - B) + \phi$. Obviously, this can be rearranged to $X = B + \phi/\tau_c$, which defines the boundary as shown above.

The market value of debt is found by integrating the bondholder after-tax returns across different states:

$$V_B = \left(\frac{1 - \tau_{pb}}{1 + r_f} \right) \left[\int_B^\infty Bf(X)dX + \int_0^B X(1 - k)f(X)dX \right] \tag{1}$$

The market value of equity can be obtained by integrating the stockholder after-tax returns across different states:

$$V_S = \left(\frac{1 - \tau_{ps}}{1 + r_f} \right) \left[\int_{B+\phi/\tau_c}^\infty [(X - B)(1 - \tau_c) + \phi]f(X)dX + \int_B^{B+\phi/\tau_c} (X - B)f(X)dX \right] \tag{2}$$

Adding together V_S and V_B gives an expression for the value of the firm, that is, $V = V_S + V_B$. It is assumed that the firm's choice of leverage, B , is determined by maximizing V .

The assumption that B is chosen to maximize V is conventional, but it is not innocuous. For instance, the firm might be maximizing managerial welfare, or the welfare of a particular set of large shareholders who have control. Such agency conflicts are assumed away. As usual, in an optimization problem, the optimal value might be found at either an interior point or on a boundary. If the optimal solution is interior, then it is provided by a first-order condition determined by differentiating V with respect to B and setting it equal to zero, that is, $\partial V/\partial B = 0$. For this model we have

$$\frac{\partial V}{\partial B} = \left(\frac{1 - \tau_{pb}}{1 + r_f} \right) \left\{ [1 - F(B)] \left[1 - \frac{(1 - \tau_c)(1 - \tau_{ps})}{(1 - \tau_{pb})} \right] - \frac{(1 - \tau_{ps})\tau_c}{1 - \tau_{pb}} [F(B + \phi/\tau_c) - F(B)] - kBf(B) \right\} \quad (3)$$

The first term in this expression represents the marginal net tax benefit of debt; the second term represents the increase in the probability of wasting interest tax shields when earnings are less than tax shields; and the third, the marginal increase in expected costs of distress. The firm's decision involves a trade-off between the marginal tax advantage of debt and the marginal leverage-related costs.⁶ The main predictions from the model are found by redifferentiating the first-order condition with respect to each of the parameters of interest. They show that:

- (1) An increase in the costs of financial distress (k) reduces the optimal debt level.
- (2) An increase in nondebt tax shields (ϕ) reduces the optimal debt level.
- (3) An increase in the personal tax rate on equity (τ_{ps}) increases the optimal debt level.
- (4) At the optimal capital structure, an increase in the marginal bondholder tax rate (τ_{pb}) decreases the optimal level of debt.
- (5) The effect of risk (σ) is ambiguous, even if uncertainty is assumed to be normally distributed. For "reasonable" parameter values, Bradley et al. (1984) show that the relation between the debt ratio and volatility is negative.

Although most of the predictions are intuitively reasonable, it is surprising that the effect of risk on leverage is ambiguous. This ambiguity between leverage and risk is also found in a variety of other models.

⁶ This model nests a number of prior theories as special cases. To get the model in Miller (1977), set $\tau_{ps} = k = \phi = 0$, so that $\partial V/\partial B = ([1 - F(B)]\tau_c - [1 - F(B)]\tau_{pb})/(1 + r_f)$. The firm term is the marginal tax advantage of debt obtained by multiplying the corporate tax rate (τ_c) with the probability that the firm will not default ($[1 - F(B)]$). The second term is the tax premium the firm expects to pay to bondholders. To get the model in Deangelo and Masulis (1980), set $\tau_{ps} = 0$, and find $\partial V/\partial B = [[1 - F(B)](\tau_c - \tau_{pb}) - \tau_c[F(B + \phi/\tau_c) - F(B)] - (1 - \tau_{pb})kBf(B)]/(1 + r_f)$. If either ϕ or k is positive, τ_c will be greater than τ_{pb} , and the first term, which represents the net tax advantage of debt, will be positive.

Tests of this model face the problem that the main elements of the model are not directly observable. Instead, proxies are used. When, for instance, Bradley et al. (1984) find an unexpected sign on nondebt tax shields, it is unclear whether the problem is a defect in the theory or in the proxy.

This trade-off model is static, although firms in the real world operate over many periods. Thus, testing the theory with data requires making auxiliary assumptions. Two aspects of static modeling are particularly important in tests of the theory—the role of retained earnings and the interpretation of mean reversion.

By construction, there are no retained earnings in the model. How should one interpret retained earnings? At one level, it can be argued that retained earnings are direct evidence that a one-period model is inappropriate. Although there is some truth to such a claim, it is fairly harsh. Theories are always simplifications. Retained earnings represent inside equity, and profitable firms automatically create this kind of equity. Unless the firm takes some offsetting action, the more profitable a firm is, the lower its leverage will be. This kind of equity creation is conceptually rather different from a secondary equity issue.

Again, by construction, and as already discussed, this theory says nothing about mean reversion. The model has a solution for leverage, but there is no room in the model for the firm ever to be anywhere but at the solution. Thus, the model contains no notion of target adjustment. This is why we separate the static trade-off theory from the target adjustment hypothesis. Evidence for or against mean reversion is not evidence of the applicability of the static trade-off theory. These are separate questions. Predictions about dynamics arise from dynamic models.

These two unmodeled aspects of the theory have been very influential in forming the profession's view of the trade-off theory and have resulted in considerable dissatisfaction with it. Some scholars have reacted by turning away from taxation and bankruptcy costs as key features altogether (e.g., see Jensen and Meckling, 1976, and Myers, 1984); for many years, this alternative line of research dominated corporate finance scholarship. In the last few years, some scholars have been returning to consideration of taxation and bankruptcy costs, but with an explicit treatment of the fact that firms last longer than a single period, which leads to the dynamic trade-off theory.

2.3.2. *The dynamic trade-off theory*

Constructing models that recognize the role of time requires specifying a number of aspects that are typically ignored in a single-period model. Of particular importance are the roles of expectations and adjustment costs. In a dynamic model, the correct financing decision typically depends on the financing margin that the firm anticipates in the next period. Some firms expect to pay out funds in the next period, whereas others expect to raise funds. If funds are to be raised, they may take the form of debt or equity. More generally, a firm undertakes a combination of these actions. Before discussing individual papers, we present two illustrative examples of the potential importance of dynamics in financing decisions.

2.3.2.1. First example Consider a highly profitable firm. Instead of raising funds, it plans to distribute money to its shareholders. It can distribute funds today, or it can retain these funds and distribute them one period later. Which should the firm do? The answer depends on the tax rates and on rates of return that the firm can earn relative to the returns that the shareholders can obtain directly. (Evidently, we are far from the world of Modigliani and Miller, 1958, at this point.) Given that the firm is profitable, its investment opportunities are likely to be better than those of its shareholders. This may lead to situations when it is better for a firm to retain funds, even though it faces a higher tax rate than do its shareholders. The more profitable the firm, presumably the more likely this is true. The example suggests that more profitable firms should retain more earnings than should less profitable firms. Since retained earnings are equity, in this example we might expect to see more profitable firms have lower leverage.

2.3.2.2. Second example Consider a firm that has more funds than it wishes to invest in this period. The firm anticipates investing in a year or two, at which time it will need funds. In a tax-free world, the firm could pay out the excess cash to its shareholders today, and later, when funds are needed, it could issue new equity. But taxes create a wedge. Paying out money causes shareholders to pay taxes. With taxes, financing round trips can be expensive. Thus, distributing funds and then raising new equity subsequently imposes a tax liability on shareholders that could have been avoided had the firm retained the funds. Hence, taxes can directly motivate firms to retain earnings.

These two examples are not complete theories. They are merely illustrations of the fact that dynamic trade-off models depart from static trade-off models in interesting ways.

The early attempts to model the dynamic trade-off appeared to be technically difficult, and not all that promising at a time when adverse selection and agency considerations were center stage in the literature. Currently, scholars are starting to work through the technical problems that are present in dynamic models with uncertainty and bankruptcy.⁷ The dynamic models contain features that allow the trade-off theory to provide a better account of how firms finance their operations than had been previously thought.

An important precursor to modern dynamic trade-off theories was Stiglitz (1973), who examines the effects of taxation from a public finance perspective. Stiglitz's model is not a trade-off theory since he took the drastic step of assuming away uncertainty. This, of course, simplifies things immensely. His analysis, which allows for both personal and corporate taxes, highlights an interesting asymmetry in the tax code. Money paid in to the

⁷ Due to technical difficulties, these current papers make important simplifying assumptions that probably experience loss of generality. Unfortunately, at this time, in contrast to the literature on asset pricing, we do not yet have a common workhorse model from which individual papers can naturally be developed.

firm is not taxed, but money paid out is taxed.⁸ For reasonable parameter values, Stiglitz's basic result is that it pays to finance as much investment as possible through retained earnings and to finance the excess of investment over retained earnings with debt. The observed leverage ratio is thus a "fortuitous outcome of the profit and investment history of the firm" (Stiglitz, 1973, p. 32). In other words, the solution is essentially what we might now call the pecking order.

The first dynamic models to consider the tax-savings versus bankruptcy cost trade-off are by Kane et al. (1984) and Brennan and Schwartz (1984). Both analyzed continuous time models with uncertainty, taxes, and bankruptcy costs, but no transaction costs. Since firms react to adverse shocks immediately by rebalancing costlessly, firms maintain high levels of debt to take advantage of the tax savings. These models reinforced Miller (1977) in that the trade-off theory predicts much higher debt levels than those typically observed in most firms (see Section 3.2.3).

To avoid the unrealistically rapid rebalancing problem, Fischer et al. (1989) introduced transaction costs into the analysis of dynamic capital structures. Because of transaction costs, the firm allows its capital structure to drift much of the time. When its leverage gets too far out of line, the firm undertakes a discrete rebalancing. They assumed that the rebalancing takes place at an upper and at a lower limit so that recapitalization takes the form of an " (s, S) " policy. When the firm earns profits, it pays down debt. If the lower leverage limit is reached, the firm recapitalizes. If the firm loses money so that debt increases, it will again permit the drift until the boundary is reached. Accordingly, when we look at a large panel of data, most of the data reflects drift rather than active rebalancing. This can account for the empirical observation that profits and leverage are negatively related.

Fischer et al. (1989) solve the model numerically. Their simulations suggest that even small transaction costs can lead to delay in rebalancing and wide variations in the debt ratio. The numerical solutions have a number of reasonable features. The tax advantage of debt is increasing in the corporate tax rate and decreasing in the personal tax rate. Greater volatility is associated with an increased range over which the firm permits leverage to fluctuate and with a reduction in the target to which the firm recapitalizes when boundaries are reached. Thus, volatility is negatively associated with average leverage. Leary and Roberts (2005) show that the Fischer et al. model accounts for a number of aspects of firm leverage dynamics. More controversially, in the Fischer et al. model, good operating performance will eventually cause the firm to hit the refinancing barrier, at

⁸ There is "a basic asymmetry (which arises even in our idealized tax structure) between payments to shareholders and receipts from them. Payments to shareholders are taxed, so reductions in dividends or in shares purchased back from shareholders reduce the taxes paid, but receipts from shareholders are not taxed. Accordingly, if the firm is not paying out any dividends, using all of its retained earnings for investment, and financing the excess of investment over retained earnings by debt, an attempt to increase the equity by reducing the new debt issue and increasing the new equity issue will have disadvantageous tax effects; there will be no reduction in taxation on 'equity account' this period but an increase in corporate profit taxes paid in future periods because of the reduction in interest payments" (Stiglitz, 1973, p. 7).

which point it loads up on debt.⁹ Thus, good performance is eventually followed by debt issues.

In order to understand the recent dynamic trade-off literature, it is helpful to classify the papers according to their assumptions. One important dividing line is the treatment of investment. Classical analysis such as Modigliani and Miller (1958) and Kraus and Litzenberger (1973) takes the firm's cash flows as exogenous. Many trade-off models such as Kane et al. (1984), Fischer et al. (1989), Goldstein et al. (2001) and Strebulaev (2007) follow this tradition of keeping the firm's cash flows exogenous. However, it is quite likely that investment and thus the firm's cash flows depend on how the firm finances its operations. Thus, some papers consider investment together with financing. Notably, this is done by Brennan and Schwartz (1984), Mello and Parsons (1992), Mauer and Triantis (1994), Titman and Tsyplakov (2007), and Hennessy and Whited (2005).

If the firm's earnings are stochastic but unrelated to leverage, then one must decide how to model the excess cash in good times. Generally, it is assumed that excess cash will be paid out to the shareholders. Many papers do not give the firm a choice of how much to pay out versus how much to retain. For example, Brennan and Schwartz (1984) and Titman and Tsyplakov (2007) assume that the firm pays out all funds. This assumption obviously limits the ability of the theory to speak to the empirically important issue of retained earnings. Both Stiglitz (1973) and Hennessy and Whited (2005) are more satisfactory in this respect.

The tax system assumptions differ across papers. Kane et al. (1984), Fischer et al. (1989), and Titman and Tsyplakov (2007) omit consideration of taxes on corporate payouts. To include linear tax on distributions, Goldstein et al. (2001) and Strebulaev (2007) appear to be effectively assuming that the shareholders get a tax rebate when contributing equity. By contrast, Stiglitz (1973) and Hennessy and Whited (2005) both capture the fundamental distinction that generally taxes are due on distributions from firms to investors, but not on funds that investors provide to firms.

Dynamic trade-off models can also be used to consider the option values embedded in deferring leverage decisions to the next period. Goldstein et al. (2001) observe that a firm with low leverage today has the subsequent option to increase leverage. Under their assumptions, the option to increase leverage in the future serves to reduce the otherwise optimal level of leverage today. Strebulaev (2007) analyzed a model quite similar to that of Fischer et al. (1989) and Goldstein et al. (2001). Again, if firms optimally finance only periodically because of transaction costs, then the debt ratios of most firms will deviate from the optimum most of the time. In the model, the firm's leverage responds less to short-run equity fluctuations and more to long-run value changes.

⁹ Some have objected that persistently profitable firms do not often go out to load up on debt. However, such firms do undertake significant new debt when engaging in mergers and acquisitions. Profitable firms do seem more likely to undertake such actions. The best way to think about the relation between leverage and M&A activity probably deserves more attention.

Hennessy and Whited (2005) consider the interaction of financing and investment in a model with corporate and personal taxes, financial distress costs, and equity flotation costs. In contrast to many of the earlier papers, the firm is not obliged to pay out funds, and so it allows for an explicit analysis of the kinds of dynamic considerations discussed in the two examples presented earlier in this section. They find that optimal leverage is path dependent and that profitable firms tend to be less highly levered. Another closely related paper that considers the interaction between investment and financing decisions is by Tserlukevich (2006), who develops a dynamic structural trade-off model with real frictions. In this model, while equity values increase when firms experience positive demand shocks, investment is delayed because of real frictions, and consequently leverage goes down. For tax reasons, firms issue debt only when investments are made. Incorporating these real frictions in a dynamic model of financing decisions, Tserlukevich is able to replicate several stylized facts such as the mean reversion in leverage and the inverse relation between leverage and profitability without relying on transaction costs.

Hennessy and Whited (2005), Fischer et al. (1989) as further developed by Leary and Roberts (2005), and Strebulaev (2007) all seem capable of accounting for the results of Baker and Wurgler (2002) and Welch (2004). The models of Goldstein et al. (2001) and Hennessy and Whited (2005) also help to resolve the high-debt problem identified by Kane et al. (1984) and Brennan and Schwartz (1984).¹⁰

Lewellen and Lewellen (2006) argue that if a firm repurchases shares, the tax that must be paid by the shareholders depends on the capital gains that have been incurred since they bought in originally. Accordingly, the optimal financing of the firm may depend on how frequently their shares are turned over in the stock market. Firms with many long-term shareholders may be more reluctant to trigger a tax bill for their shareholders than would firms with many short-term shareholders.¹¹

Certain ideas are fairly general in dynamic models. The optimal financial choice today depends on what is expected to be optimal in the next period. In the next period, it may be optimal to raise funds or to pay them out. When raising new funds, it might be optimal to raise them in the form of debt or in the form of equity. In each case, what is expected to be optimal in the next period will help to pin down the relevant comparison for the firm in the current period. By stressing different costs, different dynamic models lead to somewhat different conclusions.

The idea that the rate of return in the hands of the firm needs to be compared to the rate of return in the hands of the investor is fairly general and seems to transcend specific

¹⁰ A variety of other dynamic agency models has been proposed such as Morellec (2004) and Mello and Parsons (1992). The optimal capital structure can also be considered from an optimal dynamic contracting perspective as in Atkeson and Cole (2005). Titman and Tsyplakov (2007) study the difference between firm value maximization and equity value maximization.

¹¹ Green and Hollifield (2003) provide a careful analysis of many of the complexities that arise due to personal taxes. However, they simplify the analysis by assuming that corporate debt policy keeps the interest payments fixed from period to period.

models. The fact that transaction costs and taxes can create wedges that lead to times when money should be left in whichever hands it currently is in is also quite general and recurs across many models.

As stated earlier, there is an asymmetry created by the fact that payments by firms to investors trigger taxation, but payments by investors to firms do not do so. This asymmetry seems to be fairly basic, and it is likely to arise in many dynamic models. Both taxes and transactions costs can create wedges such that shocks are not undone. This leads to path-dependent solutions in a variety of models.

Much of the work on dynamic trade-off models is fairly recent, and so any judgments on their results must be somewhat tentative. This work has already fundamentally altered our understanding of mean reversion, the role of profits, the role of retained earnings, and path dependence. As a result, the trade-off class of models now appears to be much more promising than it did even just a few years ago.

2.4. The pecking order theory

The pecking order theory comes from Myers (1984), who in turn was influenced by the earlier institutional literature, including the book by Donaldson (1961). Myers (1984) argues that adverse selection implies that retained earnings are better than debt and debt is better than equity. This ranking was motivated with reference to the adverse selection model in Myers and Majluf (1984). The ordering, however, stems from a variety of sources, including agency conflicts and taxes.¹²

Definition 2.3. Myers (1984): A firm is said to follow a pecking order if it prefers internal to external financing and debt to equity if external financing is used.

This definition can be interpreted in different ways. What does it mean to “prefer” internal financing? Does this mean that the firm uses all available sources of internal finance before using any debt or equity issues? Or does it mean that, “other things equal,” the firm will mostly use internal financing before using external financing? If the verb “prefer” is interpreted strictly, the theory is more testable. If “prefer” is interpreted in the “other things equal” way, then any test of the theory rests on the specification of “other things equal.”

Most firms hold some internal funds (cash and short-term investments) even when they are raising outside funds. This is so obvious that it is rarely considered in tests of the pecking order. It is implicitly assumed that these funds are held for reasons that are outside the theory, such as for transactions. Accordingly, almost all discussions maintain some version of an “other things equal” interpretation of the relative use of internal and external funds.

¹² Baker et al. (2007) point out that excessive managerial optimism might also be used to generate a version of the pecking order if it were the only distortion.

A second problem for the definition concerns the preference of debt over equity. As we will see, initial claims for the theory tended to rest on a strict interpretation in which equity is never issued if debt is feasible. As it has become increasingly clear that this strict interpretation is not only more refutable, but actually refuted, proponents of the pecking order theory have moved increasingly to the “other things equal” interpretation. Different papers invoke different empirical versions of “other things equal.” Of course, the more a test depends on the other things, the less the data are explained by the pecking order itself.

At what point is equity introduced? The strict interpretation suggests that after the initial public offering (IPO), equity should never be issued unless debt has for some reason become infeasible. This leads to the notion of a “debt capacity.” The debt capacity serves to limit the amount of debt within the pecking order and to allow for the use of equity. Obviously, this raises the problem of defining the debt capacity. The literature provides no agreed-upon definition. Several recent papers have used factors commonly employed in tests of the trade-off theory to define the debt capacity. Of course, this leads to difficulties in interpreting the results.

Pecking order models can be derived based on adverse selection considerations, agency considerations, or other factors. Two common features underlie pecking order theories. The first feature is the linearity of the firm’s objective function; this helps because it means that costs tend to drive the results to corner solutions. The second feature is the model’s relative simplicity. The pecking order hierarchy is a relatively simple structure. A model that is complex is unlikely to have such a simple solution. When many things are factored in, a more complex range of things tends to happen. Thus, it seems that the pecking order is generally more likely to emerge from an illustrative model than it is from a unifying model.

While this section describes pecking order models based on adverse selection and agency costs, Section 2.3.2 shows that tax considerations alone can also generate pecking order behavior. It is also possible to have other features that lead to a financing hierarchy. To the best of our knowledge, no one has tried to distinguish among the alternative possible sources of pecking order behavior.

2.4.1. Adverse selection

The most common motivation for the pecking order is adverse selection, developed by Myers and Majluf (1984) and Myers (1984). The key idea is that the owner–manager of the firm knows the true value of the firm’s assets and growth opportunities. Outside investors can only guess these values. If the manager offers to sell equity, then the outside investor must ask why the manager is willing to do so. In many cases, the manager of an overvalued firm will be happy to sell equity, while the manager of an undervalued firm will not. Our presentation follows Cadsby et al. (1990).

Consider an original owner/operator of a firm and potential investors. Everyone is risk-neutral, and there are no transaction costs and no discounting. All financing is through

equity. The firm has some existing assets, and it decides whether or not to invest in a project. If the project is to be undertaken, then the potential investors compete in an auction for the right to finance the project. The auction is for a share of equity in the firm that the investor demands in exchange for the necessary funding of the project. Accordingly, financing is breakeven given the beliefs of the investors.

The firm has assets in place, denoted by A_i , and access to a positive net present value (NPV) project that offers a net payoff denoted by B_i . The subscript i refers to the firm's type, which can be either type H (high) or type L (low). The sum of the assets in place plus the net value of the project is greater for a type H firm than it is for a type L firm. The two types are equally likely. The firm knows the true worth of both its assets and the project. The investors can only guess about the firm's type. In order to undertake the project, the firm would need to raise $I > 0$ from the investor.

If the project is not undertaken, then the firm's value (denoted V_i) is just $V_i = A_i$. If the project is undertaken, V_i must be shared with the outside investor. The investor's share of the firm is denoted s , so the original owner gets $(1 - s)V_i$. An auction is held among the risk-neutral investors for the right to provide I in exchange for sV_i . The winner of the auction expects to break even.

There is a unique pooling equilibrium in which both type H and type L firms undertake the new projects if and only if $(I/V_L) < (B_H + I)/V_H$. The investor gets a share denoted s^* , where $s^* = I/(0.5V_H + 0.5V_L)$.

The pooling equilibrium conditions allow the investor only to expect to break even on average since both types of firm will undertake the project. Under the parameter value restriction, the new project is sufficiently lucrative that the high-type firm wishes to go ahead, despite the fact that the investor is only financing the project on average terms. Thus, all players are willing to follow the suggested strategies.

There is a unique separating equilibrium in which a type L firm undertakes the project and a type H firm does not, if and only if $(B_H + I)/V_H < I/(0.5V_H + 0.5V_L)$. The investors get a share, $s^* = I/V_L$.

In this case, only the low-type firm goes ahead with the project. The investor knows that a low-type firm is being financed and therefore demands terms that reflect this fact. If a high-type firm were to go ahead, the investor would demand the same unattractive terms required from low-type firms. As such, the high-type firm finds it better to simply forgo the project altogether. The parameter values are such that the suggested strategies reflect each player's self-interest given how all the other players are acting.

Both a pooling and a separating equilibrium exist simultaneously when $I/(0.5V_H + 0.5V_L) < (B_H + I)/V_H < I/V_L$. The investor's shares depend on whether the equilibrium is pooling or separating. The investor always expects only to break even. Cadsby et al. (1990) point out that in the overlapping region, there is also a semi-separating equilibrium.¹³

¹³ Cadsby et al. (1990) conducted experimental tests of the model. The model predicted well. Cadsby et al. (1998) also considered an extended version of the model in which the firm could advertise its type. In this case, the predictions of the model were not as good.

In the pooling equilibrium, the asymmetric information does not cause the valuable project to be lost. But if the value of the assets in place is quite high relative to the value of the positive NPV of the project, then the firm chooses not to raise any outside funds.

In this model, internal financing when feasible would always work. That is to say, such financing would avoid all asymmetric information problems. External equity is sometimes too expensive, and the firm will even give up positive NPV projects to avoid it. This is part of the pecking order hierarchy.

As in Myers and Majluf (1984), debt is not formally included in the analysis. If debt were available and risk free, it would work as well as internal financing. If debt is available and risky, then Myers (1984) argues *intuitively* that it ought to fall somewhere between retained earnings and equity, thus creating the pecking order.

The formal analysis of a model with risky debt is not as simple as it seems when reading Myers (1984). When both debt and equity financing are feasible, there are often multiple equilibria, and it is not clear how to select among them. Noe (1988) provides an important analysis of the problem. Cadsby et al. (1998) provide experimental tests of some of the equilibrium selection arguments that have been invoked in financial theory. Path dependence and learning seem to play more important roles than do formal equilibrium selection criteria.

The subsequent theoretical literature has considered many versions of adverse selection problems. Generally, the results are not as elegant as the standard pecking order suggests. For example, the adverse selection model of Myers and Majluf (1984) assumes one-sided asymmetric information in which a firm selects securities for cash. However, if information asymmetry is two sided (as in Eckbo et al., 1990), there are several possible equilibria leading to the firm's preference for stock, or a combination of stock and cash over pure cash. Thus, in mergers with two-sided information asymmetry, firms sometimes actually prefer stock transactions over cash transactions.

Dybvig and Zender (1991) show that properly designed managerial compensation contracts (with compensation tied to the value of the firm) could solve adverse selection problems. However, in practice, one rarely observes managerial compensation contracts that are linked to firm value; they are mostly tied to equity value. Viswanath (1993) considers a world with more than one period, and he finds that the results depend on how the first- and the second-period uncertainties are related. Ravid and Spiegel (1997) consider adverse selection with no assets in place to start with. This results in entrepreneur and investor splitting the proceeds. In their setting, as in the examples discussed above, firms will use riskless debt before turning to equity financing.

Eckbo and Masulis (1992) and Eckbo and Norli (2004) extend the basic adverse selection model to allow for current shareholder participation in equity issues and underwriter quality certification. Adverse selection would be less severe if current shareholders were allowed to participate in the equity issue. In their model, firms that expect a high proportion of their current shareholder to take-up new issues face low adverse selection and prefer to issue uninsured rights. Firms with expectations of low current shareholder take-up prefer to issue equity using "firm-commitment" underwritten offerings. Firms with expectations of intermediate current shareholder take-up prefer to issue equity using

standby rights. This implies what might be termed a pecking order of equity flotation method choices.

Halov and Heider (2005) argue that the standard pecking order is a special case of adverse selection. When there is adverse selection about firm value, firms prefer to issue debt over outside equity and standard pecking order models apply. However, when there is asymmetric information about risk, adverse selection arguments for debt apply and firms prefer to issue external equity over debt. Thus, adverse selection can lead to a preference for external debt or external equity, depending on whether asymmetric information problems concern value or risk.

The main conclusion is that adverse selection models can be a bit delicate. It is possible to construct equilibria with a pecking order flavor. But adverse selection does not imply pecking order as a general situation.

2.4.2. Agency theory

The idea that managers prefer internal financing to external financing is, of course, old (e.g., Butters, 1949). Traditionally, the argument was that outside financing required managers to explain the project details to outside investors and therefore expose themselves to investor monitoring. Managers dislike this process and prefer retained earnings to external financing. But there is no direct prediction about the relative use of debt versus equity when seeking external financing. These ideas were subsequently developed into agency theories, with Jensen and Meckling (1976) being a prominent contribution.

Myers (2003) points out that some versions of agency theory imply a financing hierarchy. Agency costs of equity, for example, could result in a pecking order. Consider a simple and conventional example of the agency cost of equity that follows Jensen and Meckling (1976). The firm is owned and run by an entrepreneur. The entrepreneur has R dollars; if she invests all of R , then her return is $V(R)$ with $V' > 0 > V''$. Her consumption of desirable perks is the difference between R and the amount she chooses to invest. Let that amount of investment be I . With no outside financing, her problem is:

$$\max_I \quad V(I) + (R - I) \quad (4)$$

$$s.t. \quad I \leq R \quad (5)$$

This gives the obvious first-order condition, $V' = 1$, if the constraint is not binding. Let I^* denote the solution to this first-order condition. This gives her a payoff of $V(I^*) + R - I^*$.

What happens if the constraint is binding so that $I^* > R$? Then, outside financing is interesting. Assume that financing is with riskless debt. Then, the entrepreneur asks for $I^* - R$ and promises to repay D . The entrepreneur invests optimally and repays properly. There is no distortion. If internal financing is inadequate, then risk-free external debt does not cause any distortions.

Introduction of equity into the model requires a notion of exogenous debt capacity that becomes binding at some point. For simplicity, we directly assume that outside financing takes the form of equity, E , and that the entrepreneur cannot commit to not consuming the perks. The outsiders will get a fraction, $1 - s$, of the firm. The amount raised will be $E = (1 - s)V(I)$. Thus, the problem for the entrepreneur is now:

$$\max_I \quad sV(I) + R + E - I \quad (6)$$

$$s.t. \quad I \leq R + E \quad (7)$$

The associated first-order condition is $sV'(I) = 1$. The solution is denoted I^{**} . As long as $s < 1$, then $I^{**} < I^*$ and the entrepreneur is underinvesting. She bears the full cost of any perks not consumed, and she must share the benefits.

Obviously, this underinvestment is inefficient. Use of internal financing would result in higher welfare. Thus, retained earnings are preferred. Debt is just as good in this simple model. Equity is inefficient. We, therefore, have a version of the pecking order.

Jensen and Meckling (1976) also identified an agency problem of debt called risk shifting. The idea is that if the firm is operated on behalf of equity, only cash flows in nonbankrupt states matter. The firm will therefore tend to accept projects that are too risky but have large payoffs in good states. It is clear that this kind of behavior is sometimes observed when a firm is in desperate circumstances, but the general importance of this kind of risk-taking behavior is under debate (see Parrino and Weisbach, 1999).

If both kinds of agency conflicts are at work, then their relative importance is unclear. One might imagine that they balance at an interior optimum as in the trade-off theory. However, the details of conflicting investment incentives can lead to complex problems, as suggested by Berkovitch and Kim (1990). Eventually, dynamic agency models such as Morellec (2004) and Atkeson and Cole (2005) and dynamic trade-off models such as those discussed in Section 2.3.2 are likely to go a long distance toward closing theoretical gaps between the various approaches to leverage. It seems likely to happen over the next few years.

3. Evidence

The available evidence on capital structure is organized in six parts, as follows: evidence on financing decisions at the aggregate level; a review of cross-sectional evidence on capital structure; an examination of evidence on leverage changes and a discussion of the tests of the pecking order theory and tests of mean reversion; evidence on capital structure changes from event studies; evidence from natural experiments; and the evidence from surveys of corporate managers.

3.1. Financing decisions at the aggregate level

How has leverage changed at the aggregate level? How do firms finance imbalances between investments and internal cash flow? Do they issue debt or equity? Who holds

debt and equity claims in the economy? Who are the major issuers and purchasers of debt and equity claims? The aggregate data help answer these questions. In addition, they provide an understanding of the differences between private and public firms since the U.S. Flow of Funds data include both. By contrast, much capital structure research examines publicly traded firms included in the Compustat files. Comparing the Compustat data to the U.S. Flow of Funds data reveals many similarities in capital structure decisions of private and public firms. But there are also important differences. However, the greatest differences appear when we examine the financing behavior of small and large public firms.¹⁴

3.1.1. Balance sheet

The aggregate balance sheet data in Table 1 show the remarkable stability of leverage ratios over the last half century.¹⁵ Debt neither vanishes from corporate accounts nor explodes to overwhelm equity. Aggregate leverage seems to be quite stationary. The evidence from before the 1950s is much sketchier, but what is known reinforces this basic sense of stability. Wright (2004) provides a useful compilation of data about the corporate sector from 1900 onward. Aggregate debt and aggregate equity both grow decade by decade. While leverage fluctuates during 1900–2002, it stays within rather narrow bounds. It is remarkable how similar leverage ratios are to each other in year 1900 and in year 2002. This is despite phenomenal changes in many features of the business environment during this period.

Stylized Fact 1 *Over long periods of time, aggregate leverage is stationary.*

Similar persistence at the firm level is reported in Lemmon et al. (2007). The persistence in leverage ratios places important limits on theory. It means that a satisfactory theory must account for why firms keep leverage stationary. Or the theory must explain

¹⁴ The aggregate series for the U.S. nonfarm nonfinancial sectors are taken from the Federal Reserve's Flow of Funds Statistics (Federal Reserve, 2003). The data cover the period from 1945 to 2002. The level data are taken from Table L.102, the balance sheet data are taken from Table B.102, and the flows from Table F.102. To examine public and private firms separately, an aggregated annual series for publicly traded firms is constructed first. The difference between the series for the entire economy and the series for the publicly traded firms provides the series for the private firms. The publicly traded firm series is constructed by aggregating Compustat-listed firms. Excluded are firms identified on the database as private and foreign-incorporated firms and firms with SIC codes less than 1000 and between 6000 and 7000.

¹⁵ Interestingly, the asset structure shows significant changes, with large increases in the proportion of financial assets and decline in tangible assets. We observe that public firms hold considerably more tangible assets than do private firms. The large decline in tangible assets for the aggregate economy is primarily driven by private firms. We also find that, in recent years, public firms have noticeably higher book leverage than do private firms.

Table 1
Common-size balance sheets

This table presents average balance sheets for the aggregate U.S. Nonfarm Nonfinancial Corporate Business. The data is constructed using the Federal Flow of Funds (March 2003 release). The value of each balance-sheet item is calculated as a percentage of the replacement value of total assets and then averaged over available years in each decade.

Balance-sheet item	1945–1949	1950s	1960s	1970s	1980	1990s	2000+
Tangible assets	0.78	0.77	0.74	0.73	0.68	0.58	0.49
Financial assets	0.22	0.23	0.26	0.27	0.32	0.42	0.51
Total assets	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Commercial paper	0.00	0.00	0.00	0.00	0.01	0.01	0.01
Municipal securities	0.00	0.00	0.00	0.00	0.01	0.01	0.01
Corporate bonds	0.08	0.09	0.10	0.10	0.08	0.12	0.13
Bank loans n.e.c.	0.04	0.04	0.06	0.06	0.05	0.05	0.04
Other loans/advances	0.01	0.01	0.01	0.02	0.03	0.04	0.04
Mortgages	0.03	0.03	0.03	0.04	0.03	0.02	0.02
Total debt	0.16	0.17	0.21	0.22	0.21	0.25	0.25
Trade payables	0.06	0.07	0.09	0.08	0.06	0.07	0.08
Taxes payable	0.03	0.03	0.02	0.01	0.01	0.00	0.00
Misc. liabilities	0.01	0.01	0.02	0.06	0.15	0.18	0.20
Liabilities	0.26	0.28	0.34	0.37	0.43	0.51	0.53
Net worth	0.74	0.72	0.66	0.63	0.57	0.49	0.47
Liabilities + net worth	1.00	1.00	1.00	1.00	1.00	1.00	1.00
<i>Debt</i>							
<i>Debt + MV of equity</i>	0.36	0.32	0.27	0.40	0.45	0.32	0.32

why the environment serves to maintain the leverage despite managerial indifference.¹⁶ The market leverage ratios increased during the 1970s and the 1980s, perhaps caused by increases in the mergers and acquisitions and in leveraged buyout activity,¹⁷ but they subsequently fell to the long-term average of about 0.32.

¹⁶ For example, this poses problems for Welch (2004), who argues that changes in leverage are not undone. Frank and Goyal (2004) show that shocks in the equity market are cushioned by adjustments in the debt market in a manner that maintains the leverage ratio.

¹⁷ In a trade-off theory, if taxes affect the mix between debt and equity, then it is possible that the Tax Reform Act of 1986 increased the attractiveness of debt during the 1980s; see Givoly et al. (1992).

Stylized Fact 2 *Over the past half century, the aggregate market-based leverage ratio has been about 0.32. There have been surprisingly small fluctuations in this ratio from decade to decade.*

Following Myers (1984), it may seem that the stability of aggregate leverage is consistent with the trade-off theory. In fact, there is too much stability for the simple version of tax versus bankruptcy theory. For most of the 1950s and the 1960s, the top corporate tax rate was roughly 50% (see Taylor, 2003); in the 1990s, it was around 35%. Despite this large difference in tax rates, the market leverage ratio averaged 0.32 in both the 1950s and the 1990s, while, in the 1960s, it averaged 0.27. Have bankruptcy costs really fluctuated in just the right manner to account for this evidence? It seems difficult to imagine. This evidence, though not a proof, is certainly a serious warning sign for the trade-off theory.¹⁸ The remarkable stability of leverage ratios also poses a problem for the pecking order theory. Leverage should fluctuate as the financing deficit ebbs and flows according to the standard pecking order theory. In order to account for this evidence, something must be added to the basic pecking order theory.

3.1.2. Cash flow statements

Aggregate cash flow data (reported in Table 2 and plotted in Figure 1) show that dividends, capital expenditures, and net debt issues all fluctuate, but were rather stable over the last half of the twentieth century. The fact that aggregate dividends have not changed much contradicts some of the recent literature that finds declining dividends from U.S. firms. It is possible that the aggregate data mask a lot of heterogeneity in the dividend decisions of firms and that large increases in dividends by a certain sector of the economy offset increasing numbers of nondividend-paying firms.

Net debt issues finance a large part of the financing deficit. Equity issues are negative, and debt issues exceed the financing deficit during the last two decades, suggesting that firms issued debt to finance debt for equity swaps. While such swaps do take place, it is likely that debt-financed takeovers contribute more significantly to explaining these patterns.

Considerable heterogeneity exists between small public firms and large public firms and between private and public firms. Figure 2 plots the flow variables for *large public firms* (defined as firms whose book assets are in the top one-third of all publicly traded firms each year). For these firms, capital expenditures and internal funds are highly correlated. Their debt issues track financing deficits.¹⁹

¹⁸ The recent dynamic models that are supportive of the trade-off theory tend to use relatively recent data. For example, Hennessy and Whited (2005) study data from 1993 to 2001.

¹⁹ Faulkender and Petersen (2006) and Lemmon and Zender (2004) draw a distinction between firms with and without a credit rating. Those with a credit rating have easier access to public debt markets and thus use more debt financing. Empirically, it is likely that the large firms considered in Figure 2 are generally the firms with good credit ratings.

Table 2

Common-size statement of sources and use of funds

This table presents funds flow data for U.S. Nonfarm Nonfinancial Corporate Business. The value of each flow item is calculated as a percentage of the replacement value of total assets and then averaged over available years in each decade.

Fund flow statement item	1945–1949	1950–1959	1960–1969	1970–1979	1980–1989	1990–1999	2000–2002
Profit before taxes	0.075	0.066	0.059	0.044	0.026	0.030	0.019
Taxes	0.028	0.032	0.026	0.017	0.010	0.011	0.007
Profit after taxes	0.047	0.034	0.033	0.026	0.016	0.020	0.012
Depreciation	0.020	0.027	0.037	0.033	0.039	0.039	0.038
Internal Funds-US op.	0.067	0.061	0.069	0.059	0.055	0.059	0.050
Foreign earnings ret. abroad	0.001	0.001	0.002	0.003	0.003	0.005	0.006
Inventory valuation adjustment	–0.009	–0.002	–0.001	–0.006	–0.002	0.000	0.000
Net capital transfers	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total internal funds	0.059	0.060	0.070	0.056	0.056	0.064	0.055
Financing deficit							
+Dividends	0.015	0.014	0.015	0.010	0.009	0.014	0.014
+Capital expenditures	0.050	0.050	0.058	0.055	0.05	0.051	0.045
+Change in working capital	0.002	0.008	0.008	0.009	0.003	0.010	0.007
+Discrepancy	0.009	0.004	0.008	0.006	0.008	–0.003	–0.003
–Internal Funds	0.059	0.060	0.070	0.056	0.056	0.064	0.055
Financing deficit	0.017	0.016	0.019	0.023	0.014	0.009	0.009

(Continued)

Table 2 (Continued)

Fund flow statement item	1945–1949	1950–1959	1960–1969	1970–1979	1980–1989	1990–1999	2000–2002
Net equity issues	0.003	0.003	0.001	0.003	–0.007	–0.004	–0.004
Net debt issues	0.014	0.012	0.017	0.021	0.021	0.013	0.012
Net funds issued	0.017	0.016	0.019	0.023	0.014	0.009	0.009
Sources of debt financing							
Commercial paper issues	0.000	0.000	0.000	0.001	0.001	0.001	–0.002
Municipal securities issues	0.000	0.000	0.000	0.001	0.001	0.000	0.000
Corporate bonds issues	0.007	0.006	0.007	0.008	0.008	0.009	0.011
Bank loans increase	0.004	0.004	0.006	0.005	0.005	0.002	–0.001
Other loans increase	0.000	0.001	0.002	0.003	0.004	0.001	0.002
Mortgages issued	0.002	0.001	0.002	0.004	0.001	0.000	0.002

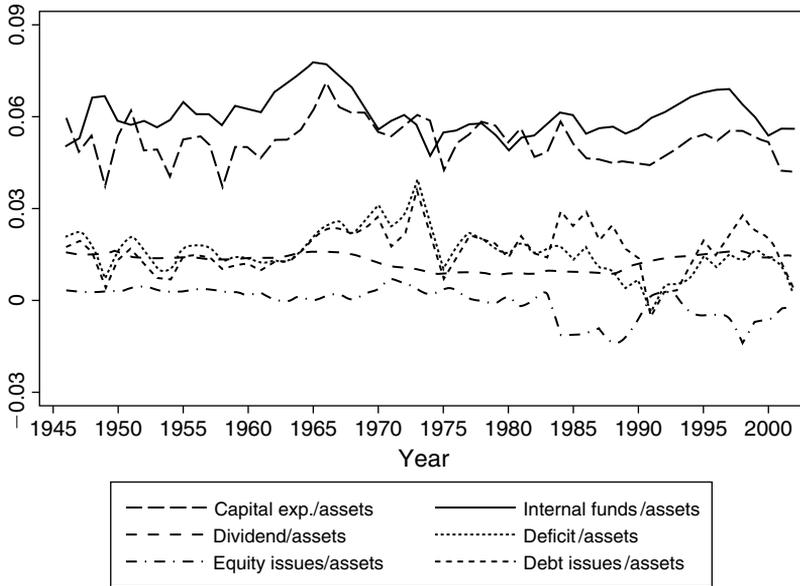


Fig. 1. **Aggregate Federal Flow of Funds Data:** Aggregate data from Funds Flow Statements (March 2003) release is used to construct capital expenditure to assets, internal funds to assets, dividend to assets, deficit to assets, net equity issued to assets, and net debt issued to assets, 1945 to 2002. The data are for the nonfarm nonfinancial corporate sector of the U.S. economy. The deficit is calculated as cash dividends plus investments plus change in working capital plus discrepancy minus internal funds.

The flow variables for *small public firms* are shown in Figure 3. Small public firms are defined as firms in the bottom one-third in terms of book assets among publicly traded firms each year. For these firms, capital expenditures exceed internal funds, and the net equity issuances and the financing deficit appear to be strongly correlated. Debt issues are fairly minor. Thus, important differences exist between large and small firms in how they finance their deficits. Large firms issue debt to finance deficits, while small firms issue equity.

Figure 4 plots the data for *private firms*. Capital expenditures tracked internal funds up until the mid-1980s, but since then internal funds have exceeded capital expenditures. Debt issues and deficits show a closer relation than do equity issues and deficits.

Several other differences between public and private firms are worth noting. Public firms are more profitable, invest more, and use more external financing (particularly equity). Private firms seem to have been increasing their dividends over time.²⁰

²⁰ This is somewhat puzzling. The aggregate Flow of Funds data say that dividend ratios have not changed. Evidence from large public firms suggests some decline, as observed by Fama and French (2001). Since small public firms pay almost no dividends, adding up the evidence seems to imply that private firms must be making up the difference through increased dividends. It would be nice to have direct evidence of such a change.

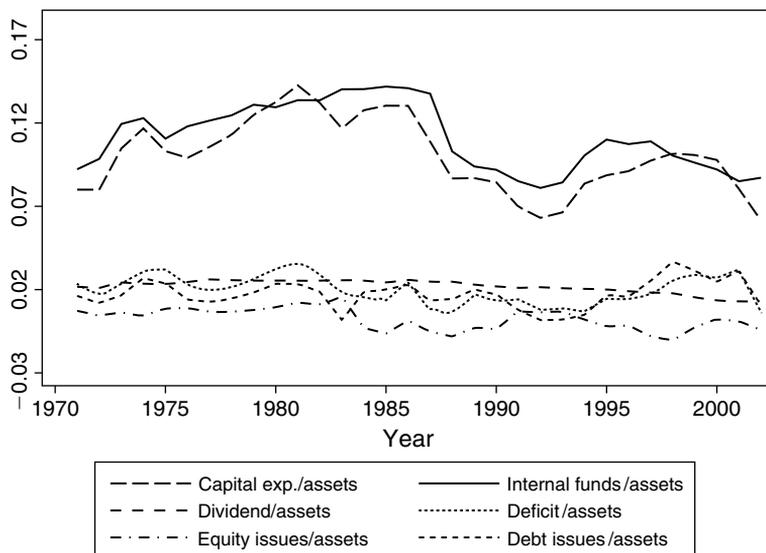


Fig. 2. **Large Public Firms from Compustat:** Average capital expenditures to assets, internal funds to assets, dividend to assets, deficits to assets, net equity issued to assets, and net debt issued to assets, 1971–2002. The sample comprises large publicly traded U.S. firms on the Compustat files (in the top one-third by book assets each year). Financial firms and regulated utilities are excluded. The deficit is calculated as cash dividends plus investments plus change in working capital minus internal cash flow. Net debt issued is long-term debt issuance minus long-term debt redemption. Net equity issued is the issue of stock minus the repurchase of stock. The variables are constructed using data from Compustat funds flow statements.

Figures 1 to 4 clearly illustrate that equity financing is more important for small public firms than it is for either private firms or large public firms. Presumably for many small public firms, the desire to issue equity easily induced them to go public in the first place.

Stylized Fact 3 *At the aggregate level, capital expenditures are very close to internal funds. This is true for large public firms and private firms; this is not true for small public firms.*

Stylized Fact 4 *At the aggregate level, the financing deficit is very close to debt issues. This holds for large public firms and for private firms; this does not hold for small public firms. For small public firms, financing deficits very closely match equity issues.*

Stylized Fact 5 *Aggregate dividends are very smooth and almost flat as a fraction of total assets for all classes of firms. There has been remarkable stability in the aggregate*

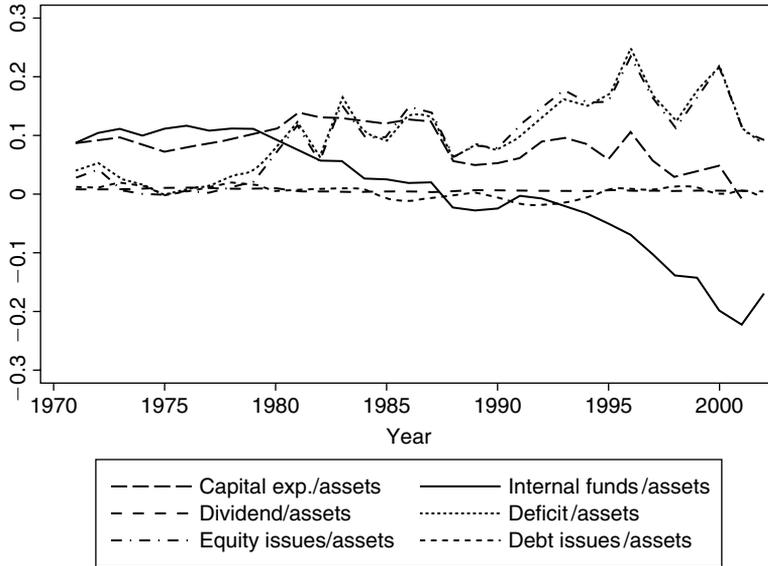


Fig. 3. **Small Public Firms from Compustat:** Average capital expenditure to assets, internal funds to assets, dividend to assets, deficit to assets, net equity issued to assets, and net debt issued to assets, 1971–2002. The sample comprises small publicly traded U.S. firms on the Compustat files (in the bottom one-third by book assets each year). Financial firms and regulated utilities are excluded. The deficit is calculated as cash dividends plus investments plus change in working capital minus internal cash flow. Net debt issued is long-term debt issuance minus long-term debt redemption. Net equity issued is the issue of stock minus the repurchase of stock. The variables are constructed using data from Compustat funds flow statements.

dividend rate over time. Large public firms pay higher dividends than do small public firms. Many small firms pay no dividends.

The evidence from before the 1950s is, as usual, quite a bit sketchier than is the subsequent evidence. Taggart (1985) suggests that stock issues were more important before World War II relative to those during the 1960s and 1970s. He also reports that, during the 1930s, aggregate total corporate debt declined, as internal funds exceeded the uses of funds. Presumably, this reflects the struggle of firms to stay afloat during the Depression. Graham and Narasimhan (2004) provide an interesting study of the Depression period.

3.1.3. Holdings of corporate financial claims

According to the Fisher Separation Theorem (Hirshleifer, 1958), with complete markets, investors are unanimous about how the firm should be run. It does not matter who provides the firms with funding. However, when markets are incomplete, it is well known that

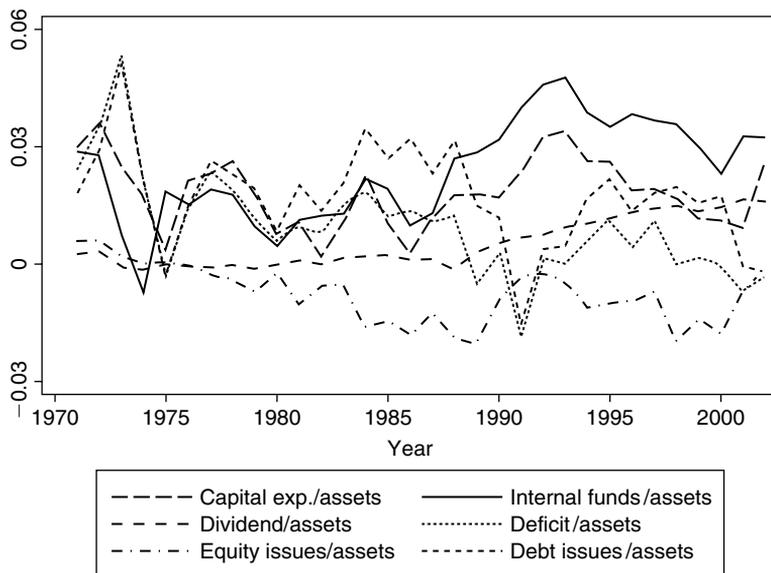


Fig. 4. **Private sector (Difference Series):** Private-sector series is the difference series between aggregate values for the nonfarm nonfinancial corporate sector for the U.S. economy from the Funds Flow statements and nonfarm nonfinancial publicly traded sample from the Compustat. The difference series is used to compute capital expenditure to assets, internal funds to assets, dividend to assets, deficit to assets, net equity issued to assets, and net debt issued to assets, 1971–2002.

differences of opinion can matter and investor clientele effects may be important.²¹ Accordingly, it is of interest to examine what we know about the providers of funds to different sectors of the economy.

Corporations raise funds from the rest of the economy. These funds come in the form of equity and debt. By definition, all debt and equity are owned either directly or indirectly. Indirect ownership happens through a variety of institutional forms, including banks, insurance companies, pension funds, and mutual funds. The markets for corporate debt and equity must reconcile investor demands with the willingness of firms to supply debt or equity. In the Flow of Funds data, debt and equity claims can be viewed as being issued by three major sectors of the economy: nonfinancial U.S. corporations, U.S. financial firms, and the rest of the world. The claims are purchased and held by six major sectors: households, governments, the rest of the world, banks, insurance companies, and funds.

Table 3 provides aggregate data on the issuers of and investors in bonds and equity. First consider the bond market. Five major sectors held most of the debt issued by the

²¹ The idea that investor clienteles might play an important role in capital structure goes back at least to Schwartz (1959). He suggested thinking about optimal capital structure in terms of monopsonistic discrimination against outside investors. The focus of the profession at this time was on making sense of Modigliani and Miller (1958), and Schwartz's paper did not receive much attention.

Table 3

Levels of Securities Outstanding by Sector

This table presents aggregate debt and equity issued and held by different sectors of the economy. Bonds issued and held are reported as a fraction of total bonds outstanding. Equity issued and held is reported as a fraction of total equity outstanding.

	1945–1949	1950–1959	1960–1969	1970–1979	1980–1989	1990–1999	2000–2002
Bond Issued by							
Corporate	0.896	0.884	0.809	0.762	0.665	0.501	0.443
Rest of world	0.091	0.061	0.071	0.080	0.083	0.095	0.087
Financial firms	0.014	0.055	0.120	0.158	0.253	0.403	0.470
Bond Holdings by							
Households	0.229	0.107	0.102	0.153	0.070	0.145	0.137
Government	0.000	0.000	0.000	0.000	0.005	0.013	0.015
Rest of world	0.010	0.007	0.008	0.026	0.123	0.132	0.196
Banks	0.126	0.085	0.048	0.109	0.121	0.087	0.085
Insurance firms	0.610	0.774	0.807	0.683	0.632	0.502	0.396
Funds	0.026	0.027	0.034	0.030	0.048	0.122	0.172
Equity Issued by							
Corporate	0.885	0.876	0.845	0.876	0.860	0.775	0.698
Rest of world	0.008	0.008	0.008	0.010	0.024	0.083	0.106
Financial firms	0.107	0.116	0.147	0.114	0.116	0.141	0.196

(Continued)

Table 3 (Continued)

	1945–1949	1950–1959	1960–1969	1970–1979	1980–1989	1990–1999	2000–2002
Equity Holdings by							
Households	0.917	0.885	0.824	0.615	0.514	0.490	0.392
Government	0.000	0.000	0.000	0.000	0.000	0.003	0.008
Rest of world	0.023	0.022	0.024	0.037	0.062	0.068	0.103
Banks	0.002	0.003	0.014	0.112	0.076	0.034	0.021
Insurance firms	0.032	0.052	0.087	0.188	0.293	0.280	0.277
Funds	0.027	0.039	0.051	0.048	0.055	0.124	0.199
Loans to Corporate/ Total bank loans							
	0.747	0.674	0.632	0.563	0.614	0.621	0.575

business sector in the 1990s: households (14% of aggregate debt), insurance companies (40%), the rest of the world (20%), pension and mutual funds (17%) and banks (9%). Over time, insurance companies have dramatically reduced their holdings of corporate debt, while the pension and mutual funds and the rest of the world have increased their holdings of corporate debt.

Bond issuers have also changed. The U.S. nonfinancial corporate sector issued almost 90% of outstanding debt in the 1950s. The financial sector played a minor role, and its outstanding debt as a fraction of total debt was only about 1%. But, by the 1990s, debt issued by the U.S. nonfinancial corporate sector declined to only about 44%; the financial sector debt now exceeds the debt from the nonfinancial corporate sector.

The equity issued by financial firms has also grown relative to that issued by nonfinancial corporate firms. Growth in equity issued in the United States by the rest of the world is even more impressive. In the 1950s, equity issued by the rest of the world as a fraction of total outstanding equity was less than 1%; by the 1990s, this number had increased to about 10%. About 70% of equity in the 1990s was issued by the nonfinancial corporate sector and the financial sector issued another 20%.

The direct holdings of equity by households have declined sharply. Equity ownership by insurance companies and by funds has increased, as has foreign ownership of U.S. equity. In the 1990s, corporate equity was held heavily by households (39% of the aggregate equity outstanding), pension and mutual funds (20%), insurance firms (28%), and the rest of the world (10%). Banks and governments do not hold much corporate equity.

Stylized Fact 6 *Over the past half century, there has been a large decrease in direct holding of corporate securities by households and a corresponding huge increase in financial intermediation of such claims.*

This growth in intermediation may be important. It is possible that in incomplete markets, mutual funds and insurance firms have different views about the appropriate rate at which they discount the future. Mutual funds may be more interested in the short term, while insurance firms may be more interested in the long term. Since 1980, the importance of insurance firms as financial intermediaries has been relatively constant, but the importance of mutual funds increased explosively over that period.²²

The change in intermediation is also important with respect to taxation. Many intermediaries pay no tax on dividends or capital gains. Depending on the type of account held by the ultimate owner, there may even be no applicable personal tax to pay. This reduces the effect of taxes on capital structures (see McDonald, 2004). If taxes were the

²² There is also some evidence that the traditional role of the bank loan has been changing, at least for large firms. In many cases, banks seem to have resold the loans in a secondary market. Sufi (2007) reports that in recent years more than 15% of nonfinancial U.S. corporate debt has come by means of a loan syndicate rather than from a single source.

full story, then all equity ought to flow into tax-advantaged accounts. Although there has been a significant flow in that direction, the flow has not resulted in all equity being held in tax-advantaged accounts.

3.1.4. Flows of corporate financial claims

Another perspective on capital structure decisions comes from examining the aggregate flows of corporate financial claims. Table 4 reports debt and equity issuances and purchases by various sectors of the economy. Consistent with the increasing share of financial sector debt, financial firms have become significant issuers of corporate debt. By the 1990s, financial sector debt issuances exceeded those by the nonfinancial corporate sector. The debt issuances by the rest of world have declined over time. Corporate debt is bought heavily by insurance firms, funds, and the rest of the world.

The net equity issuances by the U.S. nonfinancial corporate sector have been negative since the 1980s. The net issuances are defined as new equity issues less repurchases less cash-financed takeovers. Both stock repurchases and cash-financed takeovers became more important in the 1980s and in the 1990s. The negative net equity issuances imply that new equity issues by U.S. firms, together with positive net equity issuances by the rest of the world, have not been enough to offset aggregate repurchases and takeover distributions. At times, cash-financed takeover distributions have been more important than share repurchases (Wright, 2004; Holmstrom and Kalplan, 2001). The connection between mergers and acquisitions (M&A) activity and leverage deserves more attention since M&A activity is an important method by which firms exit. According to Maksimovic and Phillips (1998), it avoids at least the direct costs of bankruptcy.

Corporate equity is bought mostly by the rest of the world and mutual funds. Households have been the net sellers of corporate equity since the 1960s. Households get equity in several ways: They get it through entrepreneurship when they create a firm that did not previously exist. They get it when retained earnings increase the value of their existing equity holdings. They get it as compensation for labor, for example, through employee stock ownership plans, stock options, and stock grants.

Stylized Fact 7 *Households have been net suppliers of corporate equity since the 1960s. Corporations have been net buyers of equity since the 1980s. Most equity is no longer held directly. Insurance companies, mutual funds, and pension funds now hold more direct equity and debt than do households.*

3.2. Leverage differences between firms

Cross-sectional tests of capital structure theories examine whether debt ratios vary across firms as predicted by the theory. Two strands can be distinguished. The first strand, the bulk of this literature, is concerned with determining which factors are correlated with leverage. This literature is fairly extensive and includes contributions by Bradley et al. (1984), Long and Malitz (1985), Titman and Wessels (1988), Crutchley and Hansen

Table 4
Flows of Securities by Sector

Bond issues and purchases are divided by lagged bonds outstanding. Equity issues and purchases are divided by lagged equity outstanding.

	1945–1949	1950–1959	1960–1969	1970–1979	1980–1989	1990–1999	2000–2002
Total Bond Issuance/ Total bonds outstanding	0.096	0.081	0.079	0.101	0.127	0.114	0.102
Bonds Issued by							
Corporates	0.090	0.068	0.059	0.068	0.074	0.040	0.042
Rest of world	0.000	0.004	0.007	0.011	0.006	0.016	0.000
Financial firms	0.007	0.010	0.013	0.022	0.046	0.059	0.06
Bonds Purchased by							
Households	−0.018	0.001	0.013	0.017	0.005	0.024	0.006
Government	0.000	0.000	0.000	0.000	0.002	0.002	0.001
Rest of world	−0.001	0.000	0.001	0.003	0.024	0.018	0.036
Banks	0.009	0.001	0.003	0.013	0.018	0.005	0.009
Insurance firms	0.106	0.077	0.059	0.065	0.067	0.042	0.028
Funds	0.000	0.002	0.003	0.002	0.011	0.024	0.023
Total Equity Issuance/ Total equity outstanding	0.012	0.012	0.004	0.009	−0.018	0.004	0.003

(Continued)

Table 4 (Continued)

	1945–1949	1950–1959	1960–1969	1970–1979	1980–1989	1990–1999	2000–2002
Equity Issues by							
Corporates	0.010	0.010	0.002	0.006	−0.023	−0.005	−0.004
Rest of world	0.000	0.001	0.002	0.000	0.001	0.008	0.004
Financial firms	0.002	0.002	0.000	0.002	0.004	0.002	0.003
Equity Purchased by							
Households	0.007	0.003	−0.007	−0.007	−0.034	−0.017	−0.015
Government	0.000	0.000	0.000	0.000	0.000	0.001	0.001
Rest of world	−0.001	0.001	0.001	0.002	0.003	0.002	0.007
Banks	0.000	0.000	0.001	0.000	−0.004	−0.003	−0.001
Insurance firms	0.003	0.005	0.007	0.016	0.014	0.006	0.002
Funds	0.003	0.002	0.002	−0.002	0.003	0.014	0.009

(1989), Smith and Watts (1992), Rajan and Zingales (1995) and Frank and Goyal (2007a). The survey by Harris and Raviv (1991) has also been influential. A second strand is concerned with the debt conservatism puzzle. This puzzle lies in the allegation that many (or all) firms have lower leverage than would maximize firm value from a static trade-off perspective. Contributions include Miller (1977), Graham (2000) and Ju et al. (2005).

3.2.1. Leverage definition and other econometric issues

In testing which factors are correlated with leverage, it is necessary to define leverage. Many different empirical definitions have been used. A key issue has been whether to examine book leverage (debt divided by total assets) or market leverage (debt divided by the sum of book debt plus the market value of equity). Early empirical work tended to focus on book leverage. Myers (1977) argued that managers focus on book leverage because debt is better supported by assets in place than it is by growth opportunities. Book leverage is also preferred because financial markets fluctuate a great deal and managers are said to believe that market leverage numbers are unreliable as a guide to corporate financial policy.

The subsequent literature has given more attention to a market-based measure of leverage. Welch (2004), for example, argues that the book value of equity is primarily a “plug number” that is used to balance the left-hand side and the right-hand side of the balance sheet rather than a managerially relevant number. He further objects that it can even be negative.²³

Conceptually, book and market leverage ratios are different. The book measure looks backward, measuring what has taken place. In contrast, markets are generally assumed to be forward looking. Thus, there is no reason these two concepts should match (see Barclay et al., 2006). As Table 1 shows, we do see a difference. Market-based leverage has been rather more stable over the decades than has book leverage.

Cross-sectional leverage studies must also confront other empirical issues. One issue is how to deal with the panel structure of the data. Typically, studies examine a large number of firms over a limited number of years. Thus, one has a panel in which the errors are unlikely to be independent. How should one adjust for this lack of independence? Different papers handle the problem in different ways. The panel data textbook by Baltagi (2001) provides particularly helpful coverage of this problem. Petersen (2007) presents a useful discussion that is more directly tied to corporate finance applications. In practice, it is relatively common for studies to try more than one method of correction and then only focus on results that are robust across methods.

²³ Welch (2004) seems to prefer the use of interest coverage ratios. Frank and Goyal (2007a) show that, as an empirical issue, interest coverage ratios are not attractive. They lead to empirically fragile results. A focus on such fragile results might then serve to obscure the robust evidence that is obtained with the more popular measures.

A second issue is how to deal with incomplete data in the panel. Many firms have only incomplete records. Typical studies drop firms that lack the necessary data items. Current versions of the standard econometric packages encourage this practice since they do it more or less automatically. The user might be almost unaware that firms are dropped. However, this practice has its drawbacks. It creates a bias if the missing data are related to the process being studied. To get around this problem, statisticians such as Little and Rubin (2002) often recommend a process of “multiple imputation.”²⁴ Essentially, the observed data are used to make a best guess about the value of the unobserved data. This is done several times to reflect the fact that there is uncertainty about the imputed values. Such a procedure can help mitigate the bias. Frank and Goyal (2007a) found that the main leverage factors discussed in this section are robust to whether or not one carries out multiple imputation. However, many of the minor factors are not robust in this respect.

A third common problem for such studies is how to deal with outliers. The standard data sources such as Compustat have a nontrivial number of observations that seem quite anomalous. For instance, data items that by definition cannot be negative are sometimes coded as negative. Sometimes data items are coded in ways that result in the balance sheet not balancing or the cash flow identities not matching up. In some cases, a firm will have a value of some variable that is several orders of magnitude too large to be plausibly correct.

These “outliers” happen in too many cases for it to be practical to chase down and correct them from the original sources such as company annual reports. So how should we deal with this problem? Several approaches have been used. Some studies simply ignore the issue. This is potentially serious since we know that outliers can generate seriously misleading conclusions. Most studies take some steps to deal with the problem. Three kinds of corrections are particularly common: rule of thumb truncations, winsorization, and robust regressions.²⁵

The most common method of dealing with the problem is to use some rule of thumb to remove data that is so extreme that “it cannot possibly be correct.” Different studies employ different rules of thumb, so that one study might remove firms with a market-to-book ratio that is reported to exceed 5, while another study might remove only those that exceed 10. Many studies include some kind of minimum firm-size criterion. When a study uses a variety of such plausible, but more or less arbitrary rules of thumb, it is difficult to be sure exactly how sensitive the results are to these truncations. In particular, multiple truncation rules might interact in surprising ways.

²⁴ Currently, SAS, S-plus, and R all provide precoded routines to carry out multiple imputation. Some users have coded Stata routines to carry out multiple imputation as well, and these are easy to obtain. Multiple imputation is not yet common in corporate finance, but it seems quite likely that in the next few years this will become standard practice.

²⁵ Data problems are much more common for small firms than they are for large firms. Some studies restrict attention to large firms, and thus they largely avoid the main data problems. However, the results are then conditional on the firm size filter. It is disappointingly common for papers to use such a filter but then ignore the fact that the data have been filtered when discussing the results. As shown earlier, there are important differences in how small and large firms finance themselves.

Recently, it has become more common to use winsorization, in which the most extreme tails of the distribution are replaced by the most extreme value that has not been removed. It is particularly common to winsorize each tail at 0.5% or 1%. In essence, this procedure amounts to saying: “I do not believe the data are correct, but I know that the data exist. So instead of completely ignoring the data item, I will replace it with something a bit more reasonable.” This procedure has the advantage that it is more systematic than pure rules of thumb, and it is then easier to have consistency across papers. This kind of approach can be viewed as some type of a “poor man’s” Bayesian method. A prior is being imposed, but the full Bayesian machinery is not being used.

Another fairly common method is to run robust regressions. Most statistical packages currently include one or more types of robust procedures. The statistics literature contains quite a few alternative robust procedures.²⁶ It is fairly common for empirical papers to use some type of robust regression procedure. Typically, the results are not reported as the main results. Instead, they tend to be relegated to footnotes.

A final issue concerns the assumptions to be made about the debt market. It is now common for papers to study the ratio of book debt to the sum of book debt plus market equity. This is often accompanied by an apology to the reader. Book debt is being studied due to the inconvenient fact that a large number of firms do not have market-traded debt. Thus, only book debt numbers are available. Of course, this fact itself is informative and deserves attention. Why do so many firms have traded equity, while only relatively large firms have traded debt? Why is it that so much corporate equity is traded on organized exchanges, while so little corporate debt is exchange traded? These are not merely nuisance issues for empiricists. They are first-order facts about corporate debt that deserve attention.²⁷

3.2.2. *Leverage factors*

The capital structure literature identifies a large number of cross-sectional variables that appear related to debt ratios. However, Frank and Goyal (2007a) show that only a small number of factors are actually empirically robust and financially significant. This section summarizes the predictions and evidence for factors that exhibit the most robust correlation with leverage.

3.2.2.1. *Leverage and growth* The static trade-off theory predicts a negative relation between leverage and growth. Growth firms lose more of their value when they go into distress. Several agency theories also predict a negative relation between leverage and growth. For example, the underinvestment problem is more severe for growth firms, leading these firms to prefer less debt. The underinvestment problem arises because firms

²⁶ The popular package Stata includes the command “rreg,” which provides basic robust regression functionality. S-plus and R both provide much more complete sets of robust procedures.

²⁷ It does not seem too hard to imagine that the high fixed costs of entering public debt markets may play a role.

with risky debt have an incentive to underinvest in positive net present value projects since shareholders bear the entire cost of the project but receive only a fraction of the increase in firm value; part of it goes to debtholders (see Myers, 1977).

As growth options increase, asset substitution problems also become more severe. In high-growth firms, it is easier for stockholders to increase project risk, and it is harder for debtholders to detect such changes. Thus, debt is more costly for firms with high-growth opportunities. Agency costs of free cash flow are less severe for growth firms (see Jensen, 1986), and this also leads to the prediction that high-growth firms should have less debt. Debt mitigates agency costs of free cash flow when firms have fewer growth opportunities. The discipline that debt provides is less valuable for firms with good growth opportunities.²⁸ In summary, both the tax-bankruptcy cost trade-off and the agency theories are generally interpreted as predicting an inverse relation between the leverage ratio and growth opportunities.

By contrast, the pecking order theory predicts that firms with more investments—holding profitability fixed—should accumulate more debt over time. Thus, according to the pecking order theory, growth opportunities and leverage are expected to be positively related.

The relation between leverage and growth features in many different cross-sectional studies, including those by Bradley et al. (1984), Long and Malitz (1985), Smith and Watts (1992), Barclay et al. (1995), Barclay et al. (2006), and Frank and Goyal (2007a). The ratio of market value of assets to book value of assets is a commonly used proxy for growth opportunities. The studies generally conclude that leverage is negatively related to market-to-book ratios, which is consistent with trade-off theories. Rajan and Zingales (1995) show that the negative relation between leverage and market-to-book ratios exists in all G7 countries.

3.2.2.2. Leverage and firm size Static trade-off theory is generally interpreted as predicting that large firms will have more debt since larger firms are more diversified and have lower default risk. Larger firms are also typically more mature firms. These firms have a reputation in debt markets and consequently face lower agency costs of debt. Hence, the trade-off theory predicts that leverage and firm size should be positively related.

The pecking order theory is usually interpreted as predicting an inverse relation between leverage and firm size. The argument is that large firms have been around longer and are better known. Thus, large firms face lower adverse selection and can more easily issue equity compared with small firms where adverse selection problems are severe. There is an important caveat here. Large firms also have more assets and thus the adverse selection may be more important if it impinges on a larger base. Thus, the pecking order prediction for firm size is ambiguous. Cross-sectional tests of the relation between leverage and firm size find the relation to be robustly positive.

²⁸ The board of directors may provide a more direct method of dealing with this problem as in Yen (2005).

3.2.2.3. Leverage and tangibility of assets Tangibility of assets is typically measured by the ratio of fixed assets to total assets. Some studies construct a measure of collateralizable assets measured as the ratio of inventory plus net property plant and equipment to total assets and find a positive relation between leverage and the extent to which a firm's assets are collateralizable.

Tangible assets are easier to collateralize, and they suffer a smaller loss of value when firms go into distress. Thus, from a trade-off perspective, tangibility has an important effect on the costs of financial distress. In addition, tangibility makes it difficult for shareholders to substitute high-risk assets for low-risk ones. Agency costs of debt are therefore lower for firms with more tangible assets. Both the static trade-off and agency theories predict a positive relation between leverage and tangibility of assets. Under the pecking order, Harris and Raviv (1991) argue that the low information asymmetry associated with tangible assets makes equity less costly, resulting in a negative relation between leverage and tangibility.

The relation between debt and tangibility of assets is reliably positive. Inventory is sometimes included and sometimes excluded in measures of tangibility. Empirically, inventory seems to help to explain the use of short-term debt much more than it helps to explain the use of long-term debt.²⁹

3.2.2.4. Leverage and profitability Static trade-off theory predicts that profitable firms should have more debt. Expected bankruptcy costs are lower, and interest tax shields are more valuable for profitable firms. Furthermore, firms that generate higher profits relative to investments benefit from the discipline that debt provides in mitigating the free cash flow problem (Jensen, 1986). The pecking order theory argues that firms prefer internal finance over external funds. Thus, according to the pecking order theory, with investments and dividends fixed, more profitable firms should become less levered over time.

The empirical studies typically find a negative relation between profitability and leverage. This negative relation is traditionally interpreted as being consistent with the pecking order theory and inconsistent with the trade-off theory. However, the theory is not quite so simple. Profitability also proxies for growth opportunities. If profitability is a less noisy proxy for growth than the market-to-book ratio, the negative sign on profitability is consistent with the predictions of the static trade-off theory. More importantly, as discussed in Section 2.3.2, in a dynamic model, the traditional interpretation might not be valid. Indeed, both of the examples in that section illustrate that there are good reasons in a trade-off model for leverage to be negatively related to leverage. Thus, the trade-off theory predictions on profit are ambiguous.³⁰

²⁹ This has sometimes led to ideas of maturity matching. We do not pursue this idea here because to do so would require a more complete treatment of the various clauses and contingencies on debt contracts. Such studies are worthwhile, but they do not speak directly to Myers's contest.

³⁰ Chen and Zhao (2005) argue that neither transaction costs nor tax reasons can properly explain the negative relation between leverage and profitability. Thus, the best way to think about the relation between leverage and profits is not yet entirely settled.

3.2.2.5. Leverage and industry median debt ratios Industry leverage is a powerful predictor of firm leverage. Presumably, at least from a trade-off perspective, much of the power comes from the fact that industry leverage reflects a number of otherwise omitted common factors (Frank and Goyal, 2007a). Product market interactions are also important. As a result, the industry median leverage is likely to be a proxy for the target capital structure, albeit a noisy one. Hovakimian et al. (2001) find that firms adjust their debt ratios toward industry median debt ratios. Mackay and Phillips (2005) provide a recent analysis of industry effects on leverage and show that there is significantly more variation in leverage within industries than across industries.

3.2.2.6. Leverage and expected inflation Taggart (1985) argues that features of the tax code suggest a positive relation between debt and expected inflation. The real value of tax deductions on debt is higher when inflation is expected to be high. Thus, the trade-off theory suggests a positive relationship between leverage and expected inflation. A positive relation can also arise if managers time their debt. If managers are timing, then they will issue debt when expected inflation is high relative to current interest rates. Compared with the 1970s and the early 1980s, in recent years, inflation has not figured prominently in the academic literature on capital structure. However, the effects continue to be present in the data. Frank and Goyal (2007a) show that there is a robust positive relation between leverage and expected inflation.

Our interpretation of the evidence from cross-sectional tests of capital structure is summarized as follows.

Stylized Fact 8 *There is a core set of six reliable factors that are correlated with cross-sectional differences in leverage. Leverage is positively related to median industry leverage, tangibility, log of assets, and expected inflation. Leverage is negatively related to market-to-book and profits.*

Over time, we have acquired a better understanding of the factors that are empirically related to leverage. These reliable factors together explain about 30% of the cross-sectional variation in leverage ratios. Lemmon et al. (2007) question the relative importance of traditional leverage factors when compared to fixed effects. They show that a firm's fixed effects explain almost 60% of the variation in the leverage ratio. However, it is not clear what lies behind the unidentified components of leverage. Interpreting the evidence has also remained difficult. Many variables could reasonably be interpreted as representing different theories of capital structure. Moreover, empirical specifications are linear even when some models contain nonlinearities. Many tests are static, even though the data are generated by the dynamics of the firm's financing decisions. Thus, cross-sectional variation in debt ratios may arise because either optimal ratios differ or the actual ratios diverge from optimal ones.

3.2.3. Debt conservatism

Since at least Miller (1977), there has been some concern about the seemingly low leverage of firms given the substantial tax benefits of debt. Miller argued that bankruptcy costs appear to be too small to offset the large tax subsidies of debt: “the great emphasis on bankruptcy costs in recent discussions of optimal capital structure policy seems to me to have been misplaced. . . . the supposed trade-off between tax gains and bankruptcy costs looks suspiciously like the recipe for the fabled horse-and-rabbit stew—one horse and one rabbit” (Miller, 1977, p. 264). Dynamic trade-off models of Kane et al. (1984) and Brennan and Schwartz (1984) considerably strengthened the idea that firms are underlevered relative to the predictions of the trade-off theory.

A number of studies have attempted to quantify bankruptcy costs. Direct bankruptcy costs are indeed small (see Warner, 1977). Maksimovic and Phillips (1998) find that assets are often reshuffled between firms, and so direct bankruptcy costs may not be very high. Indirect bankruptcy costs (Titman, 1984) are likely to be much larger, but they have been difficult to quantify. A recent attempt to estimate bankruptcy costs by Andrade and Kaplan (1998) finds that, for a sample of 31 highly leveraged transactions, bankruptcy costs are between 10 and 23% of firm value.

From a different point of view, Molina (2005) observes that many estimates of default costs, such as that by Warner (1977), are ex-post estimates. Default is endogenous to the leverage decision. Molina uses the firms’ past market valuations and marginal tax rates as instruments to estimate the effect of increasing leverage on the default probability. Ex-ante costs of financial distress can be obtained by multiplying this estimated effect of leverage on the firms’ default probability with the previous estimates of ex-post costs of financial distress. Molina finds that the ex-ante costs of financial distress are comparable to the current estimates of the tax benefits of debt.

Graham (2000) estimates tax-rate functions to determine how aggressively firms use debt. He finds that a significant number of Compustat firms are surprisingly conservative in their use of debt. These are generally large, profitable, and liquid firms, the very firms that are expected to face lower costs of distress. They could have levered more. Graham concludes that the capital structures of a significant number of U.S. publicly traded firms are leaving significant sums of money on the table.³¹

As Almeida and Philippon (2007) point out, however, most debt conservatism calculations focus on expected costs of financial distress rather than the risk-adjusted costs of financial distress. This may matter. Bankruptcy occurs more commonly in bad times than in good. This is the opposite of what an insurance motive would call for. Accordingly, the utility cost must be magnified by risk considerations. Almeida and Philippon argue that this effect can be large enough to fully account for the results in Graham (2000).

³¹ Note, however, that this sounds suspiciously like the first example in Section 2.3.2. Also, these firms may have high-growth options and assets that are largely intangible. If so, then the agency costs of debt may be particularly large for this sample.

Another problem for tests of taxes is that important element of corporate taxes known as tax shelters. Information about these is very hard to find since the Internal Revenue Service (IRS) treats tax investigations confidentially. Graham and Tucker (2006) studied the results of an exhaustive search of tax court records and financial news stories and identified 44 tax-sheltering cases involving in 43 firms between 1975 and 2000. They found that firms with tax shelters use less debt as predicted by the static trade-off theory. Many scholars suspect that Graham and Tucker (2006) are only observing the “tip of the iceberg.” Unfortunately, we have no direct way of knowing the actual significance of such tax shelters.

Several recent papers attempt to reconcile the observed capital structures to those predicted by models. Minton and Wruck (2001) examine low-leverage firms and find that the low-leverage is largely transitory. These firms appear to be stockpiling financial slack or debt capacity, which is used later to make acquisitions and capital expenditures. Minton and Wruck’s evidence seems quite similar to Example 2 in Section 2.3.2.

Morellec (2004) presents a contingent claims model with manager–stockholder conflicts. The model can generate the low-debt ratios observed in practice. In another recent paper, Ju et al. (2005) present a dynamic framework that provides estimates of optimal capital structures based on a calibrated contingent-claims model. They show that firms are not underlevered relative to the predictions of their model. Maximizing share value for a firm that is calibrated to be similar to the median Compustat firm results in an optimal debt-to-capital ratio of about 15%, which is below the median Compustat debt-to-capital value of about 23%. Their results contradict the view that firms are conservative in debt financing. Their results also show that moderate deviations of capital structure from optimal values have a very small impact on firm value. Thus, in the presence of transaction costs, it may be optimal for firms to let their capital structure deviate from the target by substantial amounts. Hennessy and Whited (2005) and Strebulaev (2007) also dispute the claim that firms are underlevered relative to the predictions of dynamic trade-off models. Their models also appear to be capable of accounting for the observed corporate debt levels.

Debt conservatism has also been examined from a behavioral perspective.³² Behaviorists frequently report that overconfidence is the single most important deviation from rationality. Hackbarth (2007) presents a model in which an overconfident manager chooses higher debt levels than does a rational manager. Malmendier et al. (2005) report that, as an empirical matter, overconfident CEOs are more likely than other CEOs to raise debt (rather than equity) to cover financing deficits. They do not report on the magnitude of the effect. Instead of resolving the puzzle of why firms are underlevered, these behavioral studies deepen the debt conservatism puzzle just as the rational models are coming to grips with the problem.

While the problem of debt conservatism has attracted a certain amount of attention, it is not a first-order problem for the trade-off theory. There are a variety of ways to generate ‘low’ leverage in simulations of quite conventional trade-off models.

³² See Baker et al. (2007) for a review of behavioral approaches to corporate finance problems.

3.3. Studies of leverage changes

Leverage can change due to the firm's active decision to issue or repurchase securities. Leverage can also change when the firm's circumstances or its stock price changes. Many studies therefore examine changes in leverage (e.g., Shyam-Sunder and Myers, 1999, and Frank and Goyal, 2003). Some studies examine changes in equity (e.g., Fama and French, 2005, and Leary and Roberts, 2007). Frank and Goyal (2004) examine both changes in debt and changes in equity in a two-equation Vector Autoregression (VAR) system.

Before turning to the individual studies, it is useful to examine the raw data on leverage changes. Table 5 shows the leverage transitions from one year to the next and reports market leverage adjustments. Book leverage adjustment transitions are essentially identical and thus omitted.

The bottom row of Table 5 indicates how common each leverage category is in the overall data. Many firms have leverage ratios between 0 and 10%. As leverage increases, the number of firms declines. Only 1.2% of firms have leverage greater than 90%. Large changes in leverage are quite rare in the sense that it is common for a firm to remain within the same category from one year to the next. When the firm leaves a particular category, it typically moves to an adjacent leverage category. It is rather rare for a high-leverage firm to cut leverage dramatically.

3.3.1. Tests of the pecking order

Changes in debt have played an important role in assessing the pecking order theory. This is because the financing deficit is supposed to drive debt according to this theory. Shyam-Sunder and Myers (1999) examine how debt responds to short-term variation in investment and earnings. The theory predicts that when investments exceed earnings, debt grows, and when earnings exceed investments, debt falls. Dividends are assumed to be sticky in the short term.

Tests of the pecking order theory define financing deficit as investments plus change in working capital plus dividends less internal cash flow. The theory predicts that in a regression of net debt issues on the financing deficit, the estimated slope coefficient should be one. The slope coefficient indicates the extent to which new debt issues are explained by financing deficits.³³ Shyam-Sunder and Myers find strong support for this prediction in a sample of 157 large firms. The coefficient is 0.75 with an R^2 of 0.68 (see column 2 of their Table 2). They interpret this evidence to imply that the "pecking order

³³ Chirinko and Singha (2000) use several examples to illustrate that Shyam-Sunder and Myers's tests have low power. They show that the slope coefficient could be less than one for a firm that strictly follows the pecking order. This may happen because equity issues, while at the bottom of the financing hierarchy, are still a substantial percentage of external financing. Chirinko and Singha also show that the coefficient on deficit could be close to one even when a firm violates the pecking order model; that is, it issues equity before issuing debt or it issues debt and equity in fixed proportions.

Table 5
Leverage Transition Rates

Leverage transition rates for the untrimmed market leverage ratios (D) for the period 1950–2000. The data are from the Compustat files. Market leverage is defined as the ratio of book value of debt divided by book debt plus market value of equity. The row number is the group that the firm leverage belongs to in year t . The column number is the group that the firm's leverage belongs to in year $t + 1$. The cell entries measure percentages. Exit is defined as not a missing value in year t , but a missing value in year $t + 1$. Due to the lagging involved, the number of exits excludes the last two years.

	$D < 0$	$0 < D \leq 0.1$	$0.1 < D \leq 0.2$	$0.2 < D \leq 0.3$	$0.3 < D \leq 0.4$	$0.4 < D \leq 0.5$	$0.5 < D \leq 0.6$	$0.6 < D \leq 0.7$	$0.7 < D \leq 0.8$	$0.8 < D \leq 0.9$	$D > 0.9$	Exit	Total
$D \leq 0$	71.1	14.7	4.2	2.0	0.9	0.6	0.4	0.3	0.1	0.0	0.0	5.7	100.0
$0 < D \leq 0.1$	6.8	64.7	14.3	5.0	2.1	1.0	0.5	0.3	0.1	0.1	0.0	5.2	100.0
$0.1 < D \leq 0.2$	1.6	20.1	39.9	19.4	7.8	3.4	1.5	0.7	0.3	0.1	0.0	5.3	100.0
$0.2 < D \leq 0.3$	0.7	5.4	21.1	33.2	18.8	8.5	3.8	1.7	0.8	0.2	0.1	5.9	100.0
$0.3 < D \leq 0.4$	0.5	2.3	7.8	20.7	30.4	18.3	8.4	3.5	1.4	0.4	0.1	6.3	100.0
$0.4 < D \leq 0.5$	0.4	1.1	3.0	8.5	20.4	29.6	18.4	7.8	3.4	1.1	0.3	6.1	100.0
$0.5 < D \leq 0.6$	0.3	0.7	1.6	3.6	9.1	20.2	28.8	18.0	7.2	2.7	0.5	7.4	100.0
$0.6 < D \leq 0.7$	0.3	0.6	0.9	1.9	4.3	9.5	21.2	28.9	17.2	6.1	1.4	7.9	100.0
$0.7 < D \leq 0.8$	0.4	0.5	0.6	1.0	2.2	4.5	10.3	21.4	29.5	16.1	4.0	9.6	100.0
$0.8 < D \leq 0.9$	0.8	0.6	0.5	0.8	1.4	2.3	4.3	9.8	21.0	31.4	15.0	12.3	100.0
$D > 0.9$	1.2	0.9	0.3	0.8	0.9	1.2	1.9	3.7	7.5	23.1	42.6	16.0	100.0
Total	9.3	20.2	13.2	11.6	10.1	8.8	7.3	5.6	3.9	2.4	1.2	6.4	100.0

is an excellent first-order descriptor of corporate financing behavior” (Shyam-Sunder and Myers, 1999, p. 242).

The evidence in Shyam-Sunder and Myers is based on a small sample of 157 firms. These are large firms that traded continuously during the 1971–1989 period. The question is, what are the broad patterns of financing activity for a large cross section of firms?

Frank and Goyal (2003) examine the broad applicability of the pecking order theory. Their evidence, based on a large cross section of U.S. publicly traded firms over long time periods, shows that some firms make heavy use of external financing. On average, net equity issues track the financing deficit more closely than do net debt issues. These facts do not match the claims of the pecking order theory. The greatest support for pecking order is found among large firms, which might be expected to face the least severe adverse selection problem since they receive much better coverage by equity analysts. Even here, the support for pecking order is declining over time. They conclude that the pecking order theory does not explain broad patterns in the data.

Stylized Fact 9 *Firms frequently adjust their debt. The financing deficit plays a role in these decisions. The traditional cross-sectional factors, however, are more important than the financing deficit.*

Lemmon and Zender (2004) attempt to reconcile the findings presented by Fama and French (2002) and Frank and Goyal (2003) with those presented by Shyam-Sunder and Myers (1999). According to Lemmon and Zender, the idea of debt capacity is important in understanding the rejections of the pecking order theory. Consideration of debt capacity suggests that, when unconstrained by debt capacity, firms issue debt, but that, when constrained, they issue equity. These tests require a workable definition of debt capacity. If debt capacity is defined as the point when adding more leverage reduces firm value, then debt capacity is similar to the concept of target leverage as defined by the trade-off theory of capital structure. Thus, finding that firms use debt to fill the financing deficit when they are below their debt capacity may not sharply distinguish two theories. Lemmon and Zender operationalize the concept of debt capacity by focusing on firms with rated debt. They argue that firms with debt ratings are unconstrained by debt capacity, while firms without debt ratings are constrained. Lemmon and Zender find, as expected, that the coefficient on financing deficit in net debt regressions is significantly larger for firms with rated debt and smaller for firms with no debt rating. They also show that firms with no debt rating are small, high-growth firms and that they use equity to finance their deficits. These results are consistent with those in Fama and French (2002) and Frank and Goyal (2003). The interpretation, however, is different. While Frank and Goyal suggest that these firms face more asymmetric information problems, and thus the pecking order predicts that they should issue debt, Lemmon and Zender state that these firms are debt capacity constrained and therefore issue equity.

Another attempt to reconcile the evidence in Frank and Goyal (2003) with the predictions of adverse selection arguments is described in Halov and Heider (2005). The 2005 paper argues that when there is greater asymmetric information about risk, debt has a

more severe adverse selection problem and firms would only issue equity. To test these arguments, Halov and Heider use asset volatility as a proxy for asymmetric information about risk and divide firms into deciles based on asset volatility. They show that as asset volatility increases, firms use more equity to finance their deficits. The interpretation of these results rests on the assumption that differences in asset volatility deciles capture differences in asymmetric information about cash flow variance. The mean of the distribution is common knowledge. Thus, small, young, high-growth firms will issue equity to finance their deficits if these firm have more asymmetric information about risk and less asymmetric information about value.

Helwege and Liang (1996) found that the use of external financing by firms that undertook IPOs in 1983 did not match the pecking order prediction that financing deficit is the critical factor. Leary and Roberts (2007) find that when firms use external finance, less than 40% match the pecking order's predictions. The pecking order accurately identifies less than 20% of the observed equity issuances. They study whether these rejections are due to debt capacity or to time-varying adverse selection; they conclude that these suggestions do not account for the evidence.

Fama and French (2005) consider equity issuances. Most firms actually issue and/or retire equity in most years. Equity is issued, through many mechanisms and not only through seasoned equity offerings (SEOs). Many issues by large firms are fairly small. Violations of the pecking order are routine. More than half of the firms violate the pecking order when issuing equity. Gomes and Phillips (2005) find that half the equity issues are in the public market, whereas half are private issues. The pecking order provides a better account of the public issues and has difficulty accounting for the private issues.

Korajczyk et al. (1990) find that debt ratios do not rise prior to equity issues. There is also evidence that stock issues are typically followed by debt issues, and therefore leverage changes induced by equity issuances are only temporary (Eckbo and Masulis, 1995; Altı, 2006).

Stylized Fact 10 *After an IPO, equity issues are more important for small firms than for large firms. Many large firms infrequently issue significant amounts of equity. When larger firms do issue, the issues can be large. Many small firms issue equity fairly often.*

3.3.2. Tests of mean reversion

Static trade-off theory predicts a target debt ratio that depends on the tax benefits of debt and the costs of financial distress. By relying on adjustment costs, this theory may suggest a target adjustment process. As shown in Table 1, the aggregate data show that, in the U.S. economy as a whole, leverage is quite stable. Something must be causing such stability. It could be caused by the mean-reverting actions of individual firms, or it could be caused by the process of firm entry and exit.

Empirical tests of target adjustments focus on two related questions. First, does firm-level leverage revert to a target? Second, what do firms do when actual debt ratios deviate from the target?

Since the target is not observable, it must be estimated or its effects must be imputed. Early studies take a long-term average as the target. These early papers estimate the target debt ratio as the average debt ratio across a sample period. Examples include Taggart (1977), Marsh (1982), Jalilvand and Harris (1984), and Shyam-Sunder and Myers (1999). The approach assumes that firm characteristics that affect leverage remain unchanged over time. However, it is quite likely that the target changes over time as firm characteristics change. For example, if firms issue equity after increases in stock prices, one interpretation is that this action is inconsistent with firms targeting debt ratios because it moves them further from their target. However, an alternative interpretation is that stock price change reflects improvements in a firm's investment opportunity set. The improvement in growth prospects lowers the target debt ratio, and the equity issuance decision is a rational response of the firm to move toward its new target ratio.

Recent studies therefore adopt a two-step procedure in which an equation for the target is estimated first and the fitted value is then substituted into the adjustment equation. Examples of this approach include papers by Hovakimian et al. (2001), Fama and French (2002), Korajczyk and Levy (2003), and Kayhan and Titman (2007). For example, in the first stage in Hovakimian et al. (2001), leverage is regressed on a vector of variables presumed to affect leverage targets (similar to those described in Section 3.2). In the second stage, a logit regression predicting a firm's financing choice is estimated as a function of the difference between the actual leverage and the estimated target leverage and other variables affecting the deviation of the actual debt ratio from the target. Their results suggest that firms adjust toward target debt ratios. They issue debt when actual debt ratios are below the target, and they reduce debt when actual debt ratios are above the target. However, adjustments are stronger and more significant for debt reductions than they are for debt issuances. It is not clear why firms adjust more quickly when they are overlevered but not when they are underlevered.

The literature commonly agrees that leverage exhibits mean reversion. Mean reversion in leverage is in fact not surprising in light of the evidence that leverage has been quite stationary over long periods of time. But there is significant disagreement over how rapidly the adjustment takes place. Fama and French (2002) report estimates of adjustment speeds based on a two-step procedure of between 7 and 10% for dividend payers and between 15 and 18% for dividend nonpayers. They conclude on the one hand that reversion occurs at "a snail's pace." On the other hand, Alti (2006) and Leary and Roberts (2005) report evidence that reversion is quite fast and is mostly accomplished in two to three years.

It is also possible to substitute the target equation into the adjustment equation and then estimate the resulting structure, as in more recent papers (see Flannery and Rangan, 2006; Lemmon et al., 2007; Frank and Goyal, 2007b; and Huang and Ritter, 2007). Let $Lev_{i,t}$ denote the leverage ratio for firm i at time t and $Lev_{i,t}^*$ denote its target leverage. The standard partial adjustment equation is

$$\Delta Lev_{i,t} = \lambda(Lev_{i,t}^* - Lev_{i,t-1}) + \varepsilon_{i,t} \quad (8)$$

where λ is the speed of adjustment and $\varepsilon_{i,t} \sim N(0, \sigma_i^2)$. In other words, deviations from target leverage are corrected at a rate of λ each year. The target leverage can be specified as a function of firms' fixed effects, α_i , and time-varying firm characteristics, $X_{i,t-1}$. The parameters to be estimated are represented by β . Thus,

$$Lev_{i,t}^* = \alpha_i + \beta X_{i,t-1} \quad (9)$$

By substituting Equation (9) in (8), we get the reduced-form specification:

$$Lev_{i,t} = (\lambda\beta)X_{i,t-1} + (1 - \lambda)Lev_{i,t-1} + \lambda\alpha_i + \varepsilon_{i,t} \quad (10)$$

The estimated speed of adjustment in a dynamic panel data model with fixed effects is quite sensitive to the econometric procedures. Different papers employ different procedures and reach different conclusions. Estimations using pooled OLS ignoring the fixed effects biases the adjustment speeds downward. To mitigate these biases, Flannery and Rangan (2006) employ the firm fixed effects in Equation (10) and show rapid speeds of adjustment (about 34% per year). However, if the time dimension is short, adjustment speeds estimated using firm fixed effects are biased upward. An alternative is to employ the system generalized method of moments (GMM) as in Lemmon et al. (2007). Huang and Ritter (2007) point out that system GMM estimates are also biased upward if the dependent variable is highly persistent. They instead use a long-differencing estimator and report that leverage adjustment speeds are modest. In this case, the adjustment speeds are larger than those reported by Fama and French (2002) but lower than those reported by Flannery and Rangan (2006).

Another question is whether the target to which firms are adjusting is time varying or time invariant. Lemmon et al. (2007) show that while firms are actively managing leverage and exhibiting mean reversion, the rebalancing is largely toward a relatively time-invariant target. They argue that this target even predates the firm's IPO. Leverage ratios are relatively stable, and much of the variation in leverage is cross-sectional rather than time-series. This is in contrast to the conclusion by Hovakimian et al. (2001) and Flannery and Rangan (2006), who maintain that firms are largely adjusting to time-varying leverage targets. Frank and Goyal (2007b) provide some evidence that this firm persistence may actually result from its correlation with the managerial team. When managerial teams change, the change affects leverage. But such changes only happen every few years, and so they are highly correlated with firm fixed effects.

Shyam-Sunder and Myers (1999) have argued that mean reversion is not necessarily incompatible with the pecking order. They argue that in a pecking order world in which firms do not have leverage targets, leverage may appear to be mean reverting. This happens when capital investments are lumpy and positively serially correlated, free cash flows vary over the business cycle, and the average debt ratio is taken as the target. Chang and Dasgupta (2007) show that even with random financing and with no apparent target, leverage may appear to be mean reverting. They show that this mechanical rebalancing can lead to mean reversion in simulated data where the financing is purely random.

Transaction costs are potentially quite important. As pointed out by Leary and Roberts (2005), different forms of adjustment costs are likely to induce different patterns of

leverage changes. Fama and French (2005) argue that there are many different ways to issue equity and that these are associated with differing levels of transaction costs. It is likely that the transaction costs that a firm faces when issuing a security are generally not the same as the transaction costs associated with repurchasing that same security. Thus, it is likely that asymmetries should be found. (Of course, as pointed out by Stiglitz, 1973, there is also an important asymmetry in the tax code.) Chen and Zhao (2005) find some evidence consistent with asymmetry.

The problem of estimating adjustments is not unique to corporate finance. It arises in several fields. Caballero and Engel (2003) consider the effect of using standard econometric techniques to estimate adjustment speeds when the adjustment is lumpy and infrequent. They report that the standard practice of estimating the speed of adjustment with partial-adjustment autoregressive moving average (ARMA) procedures substantially overestimates this speed. Since the adjustment speed methods used in the capital structure literature are closely related methods, the extent to which their concerns affect current estimates is unclear. We summarize the evidence this way.³⁴

Stylized Fact 11 *Corporate leverage is mean reverting at the firm level. The speed at which this happens is not a settled issue.*

Mayor and Sussman (2004) examine the financing of unusually large projects. Large firms finance investment spikes with debt and small firms with equity. New equity issues are associated with small, loss-making firms. Mayer and Sussman also observe a tendency toward readjustment to previous levels of leverage after the spike. Kayhan and Titman (2007) also show that firms behave as if they have a target debt ratio. Their evidence suggests that investment needs, cash flows, and stock returns lead to transitory deviations from leverage targets, but firms gradually undo these deviations.

Frank and Goyal (2004) study a simple framework in which possible interactions between shocks to debt and equity are allowed to have both their own effects and cross effects on subsequent issuing decisions. To do this, a two-equation VAR system in which cointegration is permitted is estimated. They find that shocks to equity value are followed by offsetting actions in the debt market. The fact that the offsetting actions take place in the debt market is directly relevant to studies of equity market timing and seems to contradict Welch (2004).

³⁴ Caballero and Engel explain the bias as follows: “In linear models, the estimated speed of adjustment is inversely related to the degree of persistence in the data. That is, a larger first order correlation is associated with lower adjustment speed. Yet this correlation is always zero for an individual series that is adjusted discretely (and has i.i.d. shocks), so that the researcher will conclude, incorrectly, that adjustment is infinitely fast. To see that this crucial correlation is zero, first note that the product of current and lagged changes in the variable of concern is zero when there is no adjustment in either the current or the preceding period. This means that any non-zero serial correlation must come from realizations in which the unit adjusts in two consecutive periods. But when the unit adjusts in two consecutive periods, and whenever it acts it catches up with all accumulated shocks since it last adjusted, it must be that the later adjustment only involves the latest shock, which is independent from the shocks included in the previous adjustment” (p. 1).

Stylized Fact 12 *At the aggregate level, mean reversion of leverage mainly happens through debt market actions.*

3.3.3. Exit

Bankruptcy has been heavily studied in its own right. Here we only make a few observations about the connection between exit and leverage. Bankruptcy and financial distress play a crucial role in the trade-off theory. Generally, it is thought that firms in trouble are highly levered. Table 5 provides some descriptive evidence. In every leverage category, more than 5% of firms exit from one year to the next. As expected, exit is much more common for high-leverage firms than for low-leverage firms.

Bankruptcy is only one of many ways for a firm to exit. Table 6 decomposes the reasons for firm exits as listed by Compustat. By far, the most common reason for exit is either an acquisition or a merger. This alone accounts for more than half of the identified cases. Actual identified bankruptcies and liquidations are surprisingly infrequent. However, it seems likely that the “other” category includes a fair number of otherwise unidentified bankruptcies.

Stylized Fact 13 *Mergers and acquisitions are more common reasons for exit than are bankruptcies and liquidations.*

Table 6
Distribution of Compustat Deletion Codes

The table provides a distribution of Compustat deletion codes for the period 1950–2000. Companies can exit in various ways. Compustat footnote 35 provides some evidence on the relative importance of alternative exit mechanisms. This footnote appears to be somewhat incomplete and so should be regarded as suggestive rather than definitive. Frequency gives the raw count of the number of times the particular reason for deletion was listed. Fraction gives each reason divided by the total.

Reason for deletion	Frequency	Fraction
Acquisition or merger	3176	0.589
Bankruptcy—Chapter 11	368	0.068
Liquidation—Chapter 7	186	0.035
Reverse acquisition (from 1983 onward)	50	0.009
No longer fits original file format (from 1978 onward)	28	0.005
Leveraged buyout	91	0.017
Now a private company	320	0.059
Other (no longer files with SEC etc.)	1170	0.217
Total	5389	1.000

Firms that are financially distressed often take steps to try to mitigate their problems. Asquith et al. (1994) studied a group of firms that issued junk bonds and then got into financial distress. In addition to restructuring their finances, it was quite common for these firms to sell assets. Such asset sales appear to be limited by the state of the industry. Maksimovic and Phillips (1998) argue that, in fact, industry conditions are the key factor in asset redeployment. More controversially, they suggest that firms in Chapter 11 face only minor bankruptcy costs.³⁵

Exit by merger is quite different from exit by liquidation. Liquidated assets are likely to fetch low prices when sold piecemeal in second-hand asset markets. However, firms that are targets of takeovers receive large premiums. When a firm is getting into trouble, it might look for someone to acquire the firm as a going concern. To the extent that this takes place, exit through takeovers mitigates the importance of direct bankruptcy costs.

3.3.4. *The effect of current market conditions*

How important are current market conditions for leverage adjustment choices? As a matter of theory, they might or might not be important. Intuitively, it seems that market conditions ought to matter. For instance, when taking out a home mortgage, it would seem natural to look at the current term structure relative to historical norms, before deciding on the term to maturity and whether to take a fixed rate or a floating rate mortgage. Perhaps CFOs do the same thing. Such behavior may not be so crazy: “naïve investors, who judge bonds by their yields to maturity and buy long bonds when their yields are relatively high, have tended to earn superior returns in the postwar period in the United States” (Campbell et al., 1997, pp. 423–424).

Thus, it is not too surprising that the evidence points to a role for current market conditions. As shown in Section 3.2, both the market-to-book ratio and the expected inflation rate are significant factors in standard panel regressions. Both of these can be interpreted as an effect of market conditions. Frank and Goyal (2004) find that aggregate corporate debt adjusts in reaction to the current market-to-book ratio. But neither the market-to-book ratio nor the current interest rate seems to affect the aggregate long-term leverage ratio. There is good evidence that IPOs come in waves (Ritter and Welch, 2002), as do mergers (Andrade et al., 2001).

The issue of exactly how market conditions matter and how long lived the effects are is much more controversial. At one extreme, Baker and Wurgler (2002) suggest that the effects are long lived. They report that firms that issued equity when market conditions were good have lower leverage for a decade or more. They interpret this finding as support for the claim that leverage is determined by the attempt of firms to time the equity market. Chang et al. (2006) argue that information asymmetry affects a firm’s incentives to time the market. They show that firms with low information asymmetries (the ones with greater analyst coverage) have lower incentives to time the market. Firms

³⁵ Debate about the magnitude of bankruptcy costs goes back to Warner (1977). See also Andrade and Kaplan (1998).

followed by fewer analysts make infrequent but larger issues of equity. From a different point of view, Welch (2004) contends that shocks to a firm's equity are not undone, and so the effects of equity shocks on leverage are effectively permanent.

These ideas have been sharply challenged in several recent papers. First, it has been shown that such long-lived effects are consistent with dynamic trade-off theories such as Hennessy and Whited (2005) and Strebulaev (2007). Similarly, these models are able to replicate the regression results reported by Welch (2004). Thus, as a matter of theory, the evidence taken at face value does not contradict the dynamic trade-off theory.

But not everyone is willing to take the evidence at face value. Alti (2006), Leary and Roberts (2007), and Kayhan and Titman (2007) have reported evidence that "market timing" effects are present, but that they have largely dissipated after a couple of years. Huang and Ritter (2007) dispute this claim. This debate is intimately connected to the tests of target adjustment. Recall that in Section 3.3.2 we found that the rate of mean reversion is not a settled issue. Thus, it is not surprising that the durability of the market impact is also best regarded as an open issue.

The idea that managers do not react to equity shocks appears to be simply incorrect. A number of papers, including Hovakimian et al. (2001), show that good equity returns are commonly followed by further equity issues. Frank and Goyal (2004) state that equity shocks induce offsetting debt market reactions. Strebulaev (2007) points out that, in an optimizing model, managers should react to long-term changes, but not to every little blip in the market. Thus, the evidence for market condition effects appears to be compatible with fairly conventional trade-off models with varying leverage targets. The need for a completely new market timing theory as a competitor to the conventional theories is, as yet, not established.³⁶

Stylized Fact 14 *Market conditions have some effect on leverage decisions. The magnitude and durability of these effects are not settled issues.*

3.4. Market valuation of leverage changes

3.4.1. Predictions

When a firm issues, repurchases, or exchanges one security for another, it changes its capital structure. What are the valuation effects of these changes?

Under the trade-off theory, firms will only take action if they expect benefits. An implication of the theory is that the market reaction to both equity and debt securities will be positive. But the interpretation is not that easy. The market response to a leverage change confounds two pieces of information: the revelation of the fact that the firm's

³⁶ The proponents of market timing theory have not directly developed an explicit model that might then be tested on other dimensions. A new theory is normally expected to account for the facts that existing theories can already explain. So far, the proponents of market timing theory have not attempted to do so.

conditions have changed, necessitating financing, and the effect of the financing on security valuations. The information contained in security issuance decisions could be either good news or bad news. It would be good news if the firm is issuing securities to take advantage of a promising new opportunity that was not previously anticipated. It might be bad news if the firm is issuing securities because the firm actually needs more resources than anticipated to conduct operations. A firm may also issue securities now in anticipation of a change in future needs. This implies that the trade-off theory by itself places no obvious restrictions on the market valuation effects of issuing decisions. Everything depends on the setting.

Jung et al. (1996) suggest an agency perspective and argue that equity issues by firms with poor growth prospects reflect agency problems between managers and shareholders. If this is the case, then stock prices would react negatively to news of equity issues.

The pecking order theory is usually interpreted as predicting that securities with more adverse selection (equity) will result in more negative market reactions. Securities with less adverse selection (debt) will result in less negative or no market reaction. This does, of course, still rest on some assumptions about market anticipation.

3.4.2. Evidence

Announcements of ordinary debt issues generate no market reaction on average (see Eckbo, 1986; Antweiler and Frank, 2006). The lack of a market reaction to corporate debt issues is robust to various attempts to control for partial anticipation. Announcements of convertible debt issues result in mildly negative stock price reactions (see Dann and Mikkelson, 1984; Mikkelson and Partch, 1986). Announcements of equity issues result in significant negative stock price reactions (see Asquith and Mullins Jr., 1986; Masulis and Korwar, 1986; Antweiler and Frank, 2006). The announcement effects are positive when common stock is repurchased (see Masulis, 1980b; Dann, 1981; Antweiler and Frank, 2006). Equity issues by utilities generate less negative reactions than those by industrial issuers. Exchange of common stock for debt/preferred stock generates positive stock price reactions, while exchange of debt/preferred stock for common stock generates negative reactions (Masulis, 1980a).

Summarizing the event study evidence, Eckbo and Masulis (1995) conclude that announcements of security issues typically generate a nonpositive stock price reaction. The valuation effects are the most negative for common stock issues, slightly less negative for convertible debt issues, and least negative (zero) for straight debt issues. The larger the issue, the more negative the effects.

Stylized Fact 15 *Announcements of corporate debt issues and debt repurchases have little, if any, effect on the market value of the firm.*

Stylized Fact 16 *Announcements of equity issues are generally associated with a drop in the market value of the firm. Announcements of equity repurchases are generally associated with an increase in the market value of the firm.*

The negative market reaction to equity issues and the lack of a market reaction to debt issues are consistent with adverse selection arguments. Indeed, there are other interpretations. Jung et al. (1996) show that firms without valuable investment opportunities experience a more negative stock price reaction to equity issues than do firms with better investment opportunities. Thus, agency cost arguments could also explain the existing evidence on security issues. Further support for the agency view comes from the finding that firms without valuable investment opportunities issuing equity invest more than similar firms issuing debt and that firms with low managerial ownership have worse stock price reactions to new equity issue announcements than do firms with high managerial ownership.

The impact of equity issues appears to differ between countries. Several studies find positive market reaction to equity issues around the world (see Eckbo et al., 2007, for a summary). To understand this evidence, Eckbo and Masulis (1992) and, more recently, Eckbo and Norli (2004) have examined stock price reactions to equity issues conditional on a firm's choice of flotation method. Firms can issue equity using uninsured rights, standby rights, firm-commitment underwriting, and private placements. The stock price reactions to equity issues depend on the flotation method. For U.S. firms, Eckbo and Masulis (1992) find that the average announcement-period abnormal returns are insignificant for uninsured rights offerings and significantly negative for firm-commitment underwritten offerings. Eckbo and Norli (2004) in a study of equity issuances on the Oslo Stock Exchange, find that uninsured rights offerings and private placements result in positive stock price reactions, while standby rights offerings generate negative market reactions. These papers interpret the effect of the flotation method as reflecting different degrees of adverse selection problems.

3.5. *Natural experiments*

A problem with cross-sectional tests is that financial policy decisions are made jointly with investment and payout policy decisions. Thus, it is difficult to make causal inferences about debt ratios. A natural idea is thus to look for plausibly exogenous changes in a firm's environment and then see how leverage responds. This method differs from studies of leverage changes because the defining criterion is a change in the firm's environment. The literature contains a number of such studies.

Blanchard et al., (1994) examined a sample of 11 firms that received a large cash windfall without any change in marginal q . They found that firms increased their long-term debt following the cash windfall. The pecking order predicts an increase in debt if firms have attractive investment opportunities and borrow more money to undertake these projects. Since these firms did not have such opportunities, the increase in debt following cash windfalls is inconsistent with the pecking order theory.

The agency theories predict that managers expand firms when possible. Firms are able to increase debt because cash windfalls increase a firm's debt capacity. The increase in long-term debt is therefore potentially consistent with the predictions of the agency theories.

It is often suggested that cash can be viewed as negative debt. Suppose that this is correct. Then, the cash windfall is a reduction in leverage. If the original leverage was optimal, then the firm needs to increase its debt (or repurchase equity) in response to the windfall. Thus, the behavior observed by Blanchard et al., (1994) seems quite compatible with the trade-off theory perspective. The fact that the adjustment takes place in the debt market rather than the equity market is consistent with the aggregate evidence of Frank and Goyal (2004).

To examine how exogenous shocks affect firms' financing decisions, the Undistributed Profits Tax in 1936–1937 provides an interesting historical case. Christie and Nanda (1994) and Calomiris and Hubbard (1995) focus on the behavior of firms around the introduction of the tax on undistributed profits, which was introduced by the Roosevelt administration in 1936 but was abolished in 1938 following strong protests by businesses. Calomiris and Hubbard (1995) show that firms increased their debt after of the undistributed profits tax was introduced. This finding is consistent with firms increasing the amount of debt to reduce taxes on retained profits. They also show that the firms that paid the highest taxes (and lowest dividends) had high debt ratios both before and after the introduction of the tax. These are small firms with arguably high costs of external financing.

In 1986, a tax reform legislation reduced both corporate and personal marginal tax rates. Givoly et al., (1992) report that firms with high tax rates prior to the tax reform reduced their debt the most after the reform. On its own, this observation seems compatible with the trade-off theory because these are presumably the firms that receive the largest tax reductions. Graham (2003) suggests that this result is a bit surprising given the endogeneity bias of the tax rates and given the fact that the personal tax rate drops were not modeled in the analysis. This historical episode might be worth further research.

In 2003, there was a large cut in individual dividend income taxes. This event provides an alternative angle to consider the question of whether taxes affect the nature of corporate financing. In a model like that proposed by Stiglitz (1973) or Hennessy and Whited (2005), when such taxes are cut, more firms should find it attractive to pay dividends. Chetty and Saez (2005) show that there was a significant increase in dividend payments following the tax cut, along several dimensions as predicted in the tax-based theories.

Goyal et al. (2002), in their examination of the U.S. defense industry during the 1980–1995 period, found that growth opportunities increased substantially for U.S. weapons manufacturers during the Reagan defense buildup of the early 1980s and declined significantly with the end of the cold war and the associated defense budget cuts in the late 1980s and the early 1990s. It seems quite unlikely that changes in corporate debt policies altered the U.S. defense buildup. Thus, it is reasonable to consider firm leverage as reacting to the defense budgets rather than causing them.

Goyal et al. (2002) examine how the level and structure of corporate debt changed in a sample of defense firms relative to a benchmark sample over this period. As growth opportunities declined, weapons manufacturers, which were most affected by the decline in defense budgets, increased the level of debt in their capital structures. New debt issued increased significantly for weapons manufacturers during the low-growth period.

In addition, weapons manufacturers lengthened the maturity structure of their debt, decreased the ratio of private debt to total debt, and decreased the use of senior debt. Their evidence suggests that growth opportunities play a prominent role in corporate debt policies.

Baggs and Brander (2006), studying the effect of the North American Free Trade Agreement (NAFTA) on the leverage of Canadian firms, find that when domestic tariff protection is reduced, corporate profits decline at the affected firms and their leverage increases. When foreign tariffs decline, profits tend to rise and leverage declines. The results are interesting, but the interpretation is not simple. It is not clear whether the main force is the realized effect on profits or the anticipated effect that operates through growth opportunities.

Dittmar (2004) and Mehrotra et al. (2003) examine the capital structure choices that firms make when engaging in spin-offs. Spin-offs are interesting since in essence it is at this point that a capital structure must be selected. In most respects, firms allocate leverage based on attributes shown to be important in cross-sectional studies. Thus, firms with higher tangibility of assets are allocated more leverage. Assets with lower liquidation costs have more leverage. Differences in leverage between the parent and the subsidiary are negatively related to variability in the industry's operating income. In one respect, however, the results differ from cross-sectional evidence. Differences in leverage are positively related to differences in profitability.

Gilson (1997) examined the capital structures of firms emerging from financial distress and argues that Chapter 11 bankruptcy helps firms overcome transaction costs and thus permits financially distressed firms to reduce leverage. This provides direct evidence that it may not be easy for a firm to restructure its finances outside of bankruptcy, even when the actual underlying business remains valuable. This is interesting evidence of the possible nature of the transaction costs associated with high-debt levels.

Stylized Fact 17 *The natural experiments papers are generally easy to understand from the perspective of trade-off theory.*

This stylized fact characterizes the available studies, but, from the perspective of the trade-off theory, perhaps the most important natural experiment was the introduction of the corporate income tax in 1909. It would be nice to know more than we currently do about how firms reacted. It would not be too surprising if this natural experiment proves difficult to interpret under either the pecking order or the trade-off theory.

3.6. Surveys

While large sample studies offer cross-sectional variation and statistical power, they have the disadvantage that researchers cannot ask qualitative questions. Natural experiments and clinical studies provide excellent details but typically use small samples. The survey

approach provides a balance: it typically uses moderately large samples and has the ability to ask qualitative questions. Despite these benefits, the survey approach remains rare in corporate finance.

The most common criticism of the survey approach is that it measures beliefs rather than actions; the approach implicitly assumes that the manager's beliefs reflect reality. Different executives within a given firm might answer the same question in different ways. Perhaps more importantly, surveys rely on language. Ideas can be expressed in different words. In some instances, the words sound attractive, while in others they sound unattractive. For instance, it is difficult to imagine any manager agreeing that he or she is employing a "cash-burning signal." Yet, that same manager might agree that the reason a particular expensive action was worthwhile was that it proved to the market "how serious" the firm really is in some respect. As a result, considerable care is needed if the survey is to truly measure what it intends to measure. Theorists may use language somewhat differently than do practitioners.

An important contribution to the recent survey approach is by Graham and Harvey (2001).³⁷ Their study, which presents responses from U.S. CFOs, reveals that firms value financial flexibility in making debt decisions. This desire for financial flexibility seems inconsistent with the pecking order theory since dividend-paying firms (firms with relatively less information asymmetry) value flexibility the most. Graham and Harvey also find that firms that perceive their stock to be undervalued are reluctant to issue equity. But they find that large and dividend-paying firms are more likely to delay equity issuance because of undervaluation. Again, these results are surprising from the perspective of the pecking order theory.

The survey evidence suggests that CFOs consider the tax advantages of debt to be moderately important. The tax advantages are more important for firms likely to be paying more taxes (large, regulated, and dividend-paying firms). Managers show a great deal of concern about credit ratings and earnings volatility in making debt decisions. In terms of whether firms have a target debt ratio, almost 44% of the CFOs responded that they have a tight or somewhat tight target capital structure. About 34% responded that they have a flexible target and only 19% said that they have no target ratio.

Overall, the CFOs' ranking of the top three factors affecting capital structure choice—financial flexibility, credit ratings, and earnings volatility—is consistent with the view that debt decisions are influenced by a desire to avoid getting the firm into distress. This does suggest a concern to avoid bankruptcy costs or financial distress costs. The terminology is sufficiently vague that this evidence is consistent with a wide range of possible sources of such costs.

Two other recent surveys of European managers confirm the findings of Graham and Harvey (2001). Both Bancel and Mittoo (2004) and Brounen et al. (2004) report that European managers also rank financial flexibility as the most important factor in determining their firm's debt policy. In Europe, as in the United States, some firms report

³⁷ References to earlier surveys can be found in Graham and Harvey (2001).

having a target capital structure. But the target is flexible in most cases. Brounen et al. find that the tax advantage of interest expense ranked as the fourth most important factor after financial flexibility, credit rating, and earnings volatility.

Thus, different surveys now seem to provide relatively similar rankings of factors, despite the fact that the firms are operating in countries with very different institutions. This finding is somewhat reassuring. The evidence is relatively difficult to interpret in terms of the standard theories. Some of what is reported seems consistent with each theory, and other reports seem inconsistent with each theory. The stress on financial flexibility is interesting but open to a variety of interpretations. In our view, the survey evidence is of interest, but it is best regarded as being suggestive rather than providing definitive tests.

4. Conclusion

According to the standard trade-off theory, taxes and bankruptcy account for the corporate use of debt. According to the standard pecking order theory, adverse selection accounts for the corporate use of debt. There are good reasons to question the standard versions of both theories.

The trade-off theory focuses on taxes and bankruptcy costs. Until quite recently, this theory has been the dominant one in corporate finance textbooks, while, at the same time, the theory was in serious disrepute among most finance scholars. Recently, that has changed somewhat. Some of the most prominent objections to the trade-off theory have become less compelling in light of more recent evidence and an improved understanding of some aspects of the dynamic environment.

The suggestions that firms use too little debt relative to the trade-off theory were asserted with particular force by Miller (1977). However, a number of direct attempts to quantify Miller's idea, such as that by Ju et al. (2005), find that the observed debt levels are not surprising when somewhat realistic structures and parameters are considered.

Similarly, many scholars, such as Myers (1984) and Fama and French (2002), regard the lack of a positive correlation between profits and debt as a problem for the trade-off theory. However, this objection is also compatible with fairly standard dynamic trade-off models, as discussed in Section 2.3.2.

Despite the improved fortunes of the trade-off theory, it cannot be the full story. The U.S. corporate income tax did not begin until 1909 when it was introduced at a 1% rate. The use of debt contracts by businesses has a much longer history than does the corporate income tax. Thus, while taxes probably play an important role, there must be more to it.

The pecking order theory also has serious problems on a number of dimensions. Firms that have cash on hand actually issue debt. Frank and Goyal (2003) show that financing deficits does not wipe out the effect of the conventional factors. Firms routinely issue equity when they should not do so (Fama and French, 2005; Leary and Roberts, 2007). As shown in Section 3.1, leverage has been quite stationary over the recent decades.

With the standard versions of both approaches having clear flaws, it is perhaps not surprising that active research is underway.³⁸ We have a clear sense of the failings of the theories, but naturally there are differences of opinion on how best to make progress.

A lot of evidence seems consistent with bankruptcy affecting financing. The importance of collateral is quite strong in the data. A variety of other facts are also easy to interpret in this light. Direct transaction costs also seem to play a role. For instance, the differences in the use of debt and equity by small firms when compared to the use by large firms seems easy to understand in terms of direct transaction costs. The importance of retained earnings is quite consistent, with both transaction costs or taxes playing a role.

How important are the various agency conflicts relative to each other? relative to adverse selection? relative to taxes? We do not really know. A further problem is that currently there is little research that examines capital structures within a general equilibrium context. It would be nice to have calibrated versions of models along the lines of Auerbach and King (1983) or McDonald (2004). Ideally, the model might help provide an account of the kind of evidence presented in Tables 3 and 4. The remarkable growth in the role of financial intermediaries deserves much more attention than it has received in the literature on capital structure.

Many recent papers have focused on the dynamic aspects of leverage. This literature has already seriously altered our understanding of corporate capital structure. There is good reason to believe that this area of research will continue to be a productive one over the next few years. Inclusion of agency conflicts and adverse selection in these dynamic models will undoubtedly prove interesting and will help close the gap between the approaches.

Where does this leave Myers's contest? As one might have hoped, in the two decades since his address, there have been significant improvements in our understanding of the theory and marked improvements in our knowledge of the facts. Perhaps the most serious problem at this time is the lack of a satisfactory unifying model. We are not aware of any current model that is capable of simultaneously accounting for the main stylized facts, but it would be nice to have one.

5. Appendix: the stylized facts

1. Over long periods of time, aggregate leverage is stationary.
2. Over the past half century, the aggregate market-based leverage ratio has been about 0.32. There have been surprisingly small fluctuations in this ratio from decade to decade.
3. At the aggregate level, capital expenditures are very close to internal funds. This is true for large public firms and private firms; this is *not* true for small public firms.

³⁸ Since the standard versions of both theories have serious weaknesses, Fama and French (2002) have suggested that perhaps we should revert to the Modigliani-Miller theorem. However, that is not really credible either. Far too many systematic patterns hold up across countries and across time periods.

4. At the aggregate level, the financing deficit is very close to debt issues. This holds for large public firms and for private firms; this does *not* hold for small public firms. For small public firms, financing deficits very closely match equity issues.
5. Aggregate dividends are very smooth and almost flat as a fraction of total assets for all classes of firms. There has been remarkable stability in the aggregate dividend rate over time. Large public firms pay higher dividends than do small public firms. Many small firms pay no dividends.
6. Over the past half century, there has been a large decrease in direct holding of corporate securities by households, and a corresponding huge increase in financial intermediation of such claims.
7. Households have been net suppliers of corporate equity since the 1960s. Corporations have been net buyers of equity since the 1980s. Most equity is no longer held directly. Insurance companies, mutual funds, and pension funds now hold more equity and debt than households hold directly.
8. There is a core set of six reliable factors that are correlated with cross-sectional differences in leverage. Leverage is positively related to median industry leverage, collateral, log of assets, and expected inflation. Leverage is negatively related to market-to-book and profits.
9. Firms frequently adjust their debt. The financing deficit plays a role in these decisions. The traditional cross-sectional factors are, however, more important than the financing deficit.
10. After an IPO, equity issues are more important for small firms than for large firms. Many large firms infrequently issue significant amounts of equity. When larger firms do issue, the issues can be large. Many small firms issue equity fairly often.
11. Corporate leverage is mean reverting at the firm level. The speed at which this happens is not a settled issue.
12. At the aggregate level, mean reversion of leverage mainly happens through debt market actions.
13. Mergers and acquisitions are more common reasons for exit than are bankruptcies and liquidations.
14. Market conditions have some effect on leverage decisions. The magnitude and durability of these effects are not settled issues.
15. Announcements of corporate debt issues and debt repurchases have little, if any, effect on the market value of the firm.
16. Announcements of equity issues are generally associated with a drop in the market value of the firm. Announcements of equity repurchases are generally associated with an increase in the market value of the firm.
17. The natural experiments papers are generally easy to understand from the perspective of trade-off theory.

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CAPITAL STRUCTURE AND CORPORATE STRATEGY

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Abstract

In this chapter we review and discuss empirical studies that examine how a firm's financing choice affects its strategic decisions and relationships with its nonfinancial stakeholders, such as its customers or workforce. Generally, high leverage appears to inhibit a firm's ability or willingness to compete aggressively, especially against well-financed competitors. Debt also disciplines the manager–worker relationship, preventing managers from hoarding labor during economic downturns. Many of the studies also indicate that the firm's relationships with its customers can be disrupted by concerns over the firm's long term viability. A second purpose of this study is to highlight and discuss approaches researchers have taken to address endogeneity. Because the firm chooses leverage in advance, most of the studies we consider focus on exogenous shocks—either to the firm's competitive environment or to its leverage ratio. For each study, we describe the particular endogeneity problem and then discuss each author's approach to it, emphasizing differences between approaches when they arise.

1. Introduction

The connection between how a firm is financed and its other business choices is one of the most intensely examined issues in corporate finance. When considering this issue, it is convenient to think about a firm's decisions as generally falling into one of two broad categories—investment activity and corporate strategy. While in practice these decisions are linked, thinking about a firm's investment activity and corporate strategy separately allows us to better isolate the effects of capital structure on each.¹ The focus of this chapter is on the interaction between the firm's capital structure choice and corporate strategy issues that go beyond the investment choice. In particular, we consider how capital structure affects a firm's interaction with its nonfinancial stakeholders and competitors.

We define *nonfinancial stakeholders* as parties that have either a direct or indirect interest in the firm's long-term viability. These parties include customers who may be concerned about the quality of the firm's product or may anticipate additional interaction with the firm after an initial purchase, workers who develop firm-specific human capital, and suppliers who may require an investment in relationships with the firm. Each of these parties may demand compensation for the costs they will bear if the firm goes out of business, thus imposing “financial distress” costs on a firm whose capital structure introduces the possibility of bankruptcy. In addition, a firm can also face financial distress costs that arise from the actions of its *competitors*, who may choose to compete more aggressively when the firm is financially weakened.

These theories suggest that financial distress can be costly, and that the potential for incurring these financial distress costs will influence the firm's capital structure choices. Moreover, the theories suggest that a firm's financial condition will influence both its own and its stakeholders' strategic decisions. Although the majority of our discussion focuses on identifying and quantifying how leverage affects these strategic decisions, it is useful to think about this as a key step in determining optimal capital structure. For example, we will later see that firms undertaking leveraged buyouts (LBOs) may, in some circumstances, face more intense competitive pressure from rivals. The standard trade-off theory (discussed in detail by Frank and Goyal in Chapter 12) prescribes that firms take these additional pressures into account when deciding whether or not to follow through with the LBO. Similarly, if an LBO increases competition from a firm's rivals, then will a LBO firm have an incentive to stockpile cash rather pay out dividends?

¹ It has long been recognized that a firm's debt-to-equity mix can influence both its ability to invest and the characteristics of the projects it selects (Jensen and Meckling, 1976; Myers, 1977). When bankruptcy is possible, the incentives of those directing the firm's investment decisions may not lead them to make choices that maximize firm value. Examples of such conflicts of interest between equity holders and creditors are well known in the literature: asset substitution, debt overhang, choice of inferior investments with short payoff horizons, and refusal to liquidate. We refer to these costs as *investment inefficiencies* brought about by the potential for bankruptcy.

The stakeholder/competition theories have been tested in two different ways. The first type of test uses firm characteristics to proxy for the firm's sensitivity to stakeholder concerns, and it examines whether these characteristics are associated with lower leverage ratios. Most notably, Titman and Wessels (1988) find that firms with more unique or specialized products, as measured by high R&D/sales and selling expenses/sales ratios, tend to be less levered. This evidence suggests that less debt is used when financial distress is likely to be particularly costly to customers, suppliers, and workers.

The second type of study, which is the main focus of this review, investigates the extent to which leverage affects the relationships between firms and their stakeholders and competitors. This more recent literature examines how debt affects wages, the level of employment, sales, and product market prices. Although many of these studies present evidence of financial distress costs, it is often difficult to identify the specific sources of these costs. For example, although a financially distressed firm may experience declining sales and market share, these could potentially be caused by aggressive rival firms or by customers wary of doing business with a struggling company. In some cases, the empirical methodology allows us to directly identify which of a firm's specific relationships are impacted by financial distress; in others, the results may only be suggestive.

We begin with a group of studies that specifically focus on how debt affects a firm's relationship with its workers. Studies by Bronars and Deere (1991), Sharpe (1994), and Hanka (1998) focus on slightly different aspects of this relationship. The studies by Sharpe and Hanka primarily demonstrate that debt disciplines management by reducing a firm's ability to "hoard" labor during bad times, thereby increasing the sensitivity of the firm's employment to demand. Bronars and Deere present a model in which debt protects shareholder wealth by reducing the funds potentially available to labor unions; these authors then present empirical evidence supporting the contention that debt is used to deter the threat of unionization.

We then consider papers that address how financial distress can arise from disruptions in the firm–customer relationship. As noted originally by Titman (1984), a firm whose products require future servicing or maintenance may be particularly concerned about how its capital structure influences customer perceptions about its long-term health. We review two studies that contribute to our understanding of how debt affects the firm–customer relationship—Opler and Titman (1994) and Zingales (1998). While each paper presents evidence consistent with a customer-based explanation for sales and market-share declines, both explicitly consider the interaction between capital structure and competition as well.²

² "A notable omission from the the set of stakeholder-firm relationships we examine herein is that between a firm and its suppliers. Only very recently (since the final draft of this review article and its publication) has a study specifically explored this issue. In a forthcoming paper, Banerjee, Dasgupta, Kim (2007) examine both sides of a relationship where a customer constitutes a significant portion of a supplier's sales (generally 10% or more). The authors find that in such situations, both the supplier and customer maintain low leverage ratios—the former to maintain financial slack in case the relationship deteriorates, and the latter to induce customer-specific investments from the dependent supplier. Importantly, this finding is only present among industries producing durable products, where long-lasting relationships between customers and suppliers are likely to be important."

As already mentioned, a firm can also face financial distress costs through the actions of its *competitors*, since excess debt may make the firm more vulnerable to the predation of its rivals. Most studies that examine this possibility consider shocks to either leverage or competition. Phillips (1995) focuses on sharp increases in leverage in four manufacturing industries, and Chevalier (1995a, 1995b) and Chevalier and Scharfstein (1996) analyze the prices at local supermarkets after LBOs. In each of these studies, debt is shown to influence the prices charged for products, the market shares gained or lost, or the probability of exit or entry into the market. Perhaps more importantly, because of both the nature of the products and the empirical design, the observed changes in sales, market shares, or market presence are likely to be due to interactions with other firms, as opposed to interaction with nonfinancial stakeholders (such as customers).

Complementing these studies that examine competitive responses to dramatic changes in capital structure, Khanna and Tice (2000, 2005) examine competitive responses to competition shocks. The authors investigate how discount department retailers respond when Wal-Mart enters their market, with an eye on what determines the incumbent's ability to compete. Finally, Campello (2003) documents the effects of capital structure on product market competition for a large cross section of industries over a number of years.

A secondary purpose of this survey is to discuss endogeneity problems that arise in empirical corporate finance research in general and to describe how researchers studying capital structure explicitly deal with this problem. As we will see, virtually all empirical studies that attempt to shed light on the connection between capital structure and a firm's corporate strategy potentially suffer from significant endogeneity problems. Indeed, one theme we consistently find in these studies is a careful approach to endogeneity.

We begin our survey of the interaction between capital structure and its effect on real decisions by the firm with a brief review of the classical endogeneity problem in regression, after which we discuss ways in which academic researchers have addressed the issue. In contrast to the work by Li and Prabhala (Chapter 2), who provide a more detailed treatment of econometric techniques that address these endogeneity issues, our discussion is intended to provide economic intuition of the causes and solutions to endogeneity problems. As such, the "solutions" to endogeneity we discuss are often more clever than technically complicated, exploiting opportunities to approach the problem in such a way that mitigates the potentially confounding affects of endogeneity.

2. Endogeneity

Endogeneity is probably the most significant problem plaguing researchers in empirical corporate finance. Statistically, endogeneity means that the model's errors are not truly *random*, since they are partially predictable from information contained in the explanatory variables. Practically, endogeneity means that a regression is misspecified in a way that makes identifying a causal effect between two economic variables difficult, if not impossible.

How does endogeneity arise? One way is through reverse causality. For example, consider a regression with firm sales as the dependent variable and potential determinants of sales (including leverage) on the right-hand side. Although it is certainly possible that leverage can influence sales, it is *also* possible that sales can influence leverage. If poorly performing firms raise more debt capital than their better performing counterparts, then a negative relationship will arise, but not for the reason suspected.

Another related type of endogeneity can arise when the researcher is not able to control for important determinants of the dependent variable. For example, suppose that one wished to explain the debt ratios of firms in a cross section (as in Titman and Wessels, 1988). One of the posited determinants of leverage is the uniqueness of the firm's products, one proxy for which is the firm's ratio of research-and-development (R&D) costs to sales. However, another determinant of leverage is a firm's growth opportunities, since these firms may have the incentive and ability to engage in costly asset substitution; more importantly, growth firms often invest heavily in R&D. These observations in tandem highlight why including *only* R&D-to-sales may prove difficult to interpret. If the coefficient on R&D-to-sales is negative, is it because the uniqueness of the firm's products imposes costs on the firm's customers, or is it because the firm's flexibility in investment imposes potential costs on would-be creditors?

The analysis that follows explores endogeneity problems of this sort, along with the solutions various authors offer to mitigate potential bias. In many cases, the authors take advantage of an exogenous shock that is unlikely to be correlated with most (or any) of the potentially endogenously determined variables in the system. In others, careful instruments for the endogenous variable are employed in a reduced-form model that is free of bias. Some authors argue that transformed variables (often in lagged form) remove the potential for an endogenous relationship. As will become clear, there are more often than not several potential sources of endogeneity in a single study; many authors choose to deal directly with the most prominent endogeneity threats, treating the remainder with robustness checks. One feature of endogeneity is that it is often far easier to recognize than to adequately treat. Indeed, the approaches we examine often differ significantly, reflecting the difficulty faced in treating potentially endogenous relationships.

3. The determinants of capital structure choice

If a firm's leverage is affected by its relationships with nonfinancial stakeholders and competitors, then cross-sectional differences in debt levels should be observed among firms that differ in their sensitivities to these relationships. For example, firms that experience a deterioration in their stakeholder relationships when they encounter financial distress would, all else equal, be expected to choose lower debt ratios. A primary contribution of Titman and Wessels's (1988) study is to empirically document relations between a firm leverage choice and its attributes, many of which proxy for how sensitive the firm's stakeholders are to its financial distress.

The basic empirical framework is an application of the LISREL system originally developed by Karl Jöreskog and Dag Sörbom.³ The main advantage of employing this framework is that it allows for debt ratios to be determined by a family of *unobservable* firm attributes, which are specified as linear functions of *observable* proxies. The model includes eight attributes that the authors identify as potentially affecting a firm's leverage ratio: collateral value of assets, nondebt tax shields, growth, uniqueness, industry classification,⁴ size, volatility, and profitability. For the eight unobservable attributes, the authors specify fifteen observable variables (obtained mainly from accounting data for each firm), each of which proxies for one or more of the attributes.⁵ The analysis can be thought of as proceeding in two steps. First, the authors measure each of the firm's eight attributes by relating them to the observable proxy variables (the measurement model). Second, observed leverage ratios are related to each of these measured attributes (the structural model). Both steps are estimated simultaneously.

The authors measure short-term, long-term, and convertible debt (each divided by either book or market value of equity), regressing each dependent variable separately on the family of measured attributes defined in the measurement model. With regard to short- and long-term debt, only uniqueness proved a statistically significant determinant of leverage in each specification of the model. Firms offering unique products, as measured by the ratios of R&D, selling expense to sales, and labor quit rates exhibit lower debt ratios, whether measured in relation to either book or market values of equity. In addition, although an industry dummy, intended to measure the required service and maintenance associated with a firm's products, was generally statistically insignificant (with one exception), the point estimate of its partial effect was negative in every specification of either short- or long-term debt. The authors interpret the combination of this evidence as supportive of Titman (1984), which predicts lower debt ratios for firms whose liquidation imposes significant costs on its workers, customers, and suppliers.

One of the indicators of uniqueness—how often workers voluntarily left their jobs (quit rates)—reliably predicted debt ratios; firms in industries with high quit rates exhibit high leverage. One interpretation of this evidence is that in industries where workers quit frequently, financial distress is unlikely to be particularly costly to workers. We now proceed to a more recent class of studies that investigates in more detail the interaction between debt and this class of nonfinancial stakeholders.

³ LISREL is an acronym for *LI* near *Structural REL*ationships. Technically, LISREL is a computer program developed to do covariance structure analysis. Such covariance structural models are widely used in economics, marketing, and psychology. Source: *Introducing LISREL, a Guide for the Uninitiated*, Diamantopoulos, A., Siguaw, J. (2002).

⁴ The authors isolate with a dummy variable firms that produce heavy equipment and machinery, since these firms are likely to require future servicing and maintenance.

⁵ The family of observable proxies includes information from the balance sheet (ratio of intangible assets to total assets, ratio of inventory plus gross plant and equipment to total assets), income statement (depreciation over total assets, R&D-to-sales ratio), and statement of cash flows (ratio of capital expenditures-to-total assets). Many proxies are allowed to proxy for more than one firm attribute.

3.1. Debt and the firm–worker relationship

Sharpe (1994) and Hanka (1998) each consider how debt affects a firm’s relationship with its employees. Their basic findings are that firms with high leverage pay lower wages, fund pensions less aggressively, and provide less job security to their workers during downturns. Consistent with the preceding discussion regarding endogeneity, both studies carefully consider potentially omitted variables that may bias their estimates.

Sharpe considers this issue explicitly, acknowledging that although employment growth (one of the dependent variables he estimates) should be related to current and expected sales growth, sales growth is an endogenous variable that may also depend on employment. Alternatively, both sales and employment may mutually depend on factors unobserved by the econometrician. Sharpe estimates pooled regressions for multiple firms over time of the form:

$$\begin{aligned} \Delta E_{it} = & (\beta_1 + \beta_3 \text{LEV}_{i,t-2} + \beta_5 \text{SIZE}_{i,t-2}) \Delta S_{i,t+1} \\ & + (\beta_2 + \beta_4 \text{LEV}_{i,t-2} + \beta_6 \text{SIZE}_{i,t-2}) \Delta S_{i,t} \\ & + (\beta_0 + \beta_7 \text{LEV}_{i,t-2} + \beta_8 \text{SIZE}_{i,t-2}) + u_{i,t} \end{aligned} \quad (1)$$

in which E refers to the number of employees at year end, LEV to book leverage, SIZE to inflation-adjusted capital stock, and S to sales. All changes are divided by their initial levels. The point of estimating (1) is to investigate how leverage affects a firm’s sensitivity of employment to its current and future sales. Sharpe’s primary interest is to ask whether leverage or size affects a firm’s tendency to “hoard labor” during downturns. The signs of β_3 and β_4 indicate whether employment changes in highly levered firms are more sensitive to shocks in current and future sales than those of their less levered counterparts. Similarly, coefficients β_5 and β_6 tell us whether a firm’s size influences how sensitive its employment is to current and future sales shocks.

The preceding specification must address a number of endogeneity issues. One is that sales and employment growth are mutually dependent, since changes in employment can certainly cause changes in sales (think about reducing the size of the sales force). To address this issue, changes in sales, ΔS , are regressed against a set of macroeconomic instruments that are presumably exogenous from the perspective of each firm. These instruments include changes in interest rates, ratios of inventories to sales, growth in industrial production, and the Consumer Price Index (CPI) inflation rate. By effectively asking whether firms with different leverage ratios react differently to changes in the business cycle (which are presumably not predictable by firms), Sharpe is able to isolate the effect of size and leverage on unexpected shocks to a firm’s demand.

Sharpe’s argument that size is largely exogenous seems reasonable; however, leverage is certainly not exogenous, having been chosen by management simultaneously with the firm’s employment level. To address the problem of simultaneity, Sharpe uses lags of both book (alternatively market) leverage and size in his empirical model. The hope is that leverage *levels* chosen at least a year in the past are not correlated with

changes in current employment, after controlling for current and future sales growth with macroeconomic instruments. Sharpe does *not*, however, assume that using lagged leverage ratios solves the endogeneity problem. Indeed, he acknowledges that firms may select their debt ratios based in part on the costs associated with adjusting their labor forces; that is, firms with more flexible labor forces may be less risky and thus able to choose higher debt ratios. We discuss this matter in more detail later in this chapter.

Sharpe estimates Equation (1), separately for durables and nondurables from 1959 to 1985. While it is indeed the case that leverage increases a firm's employment sensitivity to sales, the impact is more pronounced in the subsample of firms that produce durable goods.⁶ In the durable category, a firm with zero debt lays off 8% of its workers in response to a 10% decline in sales, while a firm with 100% debt reduces its workforce by 11.5%. This finding is important in its own right. For example, one direct implication is that a highly levered firm may have difficulty attracting employees and inducing them to build firm-specific human capital if highly levered firms are viewed as providing more risky employment.

Sharpe acknowledges, however, that interpreting the impact of leverage on a firm's sales elasticity of employment should be done carefully. As mentioned previously, all of Sharpe's findings are consistent with firms optimally choosing capital structures that reflect their labor-adjustment costs. For example, as we mentioned earlier, a firm's debt choice may reflect the *specificity* of the human capital it affords its employees. If the knowledge and skills imparted to a firm's workers are transferable to other firms, then layoffs are not particularly costly events; therefore, firms offering fungible human capital may choose high-debt levels. Sharpe's evidence is also consistent with other interpretations, such as that advanced by Jensen (1986 1989). This alternative suggests that debt provides discipline to managers who incur psychological costs from laying off their workers during recessions. Sharpe's finding of asymmetry between hiring and firing (debt increases layoffs during recessions but does not increase hiring during expansions) is consistent with this interpretation.

Hanka motivates his work largely from Sharpe's study, claiming that although the results are suggestive, its design makes it difficult to infer increased layoff risk due to leverage. Again, endogeneity is the culprit, this time from omitted variables. What if, Hanka argues, the observed correlation between debt and employment reductions is due to factors that were not included as controls, such as poor historical performance or low-growth opportunities? Using a set of variables from 1950 to 1993 including wages, funding of pensions, and use of seasonal employees, Hanka augments Sharpe's analysis by explicitly controlling for determinants of these dependent variables. He finds that highly levered firms pay lower wages, are more likely to lay off their employees, and fund pensions less generously, conclusions that largely agree with those advanced by Sharpe.

⁶ As Sharpe indicates, "if there is any effect of leverage or size on the cyclical of employment and sales, it should be more easily detected among firms in industries for which cyclical fluctuations are a more dominant feature of the dynamics" (p. 1062).

Hanka's empirical tests use leverage as an explanatory variable to explain dependent variables that relate to employment. Similar to Sharpe's study, Hanka's tests suffer from two important potential sources of endogeneity: (1) reverse causality: leverage is selected by firms, perhaps taking into account the costs they face of changing the size of their workforces, and (2) omitted variables: employment is determined by a complex set of factors, for which many are difficult to control with proxies.

In some cases, it is possible to identify the likely direction of the endogeneity bias, which can potentially strengthen the results. For example, Hanka mentions that if firms select low-debt levels when facing high costs of financial distress, then high-debt levels should predict fewer employment reductions, since a choice of high leverage indicates a low probability of financial distress and accompanying layoffs. This would bias the results against finding the observed empirical results.⁷ Regarding the omitted variables problem, Hanka is particularly careful to attempt to control for potential determinants of employment such as growth opportunities and performance, which may be correlated with leverage.

Hanka presents results from a censored regression of employment layoffs on various sets of controls.⁸ In a model without controls for divestitures, performance, and growth opportunities, debt is seen to be positively related to layoffs. A firm that increases its debt from the 10th to the 90th percentile increases its layoffs by 140%. When controls for asset sales are added, this effect is cut in half; when controls from current and prior performance are added, the effect is halved yet again. While controls for operating efficiency and divestitures remove a significant amount of debt's impact on employment reductions, debt is still seen to play a role in a firm's employment policy.

As Hanka argues, however, debt's strong correlation with performance makes it "difficult to be sure that the effects of performance have been completely purged from the results." Hanka addresses this concern by forming portfolios based on performance (ROA) and debt. As he notes, if performance (rather than debt) is driving the results, then employment reductions should increase with declining performance, regardless of leverage. However, Hanka presents evidence that this is clearly *not* the case. While poorly performing firms do indeed lay off more employees than their better performing counterparts, the leverage effect is just as strong—often more so. For the most levered quartiles, firms with both better performance and lower debt exhibit less employment

⁷ Sharpe mentions that reverse causality may occur if characteristics related to the dependent variable (cost of employment reductions) influence a firm's choice of a dependent variable (leverage). Hanka acknowledges that if firms facing low costs of reducing their workforces choose higher debt levels, then the resulting estimates may be biased. This type of endogeneity, unlike that mentioned in the paper's body, would bias the magnitude, but not the sign of the resulting estimate. The combination of the above arguments causes Hanka to argue that although "endogeneity may bias the magnitude of the empirical results, [it] cannot easily cause their sign to be opposite that of the true causal relation" (p. 252).

⁸ Hanka argues that a Tobit specification—where employment increases are censored at zero—is appropriate, since the goal of the model is to measure debt's impact on a worker's probability of being laid off. Although such a model ignores variation with regard to *increases* in employment, Hanka mentions that the results are still significant without censoring.

reduction; since worse performance should increase employment reductions, it is hard to argue that debt fails to influence a firm's layoff decision, even after controlling for performance. Hanka thus addresses the potential endogeneity from omitted variables through both regression controls, as well as through nonparametric tests that apply dependent sorts on the potentially endogenous variable of interest.

Hanka also presents evidence that firms with higher debt ratios pay lower wages, after controlling for size, industry, changes in employment, and the fraction of assets depreciated (to capture life-cycle effects). A firm that increases its leverage from the 10th to 90th percentile pays about \$2300 less annual wage per employee, which is slightly less than 8% of the average of \$28,000. In accompanying tests, Hanka also shows that highly levered firms fund pensions less generously and that more levered firms are more likely to rely on seasonal employees.

Hanka's interpretation is that debt "disciplines" managers, forcing them to make choices that may be personally unpleasant. These results, as well as those in Sharpe, are thus consistent with Jensen's (1986) free cash flow theory. One may also be able to develop an explanation for these results based on Myers (1977) debt overhang theory; a highly levered firm may underinvest in its employees when they are financially distressed or financially constrained. Finally, these results are also consistent with the idea that firms with more flexible labor forces can handle higher debt loads. In other words, it may be the nature of the labor force that generates observed capital structures rather than the capital structures influencing employment policy. While both Hanka and Sharpe are aware of this endogeneity problem, there is no apparent way to unambiguously determine the direction of causality in this case.

In the next paper we discuss views the firm–employee relationship through the perspective of labor unions, showing how debt can also alter this dynamic in a way that benefits shareholders. Bronars and Deere (1991) develop a model in which union behavior depends on the firm's capital structure—debt induces unions to act less aggressively.⁹ In the first of two model specifications, a labor union faces the choice of either forcing the firm into bankruptcy and then negotiating with creditors or accepting a lower wage. Because creditors are assumed to operate the firm with an efficiency loss, it can be shown that the union's optimal strategy is to accept lower wages and avoid bargaining over a smaller surplus. In a second specification, the union forms and sets its wage simultaneously. When bankruptcy is costly for workers,¹⁰ "the union will moderate its demands in the face of outstanding debt." In either specification, debt shields funds that would otherwise flow from shareholders to workers; the empirical implication is that firms facing a greater threat of unionization use debt more aggressively.

Empirically, this can be written as:

$$DE_{fi} = X_{it}\beta + \gamma\pi_{fi} + \varepsilon_{fi}, \quad (2)$$

⁹ See also Dasgupta and Sengupta (1993) and Perotti and Spier (1993).

¹⁰ Bronars and Deere mention that such costs may arise from job loss or organizing another (perhaps unsuccessful) union drive.

where DE_{fi} is firm f 's debt-to-equity ratio in industry i , X_{it} is a vector of control variables, π_{fi} is the (unobserved) probability that firm f is unionized, and ε_{fi} is an error term. Since whether or not a firm is unionized is a binary variable, Bronars and Deere use the *industry average* for unionization as a proxy for the threat of unionization at the firm level. Thus, two firms with differing union status within the same industry are treated as having identical threats of unionization.

Bronars and Deere face a potential bias due to the way both the threat of unionization and leverage are measured. Consider, for example, the null hypothesis that the threat of unionization has no impact on a firm's choice of leverage—in this case, firm leverage and the threat of unionization should be uncorrelated. However, when unions form unexpectedly, market values of equity decline (to reflect potential wealth transfers from equityholders to the union), which increase the measured values of firm leverage. Thus, if we compare unionization and debt ratios across industries, there will be a positive correlation due to the negative impact on equity value caused by unionization. In this case, the null hypothesis may still be valid, despite positive correlation between average unionization rates and leverage levels.

Bronars and Deere correct for this potential bias in two ways. First, they estimate a model that measures the equity loss when unionization campaigns are successful. An adjustment factor for each industry is calculated, based on that industry's unionization rate and the average fraction of equity lost after successful campaigns.¹¹ The second adjustment is based on the idea that higher wages earned by union workers come out of the pockets of equityholders. By taking the present value of the union rents and adding them back to the observed equity values, the authors produce estimates of equity values when facing only the *threat* of unionization, not its actual occurrence.

Although regression results using the second (that based on the union wage premium) adjustment yielded an insignificant coefficient on unionization rates, the majority of Bronars and Deere's results are strongly supportive of a positive relation between the threat of unionization and debt ratios.¹² In both regressions using the first adjustment to equity as well as those with an alternative leverage measure that does not require adjustments (debt-to-margin and debt-to-paid in capital), debt ratios are strongly positively related to the unionization rates in their industries.

3.2. *Debt and the firm–customer relationship*

The remainder of the studies we examine in this chapter show how capital structure affects a firm's sales and/or market share. As we will see, these studies present us with at least

¹¹ The authors note that because they are adjusting the dependent variable (leverage) by an adjustment factor that is itself a function of one of the regressors (unionization rate), coefficients are downward biased.

¹² In Bronars and Deere's setting, it may be tempting to ask why labor unions do not explicitly bargain over the debt ratio. The reason is that labor laws specifically prohibit unions from negotiating over issues that do not directly influence workers.

two empirical hurdles. The first problem is endogeneity; although we are interested in debt's effect on a firm's sales and market share, we suspect that shocks to sales influence observed debt ratios. Second, even if we can properly infer the correct direction of causality, it may still be difficult to identify *how* the observed changes in performance occur (i.e., through customers or competitors). In this section, we focus on the aspects of two studies (Opler and Titman, 1994; Zingales, 1998) that relate to the firm–customer relationship.

The issues considered in these studies were originally explored by Altman (1984), who attempts to measure both the direct costs (i.e., those paid explicitly by the creditor(s) in the event of reorganization/liquidation such as legal fees) and indirect costs (e.g., losses of sales and foregone profits) of bankruptcy for a sample of 19 firms following bankruptcy filing. Altman interprets the observed loss in sales as evidence of financial distress costs; specifically, he “assumes that the prospect of bankruptcy will often lead to lower than expected earnings.” However, Altman admits that his results are also consistent with the alternative interpretation that “lower than expected earnings could cause the management to declare bankruptcy.”

Opler and Titman are primarily concerned with measuring financial distress costs in a way that mitigates this inference problem caused by reverse causality. They do so by identifying industries that are economically distressed rather than directly identifying financially distressed firms. They then measure the financial leverage of firms within these economically distressed industries two years prior to the industry's decline, and they assume that the more highly levered firms within these industries are more likely to be financially distressed than their more conservatively financed counterparts in these industries. Thus, if a firm's financial distress affects sales and other performance measures, the more highly levered firms should do worse than their less levered counterparts in these time periods.

Specifically, Opler and Titman examine data for the 20-year period spanning from 1972 to 1991, and they run regressions of the following form:

$$\begin{aligned} \text{Firm performance} = & \alpha + \beta_1 \text{Log(Sales)} + \beta_2 \text{Lagged industry-adjusted profitability} \\ & + \beta_3 \text{Industry-adjusted investment/assets} \\ & + \beta_4 \text{Industry-adjusted asset sale rate} \\ & + \beta_5 \text{Distressed industry dummy} \\ & + \beta_6 \text{High leverage dummy} \\ & + \beta_7 \text{Distressed industry dummy X High leverage dummy} + \varepsilon \end{aligned}$$

in which a “distressed industry” takes a value of one when the industry median sales growth is negative and the median stock return is below -30% . Firm performance is measured with industry-adjusted sales growth, industry-adjusted stock returns, and industry-adjusted operating income. Since financial distress costs are likely to be the highest for firms experiencing both economic (as measured by the distressed industry

dummy) and financial distress (as measured by the high leverage dummy), the main interest is in the coefficient of the interaction term, given by β_7 above.

The coefficient estimates on leverage (β_6) are negative when the measures of performance are either industry-adjusted stock returns or industry-adjusted sales growth, indicating that highly leveraged firms performed worse than their peers with lower leverage even in *good* times. The interaction term is also statistically significant and negative in each empirical specification, indicating that this effect is magnified in downturns. Specifically, during industry declines, a firm in the most leveraged decile experiences industry-adjusted sales declines of 25% more than its peers in the least leveraged decile. When operating income is the dependent variable, the coefficient on the interaction term is no longer significant.

Throughout the paper, Opler and Titman express concern about three possible sources of endogeneity bias:

- **Self-selection.** First, it is likely that firms with the highest costs of financial distress choose the lowest debt ratios.¹³ While it is impossible to correct for this bias in the data, the authors argue that endogeneity of this type would bias the estimates toward zero. In other words, the tests may underestimate the effect of financial distress.
- **Reverse causality.** Although high leverage levels may lead firms to experience poor performance, poor performance may also lead to higher observed leverage levels (either because distressed firms borrow more, or because their market values decline, which increases their leverage ratios). This is potentially the most serious endogeneity problem and is largely addressed by the empirical design itself. First, the study controls for past profitability. In addition, Opler and Titman compare the performance of firms with high and low leverage in industry downturns (which are largely unanticipated when leverage choices are made) and argue that if having a high-debt ratio is costly, then it should be more costly during industry downturns that can cause the highly levered firms to become distressed.
- **Omitted Variables.** Leverage may serve as a proxy for other firm characteristics that are difficult to control for. Suppose, the authors argue, that poorly run firms fail the fastest in industry downturns and that these firms are also highly leveraged. If this is the case, then even if financial distress is not costly, there will be a negative correlation between leverage and performance. Opler and Titman attempt to mitigate this concern by measuring leverage with book values, since its correlation with profitability is lower than when market values are used.

Although the results of these performance regressions suggest that financial distress is costly, Opler and Titman acknowledge that further analysis is warranted. They claim, for example, that sales declines could be evidence of “efficient downsizing” and that

¹³ Although firms with different capital structures are likely to be different along some dimensions, there exists a theoretical rationale for identical firms to be financed differently. For example, in Shleifer and Vishny (1992) firms that are ex-ante identical choose different debt ratios.

the stock return evidence may be driven by a pure leverage effect.¹⁴ To investigate this possibility, they ran the same regressions after trifurcating the sample along three dimensions: size, research and development as a percentage of sales, and industry concentration.¹⁵ Consistent with Baxter (1967), Titman (1984), and Maksimovic and Titman (1991), Opler and Titman find that the interaction term is more pronounced (more negative) among firms that invest heavily in research and development. Since these firms are most likely to offer unique products, and those that benefit from a long-term relationship between the customer and firm, the evidence is consistent with sales declines arising from customers wary of doing business with a struggling firm that may not survive to service and maintain its products. This R&D effect is also found with respect to stock returns. Regarding competitor-driven financial distress costs, Opler and Titman report that sales and market values of equity decline in concentrated industries, where the benefits to predation are likely to be the highest. Finally, they examine asset sales, investment rates, and employment growth rates between firms with high leverage and those with low leverage during industry downturns. Neither asset sales nor investment of highly leveraged firms during industry downturns exceeds those of firms with lower leverage. This finding suggests that manager-driven cost-cutting is not likely to be the explanation for the poor performance differential.

Zingales's (1998) study of the trucking industry's deregulation in 1980 also attempts to separate losses driven by customers and those caused by predating rivals. Like many of the other studies we examine, Zingales recognizes the potential for endogeneity to bias results in studies of the interaction between product markets and leverage. In particular, he notes not only that reverse causality may arise if trucking firms are able to adjust their capital structures in anticipation of deregulation, but also that spurious correlation between leverage and performance can arise if unobservable characteristics are not adequately controlled for in the explanatory variables.

The event Zingales examines is the unanticipated¹⁶ deregulation of the U.S. trucking industry between 1978 and 1979. During this time, the Interstate Commerce Commission (ICC) largely reversed its policy regarding new service applications into the industry and liberalized rate-setting practices. With such deregulation, trucking firms began to engage in intense price competition, which decreased their market values relative to the

¹⁴ Consider, for example, two firms that differ only in their leverages. When industry returns are negative, the more highly levered firm will experience comparatively lower returns purely from leverage, even in the absence of financial distress costs.

¹⁵ The authors also investigate asset sales, exit, employment, and investment, in hopes of shedding light on whether the observed sales declines could have arisen from management acting optimally in response to economic distress. The bulk of the evidence (employment being the exception) did not favor a manager-driven explanation.

¹⁶ Because part of the paper's appeal is based on the exogeneity of the shock, Zingales is careful to defend the deregulation event against the criticism that it was anticipated. First, Zingales reviews the *S&P Outlook* newsletter during the years around his study, and he concludes that 1977 was the "watershed" date (his measures of leverage, therefore, were collected prior to this date). Second, the author notes that market values of equity in the trucking sector suffered serious declines from 1978 to 1980, evidence that the deregulation event was largely unanticipated by the market.

preregulation environment. The result was that, for most firms, their ratio of debt to market value of equity (largely represented by trucking firms' operating certificates) was exogenously increased,¹⁷ which provides a natural experiment to examine the effects of capital structure on the product market environment.

The main class of results addresses whether more efficient firms were most likely to have survived the deregulation, regardless of their financing arrangement. The basic model has the following form:

$$Pr\{\text{survival in 1985}\}_i = f(X_i^{1977}, Lev_i^{1977}) + \varepsilon_i$$

where X_i^{1977} refers to a vector of proxies for the level of operating efficiency, Lev_i^{1977} is the net debt-to-capital ratio (calculated as total debt minus cash reserves divided by total debt plus equity), and ε_i is a mean zero noise term. The elements of X_i^{1977} intended to capture efficiency are the log of sales, fraction of intangible assets, return on sales, proportion of wages over total costs, and nine regional dummies. Since leverage is related to profitability, and since profitability affects survival, a spurious correlation between leverage and exit may arise if determinants of survival (other than leverage) are not included in the empirical model. Return on sales is intended to control for the efficiency of each motor carrier, a control that is crucial in defending a relation between eventual exit and ex-ante leverage. Size is included as another proxy for efficiency (since the largest firms may be the most efficient) and also serves to control for access to financing. The fraction of intangible assets is important because it potentially measures the monopoly rents enjoyed by a carrier prior to deregulation through its operating certificates. Finally, the proportion of a firm's operating expenses dedicated to wages and benefits provides a measure of the firm's sensitivity to union demands. As we have already seen, the threat of unionization is likely to affect a firm's choice of leverage (Bronars and Deere, 1991) and may also eventually affect its probability of survival. Regional dummies are included to account for potential heterogeneity across different geographical areas.

Zingales's regression indicates that highly levered firms, even after accounting for their operating efficiency, are less likely to survive deregulation than their more conservatively financed rivals. This result is robust to several specifications of operating performance and even to the ex-ante probability of default as developed by Altman (1973). More interesting perhaps are the results presented for different segments of the trucking industry, the less-than-truck (LTL) and truckload (TL) segments. The larger LTL segment provides smaller hauls (less than 10,000 lb), relying on large investments in hubs and distributional networks. Because the value of LTL firms depends largely on customer service and on developing relationships with clients, liquidation would likely be very costly for this segment.¹⁸ In contrast, the TL segment provides shipment service

¹⁷ Zingales notes that between 1977 and 1982, the market values of trucking firms fell substantially.

¹⁸ Liquidation of an LTL firm would likely destroy much of the value derived from firm-specific investments made by customers and employees. In contrast to firms with more tangible assets, recovering value from intangible assets in liquidation would likely require additional investments of organizational capital.

with loads greater than 10,000 lb, and is characterized by more intense postregulation competition and easier-to-finance capital investments. Since the value of TL firms is derived mostly from heavy trucks and equipment (as opposed to the comparatively poor collateral value of LTL assets), financial distress should be less costly for TL firms.

Zingales runs the survival model for three subgroups, those that derived (1) less than 30% of the revenues from LTL shipments, (2) between 30 and 70% from LTL, and (3) more than 70% from LTL activity. Interestingly, only in the groups deriving significant revenues from LTL shipments—where service is important—did prior leverage levels negatively affect the probability of surviving the deregulation. LTL firms derive significant value from intangible assets—distributional networks, hubs, and customer relationships—which likely imposes significant costs on these firms in the event of a restructuring. In contrast, the trucks and trailers of TL firms are redeployed with comparative ease, increasing the appeal of workouts for firms in this segment. The differential impacts of firm leverage on liquidation for each segment highlight the important role of customer-driven financial distress. When LTL firms actually face a liquidation/restructuring decision, deterioration of the firm-customer relationship may have caused irreparable loss of value to the point where a workout is infeasible or impossible.

Zingales considers that debt may affect a firm's ability to compete (and therefore, to eventually survive) by either reducing its ability to invest or hampering its competitive position (either because of predation or deterioration in its relationships with nonfinancial stakeholders). Zingales indeed finds some evidence that debt leads to less investment. Specifically, in his examination of trucking firms' investments until 1980 (to prevent bias from liquidating firms dropping out of the sample), he finds that the most highly levered firms invested less than those with less debt. Furthermore, the linkage between investment and leverage was strongest in those firms eventually forced out of the industry; there was no statistically significant relation between debt and investment for those firms that survived the deregulation. While this evidence is important, Zingales notes that this evidence is in itself unable to distinguish between alternative stories that may generate negative correlation between leverage and investment. For example, some highly leveraged firms may have been viewed as viable firms by the market and were supplied the necessary funds to survive the deregulation. Others were not viewed as favorably, were unable to obtain the necessary financing to maintain investment, and were forced to exit the industry.

Zingales also shows that in addition to investing less aggressively, highly leveraged firms began charging lower prices, starting approximately two years after deregulation (1982). A number of explanations are consistent with this evidence: (1) well-financed rivals engage in predation (Telser, 1966; Bolton and Scharfstein, 1990), and (2) they are induced to compete more aggressively (Brander and Lewis, 1986), and (3) customers of highly leveraged firms demand compensation for the possibility of bankruptcy (Titman, 1984).¹⁹ Unfortunately, the fact that trucking companies compete on a national

¹⁹ It should be noted that Chevalier and Scharfstein (1996) and Dasgupta and Titman (1998), discussed later in this chapter, provide models in which more highly levered firms charge higher prices.

scale renders it virtually impossible to define a local market in which to examine prices. Thus, although predation may represent part of the explanation for the price declines after deregulation, Zingales is unable to directly test this hypothesis. Instead, Zingales argues that the distinction between the services provided by LTL and TL carriers allows him to test an implication that applies to only one of the above possible explanations.

Because so much of an LTL carrier's value is related to its customer service, Zingales argues that if price declines for highly leveraged firms are *most* significant in this sector, then this would serve as evidence in favor of customer-driven financial distress. In contrast to the other explanations that should affect the LTL and LT segments relatively equally, price declines attributable to customers wary of doing business with a potentially bankrupt firm should be disproportionately present in the segment where customer service is most important. Although a pool of all firms (both TL and LTL) exhibits the result that highly leveraged firms charge lower prices, Zingales splits the sample by percentage of revenue derived from each segment, showing that firms deriving significant (more than 30%) revenue from LTL activity are almost totally responsible for the observed declines. Zingales interprets this evidence that "leveraged carriers discount their services to compensate consumers for the risk associated with the probability of default of the carrier."

While this interpretation may indeed reflect the most important source of financial distress among LTL firms, one cannot completely eliminate the possibility that predation is playing an important role as well. The reason is that predation is most effective in situations where some type of capital is destroyed (i.e., where actual deterioration of a firm's business occurs, as opposed to temporary depression of prices). Since entry into the TL segment is relatively easy, it is difficult to imagine that predatory pricing would be particularly effective in this segment.

3.3. *Debt and competition*

Until now, we have focused on how the possibility of financial distress alters a firm's relationship with its customers and employees. In this section, we shift our attention to how capital structure may influence a firm's ability or willingness to compete with its rivals. Most studies rely on natural experiments involving either the firm's product market environment or leverage—and sometimes both. Phillips (1995) and Chevalier (1995a, 1995b) empirically investigate the interaction between product market outcomes and capital structure by examining competitive responses to sharp increases in leverage. A subsequent group of studies by Scharfstein and Chevalier (1996), Khanna and Tice (2000, 2005), and Campello (2003) analyze shocks to competitive environments, exploring how differences in ex-ante capital structure are associated with differential responses and competitive outcomes. In both classes of studies, all these authors seek to investigate how debt influences a firm's position in its competitive environment, whether measured by pricing, market share, or likelihood of surviving.

Phillips's (1995) study examines sharp leverage increases in four industries—fiberglass, tractor trailers, polyethylene, and gypsum—in order to explore the impact on firms' competitive strategies as they relate to production, market share, and price setting. In each of the industries Phillips studied, the largest firm had undergone an LBO, resulting in at least a 25% increase in the debt-to-value ratio. Furthermore, each industry is relatively homogeneous; reducing the likelihood that differential product quality may influence the ensuing results. In nonparametric tests, Phillips shows that in three of the industries (fiberglass, tractor trailers, and polyethylene), the largest firms undertaking leveraged buyouts *lost* market share, as measured by three-year percentage of sales in the industry. In the final industry (gypsum), the industry's leading firm *increased* its market share from 47.7 to 51.1%, despite an increase in its debt-to-value ratio from 35 to 90%.

Phillips's main tests of capital structure's interaction with product markets are conducted at the industry level. To isolate the effect of debt on aggregate supply, Phillips estimates industry-level supply models for each of the four industries. Since the dependent variable in each equation is price, and because price and quantity are simultaneously determined, Phillips estimates each of his supply equations with two-stage simultaneous equations.²⁰ He also presents a reduced-form equation for each industry in which industry quantity is regressed on the exogenous variables from the price equation. In all specifications, input prices and scales of production are included as controls.

The results from these regressions for each industry indicate that debt influences product prices. In particular, the average debt ratio is positively associated with product prices in every industry except gypsum, where it is significantly negative. Furthermore, Phillips's reduced-form equations indicate that the industry *quantity* is negatively related to industry debt ratio for the same three industries, gypsum (again) representing the only exception.

Chevalier and Scharfstein (1996) and Dasgupta and Titman (1998) each present models where firms compete by setting price (i.e., Bertrand competition) in which debt commits the leveraged firm to behave less aggressively. The results in three of the four industries considered by Phillips (e.g., fiberglass, insulation, and tractor trailer) are consistent with these models. Phillips's findings in the gypsum industry, where the increase in debt led to stronger competition, is more supportive of models by Brander and Lewis (1986) and Maksimovic (1988) where firms compete by setting prices (e.g., Cournot competition). Since gypsum is a commodity with relatively low barriers to entry it is likely that the Cournot assumptions are more applicable. In addition, since overinvestment is likely to be less sustainable in a highly competitive industry, it is less likely that increased leverage will result in reductions in capacity investments.

²⁰ Phillips's methodology is a two-stage simultaneous equation framework in which instruments are used for price in the demand equation and for quantity in the supply relationship. In the demand equation, input prices (potentially including the price of oil and/or electricity, wages, etc.) are the instruments for product price.

Kovenock and Phillips (1997) add to Phillips (1995) by considering how leverage recapitalization affects individual firm investment and plant closure decisions. In addition, Kovenock and Phillips (1997) recognize the potential endogeneity problem in Phillips (1995), namely, that if firms undertaking LBOs are able to anticipate the effects of their recapitalizations, then any direct effect of debt on a firm's decisions may be obscured.

In their paper studying 10 industries, Kovenock and Phillips (1997) control for the endogeneity of the capital structure decision directly through a two-stage approach. In stage one, they run a logistic regression that explains the firm's decision to recapitalize as a function of industry variables, including capacity utilization and market concentration. In stage two, they examine both the decision to exit the industry and to close plants (in separate regressions), but importantly, they include the *predicted probability* of recapitalization from the first stage.²¹ The main result is that high leverage appears to make firms more passive, increasing plant closures and decreasing investment. However, this effect is found only in highly concentrated markets, which the authors interpret as agency problems being "more prevalent in concentrated industries, where the discipline of the market does not weed out nonoptimizing firms (pg. 771)."

Chevalier also takes advantage of the sharp increases in leverage following LBOs in two closely related papers on the supermarket industry. She uses LBOs in grocery store chains to study the effect of changes in capital structure, exploring competitive responses to exogenous shocks in leverage. The primary endogeneity problem is that LBOs may be chosen with their anticipated consequences in mind, which complicates the inferences that can be made regarding the effect of leverage on prices. Suppose, for example, that LBOs are chosen in instances where competition was anticipated to be increasing.²² Finding that LBOs preceded more competitive price setting would therefore not be surprising, but it would have little to do with the leverage increase itself.

As Chevalier (1995a) notes, "the local-market nature of supermarket competition helps to 'clean out' the endogeneity of the LBO in the study of entry, exit, and expansion." In other words, because the LBO choice is made by the firm at the *national* level, the competitive responses of its rivals in any *local* area play only a minor role in the LBO decision. Therefore, because Chevalier's analysis is conducted at the local level, the sharp increases in leverage brought about by an LBO can be viewed as exogenous, reducing the probability that the resulting estimates suffer from endogeneity bias.

Chevalier (1995a) shows that LBOs "soften" product market competition, as measured by the entry and expansion decisions of rivals of firms that undertook LBOs. Chevalier's (1995b) second paper explores in greater depth one particular dimension in which firms compete—prices. She finds that LBOs have significant impact on the local prices

²¹ The authors also use a "high-debt" dummy variable in addition to the predicted probability of recapitalization, finding similar results.

²² For example, Jensen (1986) suggests that increased debt focuses managerial attention and reduces the incentives to pursue wasteful expenditures. If competition is likely to increase, then perhaps shareholders see a greater need for the disciplining role of debt.

supermarkets charge for their goods; however, the direction of the post-LBO price changes depends on the financial structure of the LBO firm's rivals. When its competitors are less leveraged themselves, LBOs lead to decreased prices, which can be viewed as evidence of opportunistic predation by less financially constrained rivals. When competitors are also highly leveraged, prices rise following LBOs, evidence that supports Chevalier's earlier study showing that LBOs soften product market competition.

Chevalier (1995a) examines data from 85 Metropolitan Statistical Areas (MSAs) obtained from industry publications. To explain the expansion choice, she runs an ordered probit (+1 for expansion, -1 for retrenchment), conditioning on various market controls including changes in population, the Herfindahl Index, and the size of each store, as well as the market share of rival firms that had previously undertaken an LBO. When this model is run only for incumbent firms that were not themselves recapitalized by LBOs, the marginal effects of market leverage strongly suggest that high concentrations of LBOs soften product market competition. For example, if a firm with a 10% market share undertook an LBO, this shock would increase the probability that a non-LBO rival firm would add stores by approximately 6.5%.

As mentioned previously, the main alternative to Chevalier's hypotheses is that LBO decisions are endogenous and may have been driven by firm characteristics that are related to investment or pricing choices. For example, the "weakest" firms may have been LBO targets. Although the experimental design itself largely alleviates this concern, Chevalier presents evidence that LBO firms did not exhibit significant differences in pre-LBO performance. In particular, comparison of accounting data for the 31 publicly traded firms in 1985, including operating margins, market-to-book ratios, and ratio of capital expenditures to assets, indicates almost no evidence that the "types" of firms selected for LBOs were materially different. In addition, Chevalier tests the reactions of stock prices to LBO announcements for their rivals. Since a firm's stock price tends to increase following a rival's LBO, Chevalier concludes that the LBO itself likely softened the expected future competition, rather than the alternative hypothesis.²³ However, it is also possible that the positive stock price responses of the rivals reflected the possibility that they themselves face an increased probability of undergoing an LBO.

Although Chevalier argues that product market competition changes substantially following LBOs, her 1995 study in the *American Economic Review* does little to shed light on the mechanism through which such shifts may occur. For example, do LBO firms compete less aggressively in the pricing arena (i.e., underinvesting in market share)? Does heightened leverage lead to underinvestment in other areas, perhaps eliminating or delaying renovations or store upkeep? Chevalier (1995a) specifically examines the former possibility, asking whether LBOs cause price changes in the supermarket industry. Prices may fall after LBOs, Chevalier argues, if deep-pocketed rivals predate on their more financially constrained rivals. Alternatively, prices may rise when one or more firms in a local market undertakes an LBO, consistent with either leverage-induced

²³ Note that the positive stock price reactions indicate that the LBOs were largely surprises, making ex-ante strategizing in anticipation of the imminent recapitalizations unlikely.

underinvestment in market share (as discussed in Chevalier and Scharfstein, 1996, and Dasgupta and Titman, 1998) or the reversal of underpricing due to agency problems (Jensen, 1989).²⁴

Chevalier examines price changes around the time of an LBO, specifically comparing prices from one month prior to the LBO to prices after the LBO (the post-LBO prices are measured from one to six months after the event date). To control for local market conditions that may have influenced supermarket prices, she includes changes in local unemployment as well as price changes in nongrocery items, finding that the coefficients on both are statistically insignificant for all specifications. Of most interest are the coefficients on factors expected to influence either predation by rivals or the willingness of competing firms to accommodate higher prices.

Chevalier finds that the coefficient for the share of supermarket chains in the city that had undertaken LBOs prior to the time window is positive for all specifications and is usually statistically significant. In other words, prices rise when a firm that competes with other highly leveraged rivals undertakes an LBO itself. Importantly, Chevalier runs the test again with data from a time window that completely predates the LBO event (for example, examining price changes from month -6 to month -1) Under this specification, she finds “absolutely no relationship between the LBO share of rival firms in the city and price change in the period *prior* to the LBO” (p. 1105). This evidence addresses the possibility that price changes occurring after the LBO date may simply be extensions of a preexisting time trend.

In the same empirical model as previously described, Chevalier finds that the coefficient for the store market share of the largest non-LBO chain in the city is negative for all six specifications and is significant at the 1% level for the longer time windows. This suggests that prices are likely to fall in the presence of a single, large, non-LBO competitor, which can be interpreted as evidence of predation. When the regression is run for the period preceding the LBO, the market share of the largest non-LBO chain has no discernible relationship to local price changes. This again suggests that the LBO itself, rather than a preexisting trend or anticipation of the leverage change, represents the reason for the ensuing price change.

Chevalier then extends her analysis to show that price declines following LBOs accomplish the rivals' presumed goal of driving highly leveraged rivals from the market. With a probit model of exit by LBO firms, Chevalier shows that declines in the grocery price index contributes positively to exit, as would be predicted by a predation explanation.²⁵ These pieces of evidence in tandem suggest that falling prices after LBOs are most likely the result of predation by more conservatively financed rival firms.

²⁴ According to Jensen, managers derive utility from large empires, which in the current application, may lead undisciplined agents to inefficiently depress prices to maximize market share rather than profits. To the extent that an LBO aligns incentives of managers and shareholders inefficiently, low prices should rise, reflecting the newfound (and proper) incentives of management.

²⁵ When the probit model is examined for the time prior to the LBO, no relationship is observed between prices and firm exit, indicating that relatively long periods of declining prices are not alone sufficient to drive firms from the market.

Chevalier and Scharfstein (1996) present a model in which a firm's reliance on external finance alters its incentive to build market share, leading highly leveraged firms to *increase* prices during market downturns. This argument may provide an alternative explanation to Opler and Titman (1994), who show that highly leveraged firms lose sales and market shares to their more conservatively financed rivals (possibly because highly leveraged firms refuse to cut prices) and that this effect is most pronounced during downturns. Debt effectively shortens the firm's horizon by introducing the possibility of liquidation, so that firms relying on external capital have incentives to take actions that boost immediate profits, even at the expense of long-run market share. The main implication is that the output prices of liquidity-constrained firms are predicted to exhibit countercyclicality; they raise prices more (or cut them less) in recessions than their more conservatively financed rivals. Furthermore, the model predicts that even the prices of *unconstrained* rivals are expected to exhibit some—albeit a lesser—degree of countercyclicality, since price markups of the *constrained* firms influence the competitive strategies (in this case, prices) of their rivals.

Chevalier and Scharfstein explore three closely related empirical predictions: (1) more financially constrained firms exhibit more countercyclical pricing, (2) when firms face more financially constrained rivals, their markups should exhibit higher countercyclicality, and (3) industry-average markups should increase when firms within an industry are more financially constrained.

As Chevalier and Scharfstein note, perhaps the most direct of these three hypotheses would be “to relate firm-specific measures of the markup to measures of corporate liquidity.” However, as also mentioned, just as leverage is likely to affect prices (through the mechanism proposed), prices are also likely to affect leverage. It is easy to imagine examples in which a shock to a firm's leverage may lead it to raise prices, which may in turn damage its market share and firm value, which may further impact its leverage. To minimize this problem of reverse causality, the authors examine exogenous events that impose liquidity constraints on some firms more than others, investigating whether those facing stricter liquidity constraints raised their prices relative to their less constrained rivals.

Chevalier and Scharfstein use local-market pricing data from the supermarket industry to test their hypothesis that liquidity constraints cause firms to reduce their investment in market share. In one of their tests, average supermarket prices for several cities were regressed against a set of explanatory variables that include each city's sensitivity to oil price shocks as well as the importance of national chains in the local market.²⁶

In 1986, the price of oil fell by nearly 50%, inducing severe recessions in several states, including Texas, Louisiana, Oklahoma, Wyoming, and Alaska. Although grocers operating in these states experienced a negative shock, the impact was less severe for national chain stores, whose parents had operations in states relatively insensitive to the oil price spike. The national chain stores in these states could therefore afford to

²⁶ The authors use an index of grocery prices, which is a weighted average of prices for each city. The data were provided by the American Chamber of Commerce Researchers Association (ACCRA).

capture market share from their rivals by cutting prices deeply in recessions. Examining city-average prices for the six quarters spanning 1985:4–1987:1, the authors find that price declines are most severe in oil-sensitive cities containing a significant national supermarket chain presence. As they argue, the effect of price declines in these cities is quite large. For a given city in an “oil state,” an increase of one standard deviation in the fraction of stores owned by national chains from its mean of 0.35 to 0.58 decreases the expected percentage change in the local price index from -0.020 to -0.045 . Chevalier and Scharfstein also present evidence showing that firms that recently did a leveraged buyout increase prices more in severe declines than their less levered counterparts.

The city-level tests address the relation between a firm’s capital structure and its investment decisions, largely ignoring the role debt may play in a firm’s competitive response to its rivals in the market. Using firm-level pricing data from the first quarter of 1991 to the last quarter of 1992, Chevalier and Scharfstein explore how leverage impacts a firm’s pricing, paying particular attention to how the financial position of rival firms influences this decision. As in the city-level tests, whether a store was owned by a firm that undertook an LBO is used as a proxy for being subject to financial constraints. While an LBO dummy may be viewed as endogenous, it is important to remember that the LBO decision is made at the *company* (as opposed to the store) level, such that a given firm’s response (or that of its competitors) is not likely to have motivated the recapitalization. In order to test the hypothesis that more financially constrained firms raise prices compared to their less constrained competitors, and that more constrained rivals magnifies this effect, the authors run regressions of the form:

$$\begin{aligned} \Delta \text{Price} = & \alpha (\text{LBO}) + b (\text{LBO} \times \Delta \text{EMP}) \\ & + c (\text{OLBOSHARE}) + d (\text{OLBOSHARE} \times \Delta \text{EMP}) \\ & + e (\Delta \text{EMP}) + f (\Delta \text{WAGE}) + \varepsilon \end{aligned}$$

in which LBO represents a dummy if the parent company had undertaken a leveraged buyout, ΔEMP is the percentage change in employment in the city’s state during the period, OLBOSHARE is the share of stores in the local market owned by an LBO firm, and ΔWAGE is the percentage change in wages for workers in sales occupations. The dependent variable is the percentage change in price for a firm’s price index for a particular city.

Three main results may be gleaned from this regression. First, LBO firms charge higher prices, as indicated by a significantly positive coefficient on the LBO dummy. Since this may reflect increases in *costs* for LBO firms rather than markups, the fact that the coefficient on the $\text{LBO} \times \Delta \text{EMP}$ interaction term is negative and significant is important. When local markets suffer, as measured by negative employment changes, LBO firms raise prices more than their less financially constrained rivals, which is consistent with the idea that the higher prices are caused by financial constraints rather than higher costs. Also of interest is the coefficient on the local share of LBO firms, OLBOSHARE, which is positive and significant, indicating that leverage causes rivals to increase prices.

Furthermore, the interaction term is negative and significant, indicating that slow economic growth magnifies the effect. In a city with low employment growth of 0.5% (one standard deviation below the mean), an increase in OLBOSHARE by one standard deviation from the mean of 14.9 to 30.0% would lead the non-LBO firm to more than double its price increase from 1.4 to 2.9%.

Campello (2003) builds on Chevalier and Scharfstein's study, first asking "Are markups more countercyclical in highly leveraged industries?" and second, "Does a firm's capital structure affect its ability to build market share, so that competitive outcomes are indeed influenced by a firm's financing mix and the financial condition of its competitors?" While these questions are linked, the empirical approach taken by Campello is quite different, so we consider each question separately.

Campello evaluates Chevalier and Scharfstein's (1996) theory of markup (i.e., prices over marginal costs) countercyclicality, specifically the implication that the possibility of bankruptcy reduces the incentives of firms to invest in building market share in downturns. He starts by extending Bil's (1987) analysis by comparing the cyclicity of markups in industries with different leverage, finding *higher* markup cyclicity in highly leveraged industries.²⁷ Using data from 20 manufacturing industries segregated by two-digit SIC codes (codes 20–39), Campello runs industry-level (the "i" index refers to industries) regressions of the form:

$$\text{Markup}_{i,t} = \eta + \alpha(-\Delta \text{Log}(\text{GDP})_t) + \beta \text{Leverage}_{i,t-1} \\ + \lambda[\text{Leverage}_{i,t-1}x(-\Delta \text{Log}(\text{GDP})_t)] + \varepsilon_{i,t}$$

where GDP is the gross domestic product, and markup and leverage are measured as industry averages. Unlike Chevalier and Scharfstein's (1996) study however, in which the authors' empirical design sidestepped the problem of having to observe marginal costs,²⁸ Campello constructs a markup measure that incorporates prices, hourly wages, the overtime rate, the number of hours employed (both regular and overtime), the number of workers, and gross output.²⁹ Campello finds a significantly positive coefficient on the interaction between industry leverage and macroeconomic declines, concluding that "these estimates suggest that negative shocks to demand prompt firms to raise

²⁷ Bil's (1987) empirically documents that while marginal costs are "markedly procyclical," output prices are not as responsive to fluctuations in the health of the economy. The result is that price-cost margins ("markups") are highly *countercyclical*.

²⁸ Chevalier and Scharfstein note that price increases could arise from either markup or from increases in marginal costs. The empirical design focuses on price changes for both local and national supermarkets in both oil and nonoil states. If prices increase more dramatically for local chains in oil states (as the authors find), then either: (i) markups of local chains are higher than national chains in oil states, or (ii) costs increase for local chains relative to national chains *only in the oil states*, which the authors argue is very unlikely. See Section II of the paper for more details.

²⁹ To construct the markup series, Campello gathered industry price data from the Bureau of Labor Statistics (BLS) *Producer Price Indexes*. Data on the number of production workers, the weekly average hours, and the average hourly wage were obtained from the BLS *National Employment, Hours and Earnings*.

price-cost margins more (or cut them less) in industries with more externally financed competitors.” In response to a 1% decline in gross domestic product (GDP), Campello estimates that a hypothetical “all-debt” industry would experience markups of 42% more than a “zero-debt” industry.

Since Campello takes industry leverage as exogenous, the strength of his conclusions regarding leverage-induced markup countercyclicality depends on his ability to adequately control for the determinants of industry leverage. Specifically, suppose that two industries differ in their abilities to respond to macroeconomic shocks, perhaps because the more flexible industry can efficiently scale down production in the face of recession. Given this, it is likely that the firms in the flexible industry will carry more debt.

To address this potential endogeneity problem, Campello follows Sharpe (1994), splitting the sample based on whether an industry’s sales are sensitive to the business cycle. If cross-sectional differences in macroeconomic sensitivities drive Campello’s results, then the coefficient on the interaction term should not be significant for firms with low sales-to-GDP sensitivities, yet it is. A second possibility is that debt may be used to finance expansions, so that firms with high utilization rates needing to expand will issue debt when the economy grows.³⁰ For this reason, Campello explicitly includes lagged industry capacity utilization as a control, finding that the results are unchanged.³¹ Campello is careful to control for several other potential factors that potentially drive cross-sectional differences in industry debt ratios, including as controls energy prices (which may affect product costs), industry capacity, the sensitivities of each industry to the business cycle, and industry concentration (which may alter a firm’s ability to collude by manipulating prices). Campello argues that his set of controls is sufficient to suggest that the debt level itself, rather than an omitted determinant of the debt level, induces the markup countercyclicality he observes.

The second class of tests Campello runs is conducted at the firm level. Like the industry-level tests, Campello’s firm-level tests capitalize on the exogeneity of macroeconomic shocks and examine how the sensitivity of a firm’s performance to macroeconomic shocks is influenced by the firm’s debt ratio. The empirical methodology proceeds in essentially three steps. First, for each quarter from 1976:1–1996:4, he sorts all manufacturing firms (SIC codes 200–399) into quintiles ranked by book debt-to-long-term assets. Then, for the highest and lowest quintiles, he runs *cross-sectional regressions* of the following form during time t :

$$\begin{aligned} \Delta \text{Log}(\text{Sales})_{i,t} = & \eta + \alpha_K \Delta \text{Log}(\text{Sales})_{i,t-1} + \cdots + \alpha_K \Delta \text{Log}(\text{Sales})_{i,t-4} \\ & + B_K \Delta \text{Log}(\text{PPE})_{i,t-1} + \cdots + \beta_K \Delta \text{Log}(\text{PPE})_{i,t-4} \end{aligned}$$

³⁰ In the presence of scale economies, decreasing marginal costs may then lead to markdowns for such expanding firms. Therefore, debt (issued when the economy grows) may appear to increase markup countercyclicality (since marginal costs decline, reducing prices) if it is used to finance expansions, but not for the reason posited in Chevalier and Scharfstein (1996).

³¹ The other control variables are intended to address other potential sources of endogeneity from omitted variables. See Section III of Campello (2002) for more details.

$$\begin{aligned}
& + \Lambda_1 \text{Log(Assets)}_{i,t-1} + \dots + \Lambda_4 \text{Log(Assets)}_{i,t-4} \\
& + \delta \text{Leverage}_{i,t-1} + \varepsilon_{i,t}
\end{aligned}$$

saving the vector of sales-to-leverage sensitivities δ_t for both the high- and low-leverage quintiles. All variables are converted to deviations from their industry means. During the final step, Campello runs two time-series regressions (one for each leverage quintile) of the form:

$$\delta_t = \eta + \varphi_1 \Delta \text{Activity}_{t-1} + \dots + \varphi_4 \Delta \text{Activity}_{t-4} + \gamma \text{Trend}_t + \varepsilon_t$$

where Activity is one of several proxies for downward macroeconomic shocks. The primary question such a regression addresses is whether or not highly leveraged firms have sales-to-leverage sensitivities that are themselves more sensitive to economic downturns. While Campello finds that in high-debt industries none of the Δ Activity coefficients are significantly different from zero, the opposite is true in low-debt industries, where the same coefficients are significantly negative in all but one of the specifications. Importantly, the negative impact of debt on sales growth during recessions is limited to industries *in which a firm's rivals have low leverage*. For example, consider two otherwise identical firms operating in a low-leverage industry, except that one is 10% above while the other is 10% below the (low) industry average. After a 1% decline in GDP, the sales growth of the more indebted firm is predicted to be 1.3% lower than the more conservatively financed rival. Were this same test applied in a “high-debt” industry, no differences between the firms’ sales growths would be observed.

Both Campello’s industry and firm-level evidence can be interpreted as supportive of Chevalier and Scharfstein’s theory that cash shortfalls induced by external finance reduce a firm’s incentive to invest in market share. It may also be the case however, that debt reduces a firm’s ability (rather than willingness) to compete with opportunistic rivals. If less levered firms predate on their more levered rivals during downward demand shocks, then highly leveraged firms in low-debt industries would lose market share in precisely the way Campello documents. In this way, his firm-level tests fail to distinguish between Chevalier and Scharfstein’s theory of liquidity-induced underinvestment and Telser’s (1966) and Bolton and Scharfstein’s (1990) predation models.

Our preceding discussion indicates that macroeconomic changes provide an exogenous source of variation that allows researchers to examine the effect of leverage on competition. An alternative way to examine these issues is to examine how firms respond to exogenous shocks to their competitive environments. Khanna and Tice (2000) examine precisely this issue, studying the rapid nationwide expansion of the discount retailer Wal-Mart during 1975–1996. They focus on how characteristics such as debt, ownership, focus, and profitability lead incumbent firms to react differently to Wal-Mart’s expansion into their respective regions.

As in each of the studies we have considered so far, such an investigation requires a careful treatment of endogeneity. In particular, since Wal-Mart’s entry into a particular market may be driven by the collective inabilities of incumbents to respond, it may be difficult to infer cause and effect between incumbent characteristics and competitive

responses. The concern is that perhaps Wal-Mart chooses to expand into regions with weak competitors and that these firms (perhaps because of a history of poor performance) may have high leverage. While it certainly would not be surprising to find that highly leveraged firms respond to Wal-Mart's entry less aggressively, it may be impossible to tell whether debt itself inhibits the incumbent's response, or whether debt is simply correlated with other characteristics that render incumbents less likely to respond aggressively.

Khanna and Tice convincingly argue that this is *not* the case. Wal-Mart's expansion decisions appear to be driven by its own distributional efficiencies rather than by characteristics of its potential competitors. The observation that incumbent characteristics play only "a relatively minor role" in the expansion decisions allows Khanna and Tice to analyze the effects of capital structure and other incumbent firm characteristics on the reactions to entry by Wal-Mart.

The main classes of tests are variations of an ordered probit in which incumbent actions are ranked by the degree of response aggressiveness to Wal-Mart. The dependent variable is the firm's response, ordered from most aggressive (adding stores, which is assigned a value of +1) to least aggressive (reducing the number of stores, assigned a value of -1). Although Khanna and Tice analyze the impact of many firm and market characteristics, we focus primarily on marginal effects of capital structure on the incumbent responses. When the sample is restricted to public incumbent firms, high debt-to-asset ratios are associated with less aggressive capital investments, as measured by expansion and retrenchment decisions. In particular, when all controls are evaluated at their mean values, an increase in the debt ratio of 10% decreases the probability of expansion by 2.7% and increases the probability of retrenchment by 3.5%.³²

Khanna and Tice also study whether or not the incumbent had undergone an LBO influences its response to Wal-Mart. Interestingly, they find that LBO firms mount *more* aggressive responses, which contrasts with the Chevalier evidence we described earlier. Khanna and Tice suggest that although this evidence may indicate that "LBO decisions are different from leverage decisions," they encourage a cautious interpretation due to the small number of LBOs in their sample and a potential endogeneity problem. Specifically, it might be the case that firms with more aggressive management were more likely to undertake LBOs.

Khanna and Tice (2005) expand on their earlier work in which they investigate Wal-Mart's decision to enter a particular market by considering Wal-Mart's location *within* that market. Interestingly, Wal-Mart places its stores closer to rival stores that are less efficient and more highly leveraged, consistent with the idea that leverage weakens a firm's ability to withstand competition.

In other results, Khanna and Tice (2005) present evidence suggesting predation on highly leveraged firms by more conservatively financed rivals. During the period

³² In addition, the authors find that firms more "focused" on the discount retailing business (as measured by discount retail sales divided by total firm sales), larger firms, and more profitable firms compete more aggressively with Wal-Mart.

1982–1995, they study market-level average prices in various metropolitan areas and consider whether prices charged by discount retailers were different between recessions and normal times. The authors find that higher industry leverage (averaged across all discounters within a given market) implies higher average prices during normal times, but lower prices during recessions. While this evidence suggests that leverage softens competition during downturns, even more compelling is that the price difference between normal times and recessions was greatest in markets with high-debt *dispersion*, suggesting predation as the mechanism driving the observed procyclicality in prices. Consistent with the authors' interpretation of predation, in markets with homogeneous capital structures, prices were no lower in recessions than in normal times.

Further evidence in support of a predation hypothesis comes from regressions examining the sensitivity of exit to price declines. Within the predation framework, price cuts during recessions should drive out financially troubled rivals, a result confirmed in the empirical analysis. In markets where firms have similar capital structures, the extent to which firms exit is not related to price cuts during recessions (even in markets where most firms are highly leveraged). However, in markets where only *some* firms are financially distressed, price cuts increase the probability that a highly leveraged firm is forced out of the market during downturns. Combining this result with those studying the procyclicality of prices between markets with different debt ratio dispersions, Khanna and Tice make a convincing case that predation is likely to be an important influence on prices and survival.

4. Conclusion

The studies surveyed in this chapter indicate that a firm's capital structure has a nontrivial effect on its relationships with competitors and nonfinancial stakeholders such as its workers, suppliers, and customers. Generally, the evidence from this literature suggests that debt magnifies the effects of economic downturns and predation, effectively making bad situations even worse for highly leveraged firms. During a recession or downward shock to profitability, a highly leveraged firm can expect to disproportionately lose market share and sales (Opler and Titman, 1994; Zingales, 1998; Campello, 2003), to lay off workers and pay lower wages (Sharpe, 1994; Hanka 1998), and to reduce investment to conserve cash (Chevalier and Scharfstein, 1995; Khanna and Tice, 2000). Debt also appears to render firms more susceptible to predation, as directly suggested by Chevalier's (1995a, 1995b) analysis of supermarket prices and indicated as a possibility in Zingales's (1998) study of deregulation in the trucking industry.

Perhaps just as interesting is what *cannot* be concluded about capital structure's effects on a firm's competitive strategy and relationship with its stakeholders. Since debt ratios are chosen by the firm, cross-sectional differences in capital structure result from cross-sectional differences in firm-level explanatory variables (e.g., the degree to which a firm's customers will be harmed in the event of liquidation). Since many of the determinants of capital structure are either unobservable or do not have good proxies, it is often

impossible to distinguish between the direct effect of debt on firm performance and that of an omitted variable(s) that partially determines the debt ratio.

For example, Sharpe (1994) finds that the employment choices of firms with higher leverage ratios are more sensitive to the business cycle. He argues that this finding is consistent with both Titman (1984), whereby firms with less firm-specific human capital (which is presumably destroyed during liquidation) choose higher leverage ratios, as well as with Jensen (1988, 1989), in which debt forces managers to lay off workers even if psychologically costly. A third possibility is that firms simply differ in how easily they can adjust the sizes of their labor forces and that these differences influence debt choices. While it would be interesting to understand whether highly leveraged firms lay off more workers in downturns because of differences in firm-specific human capital, agency problems, or cost structure, in most studies such precision is not possible. Further research will hopefully produce clearer answers to some of these questions.

Other promising areas of research include a consideration of the interaction between corporate governance and the impacts of leverage on a firm's competitive strategy. For example, continuing discussion of Sharpe's (1994) study, it would be interesting to understand whether the debt appears to provide more or less discipline between firms that differ in the strength of their corporate governance (e.g., independent corporate versus insider-dominated boards). Since strict corporate governance and leverage may both discipline management, interesting relationships may arise between governance and the effects of leverage on a firm's employment policy.

Also relatively unexplored are the implications for asset pricing that may arise from the impact of capital structure on product market competition. For example, if financial constraints make a firm more vulnerable to predation, and if predation is more likely to occur in economic downturns, then financially constrained firms will have higher betas and hence, higher costs of capital. However, as Chevalier (1995b) shows, this may not hold in every instance, since predation appears to require both a financially vulnerable victim and a well-financed competitor. Do highly leverage firms with deep-pocketed rivals face higher costs of finance than similarly leveraged firms in industries where predation is more difficult?

But perhaps the most important question is whether the effects of capital structure on a firm's relationships with its stakeholders and competitors are significant enough to play an important role in how firms actually determine their capital structures. For example, when a firm undertakes an LBO, is the anticipated response of competitors a first-order effect? Are the concessions made by firms whose customers depend on its long-term viability large enough to merit serious consideration by the firm? These issues were considered by Titman and Wessels (1988) and others in research that predates work examining the effect of debt on strategic choices, which is the focus of this chapter. Perhaps the next step in this research is to determine how the insights of this more recent literature can be used to refine these earlier cross-sectional tests. While we have anecdotal evidence to suggest that these stakeholder issues are serious concerns of management, we have little direct evidence describing how capital structure decisions explicitly take these issues into account.

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BANKRUPTCY AND THE RESOLUTION OF FINANCIAL DISTRESS*

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Abstract

This chapter reviews empirical research on the use of private and court-supervised mechanisms for resolving default and reorganizing companies in financial distress. Starting with a simple framework for financial distress and a quick overview of the theoretical research in this area, we proceed to summarize and synthesize the empirical research in the areas of financial distress, asset and debt restructuring, and features of the formal bankruptcy procedures in the United States and around the world. Studies of out-of-court restructurings (workouts and exchange offers), corporate governance issues relating to distressed restructurings, and the magnitude of the costs and the efficiency of bankruptcy reorganizations are among the topics covered.

Keywords

bankruptcy, financial distress, bankruptcy costs, fire sales, bankruptcy auctions, reorganizations, Chapter 11

1. Introduction

Bankruptcy law and related out-of-court mechanisms governing default on debt contracts form one of the essential building blocks of a private economy. The law provides a general structure that helps claimholders resolve unforeseen conflicts arising when the firm defaults on its debt payments. It also determines the allocation of control over the distressed firm to various claimholders and the extent to which market mechanisms are used in resolving financial distress. This in turn affects investors' willingness to provide capital *ex ante* and thus firms' choice of capital structure and cost of capital.¹

The design of bankruptcy procedures varies widely across the world. Some countries, like the United States and France, have laws that are favorable to the incumbent management and the continuation of the firm as an ongoing entity. Other countries, like the UK and Sweden, rely on the market in allocating the failing firm's assets. With emerging economies striving to adopt adequate bankruptcy procedures, the relative efficiency of existing procedures has become an important topic for debate.

Furthermore, the use of high leverage in corporate restructuring and the popularity of junk bonds (original issue high-yield bonds) have been important aspects of the U.S. corporate finance scene since the 1980s. Leverage increases are accompanied by increased potential for default and bankruptcy. These structures raise the importance to financial economists, managers, and legal scholars of understanding how firms deal with financial distress.

An active academic literature that examines various aspects of the use of private and court-supervised mechanisms for resolving default has developed over the last two decades. The purpose of this chapter is to summarize and synthesize the empirical research in the areas of financial distress, asset and debt restructuring, and formal bankruptcy procedures in the United States and around the world.²

The survey is organized as follows. Section 2 presents a simple conceptual framework for analyzing financial distress that guides the organization of the empirical literature in the subsequent sections. The bulk of the evidence is from the United States, and we turn to the international evidence at the end (Section 8). We review the U.S. evidence in the following order: Evidence on asset restructurings is reviewed in Section 3. Studies of out-of-court debt restructuring (workout and exchange offers) are described in Section 4. Section 5 reviews corporate governance issues related to the restructuring of financially distressed firms. Sections 6 and 7 discuss different aspects of formal bankruptcy proceedings in the United States, in particular the magnitude of costs and the efficiency of the outcome. In Section 8, research on insolvency procedures in other countries is surveyed. Section 9 concludes by offering some comments and suggestions for the direction of future research.

¹ These *ex-ante* effects are analyzed in the literature on optimal security design and capital structure. See, for example, Allen (1989), Allen and Gale (1994), and Allen and Winton (1995) for security design, and Harris and Raviv (1991) and Part 3 of this book for capital structure. We focus here on the *ex-post* efficiency of the distress resolution mechanisms.

² See Wruck (1990), John and John (1992), John (1993), and Senbet and Seward (1995) for earlier surveys of this literature.

2. Theoretical framework

This section presents a simple framework describing financial distress and the mechanisms available to resolve distress. The framework provides an overview of the issues analyzed in the theoretical literature and hence a motivation for the questions examined in the empirical literature.

2.1. Restructuring of assets and financial contracts

The financial contracts of a firm can be broadly categorized into hard and soft contracts. An example of a hard contract is a coupon-paying debt contract that promises periodic payments by the firm to its bondholders. If these payments are not made on time, the firm is in violation of the contract, and bondholders can seek legal recourse to enforce the agreement. Lack of liquidity does not constitute a mitigating circumstance for non-payment. Obligations to suppliers and employees are other examples of hard contracts. In contrast, common stock and preferred stock are examples of soft contracts. Here, even though equityholders have expectations of receiving regular cash payouts from the firm, the level and frequency of these payouts are discretionary policy decisions made by the firm. Specifically, the payouts can be suspended or postponed based on the availability of liquid resources remaining in the firm after satisfying the claims of the hard contracts.

The assets of a firm also have a natural categorization based on liquidity. Cash and marketable securities that can quickly be converted into cash are liquid assets. Long-term investments, such as plant and machinery, which may only produce liquid assets in the future, are considered illiquid or hard assets.

These categorizations of the financing contracts of a firm and its assets form the basis for a straightforward definition of financial distress. A firm is in financial distress at a given point in time when the liquid assets of the firm are not sufficient to meet the current requirements of its hard contracts. Mechanisms for resolving financial distress do so by rectifying the mismatch through restructuring the assets or restructuring the financing contracts, or both. In this survey, we examine the costs of resolving financial distress using either method.

On the asset side, the hard assets can be wholly or partially sold to generate additional cash in order to meet the current obligations. Premature sale of illiquid assets, however, may result in the destruction of going-concern value and involves a cost of liquidation. This cost can be thought of as the difference between the going-concern value of the assets (i.e., the present value of all future cash flows produced by the assets) and the highest value that can be realized if the assets are sold immediately. The cost of liquidation, and hence the cost of the asset restructuring, depends on a variety of factors such as what fraction of the assets needs to be sold and what operational relationship the liquidated assets has to those that are retained. If the assets can be sold as a going-concern package instead of a piecemeal sale of assets, the liquidation costs may be lower. Similarly, if the assets are sold in a competitive auction to a buyer who can use these assets efficiently, liquidation costs may be very low or—if the buyer is a higher-value user than

the seller—even positive. In other words, the efficiency of the asset-restructuring channel will depend on the liquidation costs associated with the sale of the required assets.

Shleifer and Vishny (1992) analyze the determinants of liquidation costs related to asset sales in financial distress. They focus on different aspects of market liquidity, including credit constraints in the industry, asset fungibility (the number of distinct uses and users for a particular asset), and participation restrictions (e.g., regulations on foreign acquisitions and antitrust restrictions). In their model, industry outsiders are lower-valuation users of the assets. Shleifer and Vishny argue that the price received in a distressed asset sale may suffer from large discounts if the entire industry is financially distressed and industry insiders are unable to compete for the assets due to liquidity constraints.

An alternative way of dealing with financial distress involves restructuring the financial contracts. One mechanism for this restructuring is to negotiate with creditors and reformulate the terms of hard contracts such that the current obligations are reduced or are deferred to a later date. Another technique is to replace the hard contract with soft securities that have residual rather than fixed payoffs. In general, debt restructuring provides relief from financial distress by replacing the existing debt with a new debt contract that reduces the interest or principal payments, or extends the maturity, or exchanges equity securities for the debt.

An additional financial restructuring mechanism that helps correct the imbalance between current assets and requirements of the hard contracts is to raise current liquidity by issuing additional new claims against future cash flows. Although the original hard contracts are left unaltered, the claim structure of the firm is changed by the new financing undertaken. When the newly issued claims are a softer contract or have longer maturity, the total package of financing becomes less onerous on the firm, resolving financial distress. An infusion of private equity is an example of this type of restructuring.

Both asset restructurings and debt restructurings can be accomplished either through a formal court-adjudicated process or in a voluntary out-of-court workout. The choice of method used to resolve financial distress depends on the relative costs and benefits of each mechanism. For example, in an illiquid secondary market, the costs of asset restructurings are likely to be high, and financial restructuring may constitute a dominant restructuring mechanism. By the same token, if asset restructuring involves asset sales through efficient mechanisms such as auctions, the overall costs of resolving financial distress may be lower.

2.2. *Efficiency issues in recontracting*

The efficiency of the mechanisms for resolving distress can be measured by the loss in asset value incurred in the process of the asset and debt restructuring. A number of factors related to the structure of the firm's claims and to the institutional framework governing the process for restructuring contribute to these costs. To understand these factors, it is useful to first consider a simple theoretical setting in which distress can be resolved costlessly.

In this simple setting, a single lender has access to the same information as corporate insiders, and the debt contract is complete; that is, a complete state-contingent set of contracts can be written and are enforced by the legal system. Here, either an initial contract can be designed that imposes the financial restructuring necessary to avoid a premature liquidation of assets, or the contract will be renegotiated costlessly in default in order to avoid suboptimal liquidations. For example, if at any time the firm's current liquidity falls short of the current coupon obligations of the debt contract, the debt contract is renegotiated. In the negotiation, the lender is promised a combination of cash in the current period that the firm can pay without liquidating assets and additional cash flow in the future. The expected value of this combination is equal to the cash flow guaranteed by the old debt contract. Under symmetric information, the lender knows that the restructuring of the debt is such that he or she is indifferent between the new contract and the old one, and will accept the proposed contract. Moreover, the firm is no longer financially distressed under the new contract. In this example, the distress resolution is completely efficient and simply accomplished through a costless restructuring of the debt contract.

In practice, however, contracts are by nature generally incomplete. Neither outside investors nor the court system can verify the detailed information required to enforce many contracts. The current cash available, for instance, may not be observable to outside parties, preventing the enforcement of contracts that are contingent on these cash flows. Moreover, managers may have some latitude to divert a portion of the firm's cash flows according to their personal preferences. Hart and Moore (1998) show that when one cannot contract on cash flows, creditors must be given some rights to liquidate physical assets in order to make borrowing viable. Otherwise, managers would always choose to default strategically and divert available cash to them. Anticipating this situation, creditors would not be willing to lend money to the firm. In contrast, if creditors are given the right to sell assets following nonpayment (default), the threat of liquidation helps deter strategic defaults. To keep the threat credible, suboptimal asset sales may sometimes occur following liquidity-induced defaults.

Financial restructuring can provide a solution to this problem. Mechanisms facilitating debt restructuring will reduce the costs of premature asset sales following liquidity defaults. The same mechanisms, however, will reduce creditors' rights to liquidate assets following a strategic default, encouraging such defaults. The efficiency of the debt-restructuring mechanism ultimately depends on the relative importance of these two effects. Harris and Raviv (1991) and Bolton and Scharfstein (1996) develop related arguments.

In addition to the incomplete contracting problem, asymmetric information between debtors and creditors about the value of the assets—ongoing firm value and liquidation value—can impede a mutually beneficial debt renegotiation. As pointed out by Brown (1989), a private workout is always successful when there is symmetric information between management and a single creditor. Many of the theoretical models in the area examine the effect of incomplete contracting and asymmetric information on the efficiency of contracting, as well as the mechanisms necessary to resolve financial distress arising from a failure to meet the terms of the debt contract.

A third problem in practice is that there are usually multiple creditors with interests that are not congruent. Depending on the nature of the debt contract (private debt vs. public debt, syndicated vs. nonsyndicated debt), it may be difficult to achieve an agreement among creditors. Moreover, each creditor may have incentives to be the first to force a liquidation of the firm's assets in order to guarantee payment in full. It has been argued that one of the central reasons for needing a bankruptcy law is to curb the inefficiencies resulting from this "common pool" problem.

The presence of all these factors will influence the firm's choice of restructuring venue—that is, whether it will recontract privately or will instead choose to enter formal bankruptcy proceedings. We discuss this choice further in Section 2.4, following a brief review of the main ingredients of the formal bankruptcy process in the United States.

2.3. Rules and procedures of the U.S. bankruptcy code

For most firms in the United States, formal bankruptcy practices are governed by the Bankruptcy Reform Act of 1978 and, more recently, the Bankruptcy Reform Act of 2005. Bankruptcy petitions are filed in one of 94 regional bankruptcy courts, often based on the physical location of the company's assets.³ Corporations generally file for liquidation under Chapter 7 or for reorganization under Chapter 11. Although creditors may initiate an involuntary filing under Chapter 7, management is often successful in converting the case to Chapter 11, allowing an attempt to reorganize. Because management can challenge an involuntary petition, bankruptcy filings are more frequently initiated by management.

For firms filing under Chapter 7, the court appoints a trustee that organizes a sale of the firm's assets. Proceeds from the asset sales are distributed to claimholders according to the absolute priority rule, implying that junior claims do not receive any payment until senior claims are paid in full. Each claimholder's distribution depends on the seniority of his claim and the total amount of proceeds received from the sale of assets.

Filings under Chapter 11 are treated as corporate reorganizations, and the bankrupt firm is expected to continue as a going concern after leaving bankruptcy. Consistent with the objective of reorganization, the major provisions of Chapter 11 are designed to allow the firm to continue operating. In general, incumbent management continues to run the business in Chapter 11. To protect the firm during the reorganization, Chapter 11 imposes an automatic stay that stops all payment of interest and principal to creditors and prevents secured creditors from foreclosing on their collateral. The debtor firm may also obtain debtor-in-possession (DIP) financing, taking the form of a line of credit or new financing for routine business expenses. Firms typically file a motion for authorization of a DIP loan at the same time as the Chapter 11 petition or shortly thereafter. Under Section 364 of the Bankruptcy Code, these post-petition loans are granted a super-seniority status

³ LoPucki and Whitford (1991) examine the choice of venue for 43 large, publicly traded companies in financial distress. They find that firms often engage in "forum shopping," that is, file in a court where the firm has little physical presence, avoiding courts that appear hostile to extensions of exclusivity or aggressively regulate attorney's fees. See also Eisenberg and LoPucki (1999) for evidence on forum shopping.

that effectively strips seniority covenants from existing debt. This reduces the default risk of the new loan, hence encouraging new lending.

To manage the large number of creditors and equityholders that may be involved in the reorganization, the Bankruptcy Code provides for the appointment of committees to represent the interests of different claimholder classes before the court. Committees normally consist of the seven largest members of a particular class who are willing to serve, and they are empowered to hire legal counsel and other professional help at the expense of the firm. A committee representing unsecured creditors is almost always appointed. Other committees can be appointed at the discretion of the Executive Office for U.S. Trustees or the court to represent other claimholder classes, including stockholders.⁴

In order to emerge from Chapter 11, the bankrupt firm must develop a reorganization plan that restructures and reallocates the financial claims on the firm. Similar claims are grouped into classes depending on the priority and other characteristics of the claims. The plan specifies what each class of claimants will receive in exchange for their pre-bankruptcy claims. The distributions typically consist of a mix of cash, new debt securities, equity, and other distributions.

The reorganization plan may embrace a substantial restructuring of the operations. For example, firms operating in Chapter 11, and particularly those with poor operating performance, undertake significant asset sales. In a successful reorganization plan, the firm must demonstrate to the bankruptcy court that, after emerging from bankruptcy, the firm is unlikely to refile for bankruptcy in the near future, either because of an inappropriate capital structure or because of continued poor operating performance.

The rules under which negotiation of a plan takes place give substantial bargaining power to the filing firm, or debtor. One source of bargaining power is that the debtor has the exclusive right to propose a reorganization plan for the first 120 days following the Chapter 11 filing. Prior to the 2005 Bankruptcy Reform Act, bankruptcy judges had considerable discretion to extend this exclusivity period. If the debtor retains exclusivity, then creditors can only accept or reject a reorganization plan that management proposes. Acceptance of the plan requires an affirmative vote by a majority (two-thirds in value and one-half in number) of the claimholders in each impaired class.⁵

The Bankruptcy Code encourages bargaining among claimholders and promotes achieving agreement over the reorganization plan with limited court intervention. However, if the plan is not approved by each impaired class, the court can unilaterally impose or “cram down” the plan on dissenting classes as long as the plan is “fair and equitable.” That is, the market value of the new securities distributed to each class under the plan must be at least equal to what the class would receive in a liquidation of the firm. In practice, cram-downs are extremely rare (Klee, 1979). It is in the joint interest of all classes to avoid a cram-down, because application of the fair and equitable standard requires the

⁴ Although firms file in specific bankruptcy courts, various aspects of the administration of the case are overseen by the Executive Office for U.S. Trustees.

⁵ An impaired class is one in which the distributions under the reorganization plan are insufficient to meet the terms of the original claims. Equityholders are always presumed to be impaired in bankruptcy.

court to determine the firm's going-concern value in a special hearing. These hearings are considered extremely time-consuming and costly.

Avoidance of cram-down also explains observed deviations from absolute priority, where stockholders or other junior claimants receive some payment under a reorganization plan that provides for less than full payment of senior claims. Since classes that receive nothing under the plan (including stockholders) are considered as objecting to the plan, more senior creditors have an incentive to voluntarily relinquish part of their claim in order to reach an agreement. Empirical studies show that deviations from absolute priority are a common feature of Chapter 11 reorganizations (see Sections 4.1 and 5.1).

The Bankruptcy Reform Act of 2005 enhances the rights of creditors in Chapter 11 reorganizations. Some of the more important changes are restrictions on the use and size of management bonuses and severance payments; limitations of the exclusivity period (for management to propose a reorganization plan) to a maximum of 18 months; extension of the fraudulent conveyance look-back period to two years; and reduction of the time that the debtor has to assume or reject leases.

2.4. The choice between private and court-supervised restructuring

With a single lender, complete contracting, and symmetric information, the efficient method of resolving financial distress would be a private restructuring of the debt contract. In a more realistic setting, however, a costless private workout is not feasible, and the firm must weigh the costs and benefits of a private workout against those of a court-supervised proceeding.

Impediments to reaching a settlement in a private restructuring include information asymmetries that arise between poorly informed outside creditors and better informed managers or insiders of the firm; holdout problems when the firm's debt is held by a large number of diffuse creditors; and various conflicts of interest exacerbated when a firm has multiple layers of creditors. Giammarino (1989) and Mooradian (1994) demonstrate that poorly informed creditors may prefer a more costly bankruptcy alternative when information problems are severe. Carapeto (2005) argues that informational asymmetries could lead to extended bargaining, requiring several plans of reorganization before an agreement is reached.

As proposed by Mooradian (1994), Chapter 11 bankruptcy may serve as a screening device when outsiders cannot observe the economic efficiency of the financially distressed firm. Given the debtor's bargaining power and the associated preservation of equity value in Chapter 11, inefficient firms prefer to restructure in court rather than mimic efficient firms in a private restructuring. The self-selection on the part of inefficient firms reduces the information asymmetry between management and outsiders, thus mitigating the impediment to private restructuring for efficient firms. Alternatively, Hotchkiss and Mooradian (2003) suggest that by submitting a bid for the bankrupt firm, a coalition of management and creditors convey positive information about the value of

the firm. This may encourage outsider bidders to enter the auction, hence facilitating an efficient redeployment of the bankrupt firm's assets.⁶

It is possible that Chapter 11 may fail to resolve information asymmetries, leaving creditors uncertain about the viability of the distressed firm. Kahl (2002) claims that with sufficient uncertainty, it may be optimal for creditors to postpone the liquidation decision and gather more information about the firm's survival characteristics. Under this strategy, some inefficient firms will be allowed to emerge from Chapter 11 and, if unsuccessful post-bankruptcy, instead be liquidated at a later date.

Gertner and Scharfstein (1991) focus on the conflicts that arise when there are multiple creditors. In particular, holdout problems can arise when a class of claims, such as public debt, is diffusely held. Under the Trust Indenture Act of 1939, a change in the interest rate, principal amount, or maturity of public debt outside of a formal bankruptcy requires unanimity. As a result, public debtholders cannot coordinate their out-of-court restructuring decision. If the out-of-court restructuring is successful and a more costly bankruptcy is avoided, holdouts are paid according to the original debt contract. The cost is borne entirely by the bondholders who participated in the exchange and accepted a reduction in the value of their claim. Small claimants, such as individual bondholders and trade creditors, may realize that their decision to hold out will not materially affect the outcome of the restructuring offer (Grossman and Hart, 1981), and therefore have few incentives to participate. Thus, even though it may be collectively in the interest of public debtholders to agree to the out-of-court restructuring and avoid bankruptcy, it is likely to be individually rational for bondholders to hold out. Chapter 11 is designed to resolve holdout problems, however, since a majority vote is binding on all members of a creditor class.

Abstracting from information and contracting problems, Haugen and Senbet (1978) suggest that bankruptcy is a capital structure decision that should not be linked to liquidation, which is a capital budgeting decision. If the capital structure problem can be resolved by restructuring the financial claims, then firms will avoid costly bankruptcy procedures and privately agree on a financial restructuring. Haugen and Senbet (1978, 1988) maintain that the costs of such private mechanisms are small and should form an upper bound on the costs of managing financial distress. Similarly, Jensen (1989, 1991) argues that since private restructuring represents an alternative to formal bankruptcy, it pays to avoid bankruptcy when the informal mechanism is cost-efficient. Roe (1983) has made similar arguments.

A complication to the restructuring choice is, however, that a redistribution of the financial claims on the firm may not be independent of the firm's asset restructuring decisions. For a highly leveraged firm in financial distress, different claimholders may have conflicting incentives as to the investment decisions. The issue is that the value of junior claims increases with the riskiness of the firm's assets, while the value of senior claims decreases with risk. At the extreme, a conflict can arise as to whether to liquidate or reorganize the firm. Senior creditors that are first in line may prefer an inefficient

⁶ Povel and Sing (2007) warn that outsiders may worry about overpaying when winning against a better informed insider, and suggest that bankruptcy auctions should be biased against insiders.

liquidation that converts the firm's assets into cash and provides senior debtholders with a safe distribution. In contrast, junior creditors or out-of-the-money shareholders may prefer inefficient continuation because it has a potential upside. The models in Bulow and Shoven (1978), White (1980), and Gertner and Scharfstein (1991) show that inefficient liquidation versus reorganization decisions may occur when there are multiple classes of creditors.

Zender (1991) models a distressed restructuring as a means of transferring control from equityholders to debtholders. He argues that the shift in decision making improves the efficiency of investment decisions. If decision making is transferred to the creditor who effectively is the residual claimholder, that is, holds the claim whose value is the most sensitive to a change in firm value, the incentives of the controlling security holder will be aligned with firm value maximization.⁷

It is often not only financial distress—that is, that the hard contract obligations are too large—but also economic distress that leaves the firm unable to pay its debts. Optimally, assets of economically inefficient distressed firms should be moved to higher value uses and users, while economically efficient distressed firms should be allowed to continue to operate.⁸ The problem is that economic efficiency or inefficiency may not be readily observable.

Moreover, managers may not voluntarily reveal that a firm is economically inefficient. A manager who has private benefits of control and who is interested in preserving his or her job may seek to continue to operate the firm as an ongoing concern and also when it is efficient to liquidate the firm. Aghion, Hart, and Moore (1992) and White (1996) argue that the incentives to undertake high-risk but negative net present value projects increase when managers expect to get a harsh treatment in bankruptcy, for example by losing his or her job. Eckbo and Thorburn (2003), however, suggest that the manager's desire to continue to run the firm following a successful restructuring may counteract any such incentives to overinvest at the expense of bondholders.

In a perfect world, claimholders of a financially distressed firm would always renegotiate and voluntarily agree to a restructuring of the firm's capital structure. In reality, however, with impediments such as information asymmetries, holdout problems, and conflicting interests, firms sometimes resort to bankruptcy for a court-supervised reorganization. In any restructuring of hard contracts or hard assets, the choice of restructuring venue ultimately affects the cost of the restructuring and the impact it has on the firm's investment decisions.

3. Asset restructuring

As outlined in the preceding, one set of mechanisms to deal with financial distress involves restructuring the asset side of the balance sheet in order to generate sufficient

⁷ One way of transferring the liquidation versus continuation decision to the marginal claimholder is to sell the bankrupt firm in an auction, where the highest bidder gets to decide over the future use of the assets.

⁸ The inefficient bankruptcy outcomes of allowing economically inefficient firms to continue and liquidating economically efficient firms are labeled Type I and Type II errors, respectively, by White (1989).

cash to meet the requirements of the hard contracts. Assets can be sold, either piecemeal or in their entirety, to other firms and new management teams. Asset sales can be done privately or through court-supervised procedures, for example, during bankruptcy reorganization (e.g., Chapter 11 of the Bankruptcy Code) or under a liquidation process (e.g., Chapter 7 of the Bankruptcy Code). Each of these alternatives has different costs attached. The incidence and efficiency of asset restructuring to resolve financial distress will depend on the structure of the bankruptcy system in place. This section describes the empirical evidence on the sale of individual assets by distressed firms in the United States. Studies of sales of entire firms in Chapter 11 are discussed in Section 5, and sales of bankrupt firms in other countries are described in Section 8.

The literature described here broadly addresses the following questions: how frequently do distressed firms sell assets; what determines whether distressed firms will sell assets in or out of bankruptcy court; do asset sales lead to efficient outcomes, in that assets are moved to higher value uses; and do “fire sales” exist, where assets are sold at depressed prices?

3.1. Frequency and determinants of asset sales

Financially distressed firms may face a liquidity shortfall, yet be constrained in their ability to raise external funds to meet their obligations. In this situation, asset sales may serve as an alternative source of funds by which liquidity-constrained firms can generate cash. Consistent with this view, Lang, Poulsen, and Stulz (1995) find that asset sales typically follow a period of poor stock performance. On average, these sales announcements are associated with a positive stock price reaction.

In contrast to the evidence for poorly performing firms, Brown, James, and Mooradian (1994) find insignificant returns to announcements of asset sales for a sample of 62 distressed companies. The announcement returns are, however, significantly lower for sellers who use the proceeds to retire debt than for sellers who use the proceeds for other purposes. Firms using sales proceeds to repay debt are more likely to sell assets in poorly performing industries. Also, the greater the proportion of short-term bank debt, the more likely are the sale proceeds to be paid out to creditors, indicating that creditors may influence the decision to liquidate assets. The asset sales appear to benefit the creditors of the financially distressed firm more than its equityholders, suggesting that creditors may force a premature liquidation of the assets.

Asset sales may also convey information about the financial condition of the seller. Sicherman and Pettway (1992) report lower announcement returns for firms divesting assets following a credit downgrade than for sellers with no such downgrade. Brown, James, and Mooradian (1994) examine the characteristics of distressed firms that sell assets and find that sellers typically have experienced a period of extremely poor operating performance and are in poor financial condition. Moreover, the selling firms tend to be distinguished by multiple divisions or subsidiaries. Leverage has also been found to be a determinant of asset sales. Ofek (1993) and Kruse (2002) show that the probability of asset sales increases in the firm's debt level.

A number of papers more generally document the frequency of asset sales for financially distressed companies. Asquith, Gertner, and Scharfstein (1994), Brown, James, and Mooradian (1994), and Hotchkiss (1993, 1995) all demonstrate a high frequency of asset sales for distressed firms, whether out of court or as part of a Chapter 11 restructuring. For example, Hotchkiss (1995) shows that many firms that successfully emerge from Chapter 11 sell a substantial portion of their assets while in bankruptcy.

Asquith, Gertner, and Scharfstein (1994) find that significant asset sales are an important means of avoiding bankruptcy. They find that only 3 out of 21 companies (14%) that sell over 20% of their assets subsequently file for bankruptcy compared to 49% of firms with small or no asset sales. Firms that sell a large fraction of their assets are more likely to complete a successful debt exchange (62% versus 28%). The proceeds are often used to pay off senior private debt. Moreover, the probability of asset sales decreases with industry leverage, suggesting that asset sales may be limited by industry conditions.

3.2. Do “fire sales” of assets exist?

If creditors exert pressure on firms to inefficiently liquidate assets, the value of the firm declines. Not only should we see negative effects on the value of equity and junior debt claims, but firms should also be observed to sell assets at depressed prices in their “fire sale” attempts to raise cash. As discussed earlier, Shleifer and Vishny (1992) argue that distressed firms are likely to be selling assets at a time when potential buyers for those assets—firms in the same industry—are financially distressed as well, contributing to depressed prices. Their model predicts that distressed sellers will receive lower prices and be more likely to sell to industry outsiders in periods when the industry is financially distressed. Moreover, the more specialized the assets, the greater this fire-sale discount.

Several studies examine these issues and their implications for the efficiency of restructurings. An empirical caveat, however, is that it is almost impossible to know whether prices are low because industry demand is low or because industry insiders are liquidity constrained and unable to pay their full valuation. If industry demand has dropped, a low price simply represents an updated (and efficient) market valuation of the assets. If demand exists but a lack of liquidity prevents potential buyers from bidding aggressively, the discount is a true cost associated with the forced asset sale. Most studies construct a model price to represent the fundamental value of the asset, and they compute the fire-sale discount as the difference between this model price and the actual price. Obviously, any evidence on fire-sale discounts is limited by the quality of the estimate of such fundamental values.

Pulvino (1998, 1999) addresses the question of whether fire sales exist. He shows that financially constrained airlines receive lower prices relative to a model price when selling used aircraft than their unconstrained rivals. He also finds that the conditional prices that bankrupt airlines receive for their used aircraft typically are lower than those received by distressed but nonbankrupt firms. Therefore, not only do distressed sellers

receive lower conditional prices, but the bankruptcy status of the seller appears to further influence the outcome. Moreover, when the airline industry is depressed—defined as periods when prices are generally low—capital-constrained airlines are more likely to sell to industry outsiders (financial institutions) than are unconstrained airlines. Overall, the evidence in Pulvino (1998, 1999) is consistent with the Shleifer and Vishny (1992) model.

Two related papers study the impact of asset and industry-level characteristics on asset sales. Ramey and Shapiro (2001) examine individual equipment sales that follow three California plant closures in the aerospace industry. They find that actual transaction prices take place at a discount from estimated replacement costs. This discount is greater for equipment that is more specialized to the aerospace industry and when the buyer is an industry outsider. Kim (1998) investigates the significance of asset liquidity in the contract drilling industry, measured by trading volume and the depth of the buyers' market. She shows that the turnover of illiquid assets drops when the industry is distressed, defined as periods of low crude oil prices and few active rigs. Moreover, sellers of illiquid assets are more financially constrained than sellers of liquid assets and buyers, suggesting that firms avoid selling highly specific assets until it is necessary.⁹

Maksimovic and Phillips (1998) examine whether assets sold by manufacturing firms are redeployed efficiently. Using plant-level data from the U.S. Census Bureau, they track changes in the productivity of assets and operating cash flows for firms entering Chapter 11 and their nonbankrupt industry rivals. Maksimovic and Phillips (1998) show that industry conditions are important in explaining economic decisions such as asset redeployment. Bankrupt firms in high-growth industries are more likely to sell assets than bankrupt firms in declining industries. Furthermore, in high-growth industries, the productivity of the assets sold increases under new ownership. This evidence is consistent with the efficient redeployment of assets to more productive uses and does not support the notion of fire sales in distressed industries. Interestingly, industry conditions are more important than Chapter 11 status in explaining changes in the productivity of assets, regardless of whether they are sold or retained by the firm.

Andrade and Kaplan (1998) also contribute to the body of evidence on asset sales by distressed firms. In a sample of highly leveraged transactions that subsequently became distressed, they find that the total costs of financial distress, measured as the change in the market value of the firm, are independent of the industry's stock performance. Since the market value includes the costs associated with asset sales, their evidence fails to establish that distressed industries force asset sales at greater discounts.

Overall, asset sales appear to be an important component of how firms deal with financial distress. The asset sales are often undertaken in conjunction with a restructuring of the firm's debt contracts. While such asset sales may be costly, because they are so commonly

⁹ Asset liquidity can also influence the firm's choice of capital structure. Firms with more liquid assets tend to have higher debt levels and longer maturities; see, for example, Alderson and Betker (1995) and Benmelech, Garmaise, and Moskowitz (2005).

observed, it is conceivable that they still constitute a relatively low-cost mechanism to help resolve financial distress.

4. Debt workouts

Debt restructurings can be used to soften the hard contracts that cause financial distress. As outlined in Section 2, the distressed firm may reduce or defer payments on its debt contracts, or replace the debt with soft securities that have residual rather than fixed pay-offs. We define a debt restructuring as a transaction in which an existing debt contract is replaced by a new debt contract with a reduction in the required interest or principal payments or an extension of maturity, or exchanged for common stock or securities convertible into common stock. In an out-of-court debt restructuring, claims are renegotiated via a workout or an exchange offer, without resorting to formal bankruptcy proceedings. A workout typically involves renegotiation of bank debt and other privately held claims. Publicly traded debt is restructured through an exchange offer, in which the distressed debt is exchanged for new debt or equity securities. This section surveys the empirical evidence related to different types of debt restructurings.

4.1. *The choice between out-of-court restructuring and formal bankruptcy*

Many firms first attempt to resolve financial difficulties via a workout or exchange offer. Private mechanisms to restructure a financially distressed firm are expected to be less costly than formal bankruptcy proceedings. The greater are the cost savings, the greater are claimholders' incentives to settle privately. However, as discussed in Section 2.4, there are substantial impediments that hinder private restructurings, including asymmetric information, conflicts of interest among claimants, and holdout problems. When private mechanisms to resolve financial distress fail, the firm enters Chapter 11.

Early empirical work indicates that a substantial fraction of firms fail to successfully restructure out-of-court and file for Chapter 11 bankruptcy. Gilson, John, and Lang (1990) examine 169 financially distressed public companies that experienced extreme stock price declines and for which a debt restructuring is mentioned in the *Wall Street Journal*. Of these distressed firms, 80 (47%) restructure their debt out-of-court, while the remaining 89 firms (53%) fail to privately restructure their debt and subsequently file for Chapter 11. Franks and Torous (1994) investigate 161 firms that are downgraded to CCC or below by Standard and Poor's. They identify equal proportions of firms that complete a distressed exchange offer (76 firms) and firms filing for Chapter 11 (78 firms).

It is possible that the proportion of firms that successfully restructure out-of-court has declined. Altman and Stonberg (2006) track the size of the defaulted public bond and private debt markets. Recently, approximately 60% of defaults are concurrent with a bankruptcy filing, and many more defaulted bonds subsequently enter Chapter 11. This

is an increase from the earlier years of Chapter 11 and suggests that private workouts have become relatively less common for distressed firms. One explanation could be legal rulings related to the treatment of claims in the event of a subsequent bankruptcy that discourage out-of-court restructurings relative to bankruptcy (Jensen, 1991).¹⁰

Following the legal rulings that discourage out-of-court restructurings, prepackaged bankruptcies (prepacks) became more widely used in the early 1990s and now replace some out-of-court restructurings, particularly for firms with public debt (Tashjian, Lease, and McConnell, 1996). Prepacks are a hybrid through which a reorganization plan is negotiated with creditors prior to bankruptcy and filed concurrently with the bankruptcy petition. They are sometimes done in conjunction with an out-of-court exchange offer; if the exchange offer fails to receive sufficient support, the firm can enter Chapter 11 and use votes solicited simultaneously with the exchange offer to confirm a reorganization plan in bankruptcy. Thus, firms filing prepacks can take advantage of certain attractive features of a Chapter 11 filing, such as beneficial tax treatment and voting rules to overcome a holdout problem, without going through long and costly bankruptcy proceedings (Betker, 1995a). Baird and Rasmussen (2003) estimate that one quarter of 93 large-firm Chapter 11 bankruptcies in 2002 were prepackaged bankruptcies.

Gilson, John, and Lang (1990) examine the determinants of firms' choice between formal bankruptcy and out-of-court restructuring. They find that the probability of completing an out-of-court restructuring is higher the greater proportion of the firm's assets that is intangible. The value of intangible assets is more likely to erode in bankruptcy, for example, through asset fire sales or perishing customer demand. Since bankruptcy is relatively more costly for firms with more intangible assets, these firms have greater incentives to preserve value via an out-of-court restructuring.

The study by Gilson et al. (1990) further shows that private workouts are more common when the firm has fewer distinct classes of debt outstanding and a greater proportion of the firm's long-term debt is bank debt. Conflicts of interest among different classes of creditors are more manageable the smaller the number of distinct creditor classes. Moreover, because banks are better informed than public debtholders, reducing potential information asymmetries, it is easier and therefore less costly for firms with banks as dominant creditors to renegotiate their debt. The bank debt is also more likely to be pivotal to the restructuring the greater is the proportion of bank debt, forcing the bank to internalize some of the restructuring costs. In contrast, with a greater proportion of diffusely held debt, such as public debt or trade credit, holdout problems become more severe.

Franks and Torous (1994) compare characteristics of the financial recontracting for firms completing public debt exchange offers and firms entering Chapter 11. They find

¹⁰ One such decision was made in the LTV Corp. bankruptcy case. The bankruptcy case was filed on July 17, 1986 in the Southern District of New York, U.S. Bankruptcy Court. The court ruled on January 32, 1990 that debtholders who had participated in a prior out-of-court restructuring could only make a bankruptcy claim for the new reduced principal amount, while holdouts could claim the original principal amount. This decision discourages creditors from agreeing to reduce the principal of their debt claim in an out-of-court restructuring.

that the firms restructuring out-of-court are more solvent and liquid, and have less negative stock returns prior to the restructuring. Unlike Gilson et al. (1990), however, Franks and Torous do not find that firms restructuring out-of-court have a greater proportion of bank debt. This could be because the firms in their sample are larger and therefore rely less heavily on bank debt or because the bank loans of these firms often are syndicated and hence involve a larger number of banks. James (1995) and Asquith, Gertner, and Scharfstein (1994) also show that the presence of public bonds junior to the bank debt may impede restructurings.

Chatterjee, Dhillon, and Ramirez (1995) show that the firm's level of debt, its short-term liquidity, and the potential for coordination problems among creditors jointly determine the choice of restructuring mechanism. Firms filing for Chapter 11 are characterized by poor operating performance, high leverage, and coordination problems among creditors, whereas firms restructuring out-of-court tend to have relatively strong operating cash flows. They also examine firms filing prepacks and find that they typically have relatively strong operating performance but, in contrast to firms doing workouts, face an immediate liquidity crisis.

Asquith, Gertner, and Scharfstein (1994) provide similar evidence on the relationship between the firm's liability structure and the form of the restructuring. In particular, companies with more secured private debt and those with more complex public debt structures are more likely to enter Chapter 11. The larger fraction of secured debt may indicate a relatively low proportion of intangible assets, and thus less costly bankruptcy proceedings. They also find that 59% of firms whose banks agree to a debt restructuring ultimately enter bankruptcy, which suggests that these firms either did not reduce leverage sufficiently or did not adequately restructure assets to avoid bankruptcy. Altogether, the evidence indicates that conflicts between classes of claimants and holdout problems impede out-of-court restructurings, constrain the structure of out-of-court restructurings, or limit the effectiveness of out-of-court restructurings in the resolution of financial distress.

Although there are substantial impediments or limitations to out-of-court restructurings, the direct restructuring costs are likely to be substantially lower for an out-of-court restructuring than for a court-supervised bankruptcy. Measuring the direct costs of an out-of-court restructuring is often difficult because these costs are typically not reported separately from other nonrestructuring related operating expenses of the distressed firm. For example, although several studies of bank loan restructurings have been made, researchers have been unable to identify the related expenses. The costs can be observed, however, for the restructuring of public debt via a formal exchange offer. Gilson, John, and Lang (1990) document an average cost for 18 exchange offers of 0.6% of the book value of assets. The cost for 29 exchange offers studied by Betker (1997) is somewhat higher, with a mean of 2.5% of the pre-exchange assets (median 2.0%). In addition, out-of-court restructurings take significantly less time than Chapter 11 proceedings, suggesting that various indirect costs may be lower as well.

These estimates are useful in two respects. First, relatively low direct costs may make an out-of-court restructuring desirable relative to formal bankruptcy, particularly for firms

with less severe impediments to a privately negotiated solution. Second, in considering a firm's ex-ante optimal leverage, relatively low costs of reorganizing would encourage firms to take advantage of the tax benefits of debt through higher leverage.

The stock market reaction to the announcement of a workout versus a bankruptcy filing corroborates the lower costs of workouts. Chatterjee, Dhillon, and Ramirez (1995) report less negative abnormal returns for announcement of workouts than Chapter 11 filings. Gilson, John and Lang (1990) show that stock returns on the announcement of debt renegotiations are more negative for firms that subsequently file for Chapter 11, suggesting that the market is able to identify firms that are more likely to succeed in restructuring their debt out-of-court.

Another circumstance indicating that there is greater firm value to share in workouts than in bankruptcy is documented by Franks and Torous (1994). They find that senior creditors in workouts are willing to forego a greater share of the value of the reorganized firm in favor of equityholders through deviations from the absolute priority rule. In exchange offers, all creditor classes relinquish some financial consideration to equity (on average 9% of the value of the reorganized firms), while the magnitude of these deviations is much smaller for firms in Chapter 11 (on average 2% of firm value). The fact that senior creditors are willing to give up a greater fraction of the firm to junior claimants in a workout suggests that on average firms attempting workouts may be less severely financially insolvent than bankrupt firms. Alternatively, if senior creditors prefer a smaller fraction of a potentially more valuable firm in a workout than a larger fraction of a potentially less valuable firm in bankruptcy, then this suggests lower overall costs of a workout compared to a bankruptcy.

4.2. Characteristics of debt restructurings

A number of studies have documented various aspects of out-of-court restructurings such as the medium of exchange and debt recovery rates. Asquith, Gertner, and Scharfstein (1994) study the characteristics of private bank debt restructurings. They report that bank lenders respond to financial distress in various ways, including requiring accelerated payments and reducing further lending. Banks also waive covenants but rarely agree to a reduction in the principal amount of their claim. James (1995) expands on these results for a sample of 102 debt restructurings. He shows that banks make concessions only if public debtholders also agree to restructure their claims. In general, banks are more likely to forgive principal and take equity when a smaller fraction of the debt is held by public creditors.

James (1996) demonstrates that bank participation in the workout is important because it facilitates public debt exchange offers. Compared to restructurings in which banks do not participate, exchange offers accompanied by bank concessions have a higher likelihood of succeeding and involve significantly greater reductions in public debt outstanding and less senior debt offered to bondholders. Thus, the characteristics of a firm's debt structure help explain what form of restructuring will be feasible.

Evidence on the characteristics of distressed public debt exchanges is presented by Franks and Torous (1994). They find that a majority of the payments in exchanges of senior public debt are in the form of cash (29%) and new senior debt (38%), whereas the majority of payments in exchanges of junior debt constitutes common stock (67%). They further show that creditor recovery rates tend to be substantially higher in distressed exchange offers than in Chapter 11 reorganizations. Also, relative to Chapter 11 reorganizations, cash is used less extensively and equityholders typically get to retain a larger fraction of the reorganized firm's equity.

Brown, James, and Mooradian (1993) examine how the type of securities offered in a debt restructuring relates to information asymmetries about the firm's prospects. When firms offer equity to private lenders, who tend to be better informed about the firm, and senior debt to public debtholders, this conveys positive information about firm value. In contrast, abnormal announcement returns are negative when private lenders are offered senior debt and public lenders are offered equity.

The participation of investment banks in public debt exchange offers is investigated by Mooradian and Ryan (2005). Firms can choose to conduct a public debt exchange offer without involving an investment bank. Though costly, 61% of the sample firms engage an investment bank as an intermediary in the distressed exchange offers. Mooradian and Ryan show that investment bank participation decreases with the level of commercial bank debt outstanding and increases with bank loan concessions, firm size, number of public debt contracts outstanding, and size of the proposed debt reduction. This suggests that financially distressed firms hire an investment bank to manage their exchange offers when the debt structure is complex and there is a greater need for help in mitigating potential impediments to an out-of-court restructuring. Interestingly, the investment-bank-managed exchange offers involve less senior debt to bondholders, achieve greater debt reduction, and result in better post-restructuring operating performance.

The use of coercive tactics to alleviate holdout problems can be beneficial to the firm. A coercive offer involves a consent agreement to issue a more senior class of debt (which only requires a two-thirds majority vote) combined with an exchange offer replacing the current debt with a more senior debt issue requiring lower interest payments, less principal, or longer maturity. The offer is coercive because if the exchange offer is successful, a creditor holding out ends up with a more junior claim, albeit with more favorable terms. Chatterjee, Dhillon, and Ramirez (1995) report higher completion rates and a higher proportion of bonds tendered or exchanged when exchange offers are coercive, indicating that the coercion helps alleviate the holdout problem. They also show that the equity and debt price reactions to the announcement of the exchange offer indicate that coercion may benefit stockholders without being detrimental to bondholders.

The general conclusion from much of this literature is that absent holdout problems and other coordination problems, private debt restructurings such as exchange offers provide a lower cost restructuring mechanism than formal bankruptcy. Moreover, various characteristics of the financially distressed firm's capital structure and asset composition determine the severity of the impediments to a successful out-of-court restructuring.

5. Governance of distressed firms

The governance structure in bankruptcy determines the relative influence of different stakeholders over the process and hence the outcome of the reorganization. Because bankruptcy is a likely event if an out-of-court restructuring fails, the governance structure in bankruptcy also affects the relative power of claimants outside of bankruptcy and is thus influential in shaping any out-of-court restructuring.

Many aspects of a firm's governance are affected when a firm becomes financially distressed. The fiduciary duties of managers and directors, normally owed to the firm's shareholders, expand to include creditors. With conflicting interests between various debtholders and equityholders, corporate executives may be caught in the middle. Both managers and directors typically experience a higher turnover than normal. Also, most significant restructurings lead to large changes in ownership, with creditors often emerging as new owners of the firm. The mechanisms through which the change in control occurs, however, can be quite different from those for nondistressed firms. This section discusses various aspects of governance and their impact on the incentives of managers and other participants in the restructuring process.

5.1. *Conflicts of interest and the fiduciary duties of managers and directors*

When a corporation is solvent, the managers and directors have fiduciary duties to the corporation and its shareholders. When a company is in financial distress, however, decisions increasing the value of equity may in fact reduce total firm value. Thus, it is no longer clear that the decision making should be left to agents whose incentives are aligned with equity. The courts recognize this problem by extending the fiduciary duties of directors and officers to also include creditors when the firm becomes insolvent (Branch, 2000). This expansion of the fiduciary duties creates potential difficulties in defining managers' responsibilities, however, since shareholders and senior creditors often have opposing interests.

The 1989 bankruptcy of Eastern Airlines, described by Weiss and Wruck (1998), illustrates the potential magnitude of such conflicts. Relying on an offer to purchase the company, Weiss and Wruck estimate the equity going-concern value at the time of filing at approximately \$1.2 billion. Based on the perceived continuation value, creditors and other groups initially supported management's attempts to reorganize. However, even as Eastern continued to experience large operating losses, it was granted the right to use cash available from asset sales to continue operating. Weiss and Wruck estimate a decline in the value of the airline of more than \$2 billion over a 22-month period in bankruptcy. If management were acting solely in shareholders' interests, its best strategy was to continue operating the airline, hoping for a recovery of the business. Given the decline in asset value, however, creditors would have fared better if the cash had been used to pay their claims rather than continue funding unprofitable operations. Reorganization attempts ultimately failed, and Eastern was liquidated under Chapter 7 in 1991.

While Eastern Airlines' bankruptcy provides an extreme example of the tensions between incentives to reorganize versus liquidate, conflicts between different claimholders are manifested in many reorganization cases. Macy's bankruptcy is another example of conflicting interests between stakeholders (Noe and Rebello, 2003). After filing for bankruptcy in 1992, Macy's management embarked on a plan to restructure the operations and close underperforming stores with the objective of ultimately emerging from bankruptcy as an independent company. Negotiations between management, shareholders, and creditors over the reorganization plan remained deadlocked, however. To break the deadlock, Macy's creditors enlisted Federated Department Stores to make a bid for the bankrupt company. Management contested the acquisition and repeatedly sought extension of the exclusivity period to prevent competing reorganization plans. A fraction of the board headed by a bondholder, Laurence Tisch, opposed management's plan. Eventually, Federated and Macy's creditors jointly filed a plan under which Federated gained control of the company, providing no distribution to shareholders.

Until a debt restructuring is completed, the interests of different claimholders regarding the firm's investment decisions can deviate substantially. Chapter 11 provides features that are aimed at balancing such conflicts of interest. The "pro-debtor" provisions of the Bankruptcy Code yield considerable influence to incumbent management over the course of the restructuring and development of the reorganization plan. At the same time, both creditors and the court are granted substantial oversight of the proceedings. Unsecured creditors typically are represented by a committee, giving them influence over the negotiation process. The appointment of other committees, however, is more uncertain. Betker (1995b), for example, documents the formation of an equity committee in one-third of his sample of 75 large Chapter 11 cases.

To speed up the confirmation of a reorganization plan, preventing further deterioration of asset values, senior creditors may agree to a side-payment to junior creditors and equityholders. Such side-payments show up as deviations from the absolute priority rule. The priority of claims is violated for three-quarters of the Chapter 11 cases in Franks and Torous (1989), Eberhart, Moore, and Roenfeldt (1990), and Weiss (1990). For a more recent sample of Chapter 11 filings, Bris, Welch, and Zhu (2006) find violations of the absolute priority rule in only 12% of the cases. The much lower incidence of deviations from the priority of claims could partly be explained by a smaller firm size in Bris et al. (2006) and thus a less complex proceeding, and partly by a change in the view and enforcement of creditor rights. This trend is, however, corroborated by Bharath, Panchapegesan, and Werner (2007), who examine 531 large firms that filed for Chapter 11 between 1991 and 2005. While 26% of the bankruptcy cases in the 1990s involve deviations from absolute priority, such deviations are recorded for only 9% of the cases after year 2000.

Similarly, for a sample of 153 large corporate Chapter 11 filings in 2001, Ayotte and Morrison (2007) report that very few reorganization plans (6% or less) violate absolute priority rules by distributing any value to equityholders.¹¹ They argue

¹¹ This measure does not account for distributions to equityholders of warrants, which are usually the right to buy out the creditors at the face value of their claims.

that governance in Chapter 11 has shifted to emphasize creditor control and creditor conflict. Senior lenders exercise control through pre- and post-petition lines of credit, which limit the debtor's access to financing and impose strict requirements on business activity. Three-quarters of their sample firms obtain DIP financing, typically secured by a lien on all corporate assets. The vast majority of loans contain covenants imposing line-item budgets, profitability targets, and deadlines for reorganization plans. If these covenants are violated, the lender is generally free to seize collateral unilaterally, without seeking court approval. Ayotte and Morrison (2007) further document that junior lenders use claims trading, committees, and other tactics to gain control over the reorganization process. Acting through the unsecured creditors committee, junior creditors file objections in over half of the sample cases. In almost as many cases, DIP lenders object to actions proposed or taken by incumbent management. Amendments to the U.S. Bankruptcy Code effective October 2005 have further increased creditor influence in Chapter 11.

In sum, when a firm becomes financially distressed, the residual claim often shifts from equityholders to creditors. This creates conflicts of interest regarding the firm's investment and continuation decisions that have an important effect on bankruptcy outcome.

5.2. *Management and board changes*

Critics of Chapter 11 bankruptcy suggest that the process protects bad managers from being removed. Bradley and Rosenzweig (1992) argue, on the one hand, that bankruptcy law allows management to go relatively unpunished, retaining control over corporate assets, even when their own actions helped to render the firm insolvent. On the other hand, operating decisions of healthy firms will be affected by an increased likelihood that managers are replaced in the event of financial distress. For example, managers may be reluctant to undertake highly profitable (positive net present value) but also highly risky investments if they are likely to be fired should the investment fail.

Several academic papers examine whether financial distress is costly to managers in the sense that they are likely to lose their jobs. Gilson (1989) examines the turnover of managers carrying the title of CEO, chairman, and president over a four-year period beginning two years prior to bankruptcy filing or debt restructuring. For 69 firms filing for bankruptcy, 71% of managers are replaced over the four years. This turnover rate is significantly higher than that of financially distressed firms that successfully restructure their debt out of court. None of the executives who lose their position are employed by another publicly traded firm over a three-year period following their departure, suggesting that the personal costs are significant.

Other studies of management replacement rates for failing firms show similarly high turnover. Betker (1995b) reports a 91% turnover of CEOs in office two years prior to filing by the time the firm emerges from bankruptcy. In comparison, Weisbach (1988) and Warner, Watts, and Wruck (1988) document substantially lower CEO turnover rates for nondistressed firms. Moreover, both studies show that management turnover increases

as firm performance deteriorates. In a more recent study, Ayotte and Morrison (2007) find that 70% of CEOs are replaced within two years of a bankruptcy filing.

While the turnover of managers is abnormally high for distressed firms in general, certain bankruptcy courts (e.g., Delaware) have been alleged to maintain relatively strong pro-debtor biases. LoPucki (2004) argues that managers choose to file for bankruptcy in such districts, where they expect to receive favorable rulings that help them retain control of the reorganization process. The documented high turnover of managers, however, runs counter to the notion that they are overly protected by the process. Gilson (1989), Betker (1995b), and Hotchkiss (1995) show that although a significant fraction of managers is able to stay in place until a plan is proposed, it is unlikely that they still remain when the firm emerges from bankruptcy.

Financial distress also leads to significant changes in the membership and composition of boards. Distressed firms require a substantial commitment of time and attention from managers and directors to address the firm's operating problems and develop a restructuring plan. Some directors may resign in anticipation of the firm's problems and the implications for the board. Such concerns can potentially make it difficult to recruit new outside directors. Countering the problems with a shrinking board is that certain parties, such as large creditors or outsiders investing in the distressed firm, may seek board seats to protect their interests in the restructuring.

Gilson (1990) finds that although average board size declines for distressed firms, replacement directors often possess some special skill or interest in managing troubled companies (for example, investment bankers or workout specialists). On average, only 46% of the board members prior to financial distress are still present two years after a reorganization or debt restructuring. Hotchkiss and Mooradian (1997) show that "vulture" investors are frequently active in the governance of firms defaulting on their public debt. These investors join the board of directors for 28% of the firms they study, often maintaining these positions for at least one year after emergence from bankruptcy.

In summary, the literature documents the increase in top management turnover rates as firms become financially distressed, suggesting large personal costs for incumbent managers. Director turnover is also high, often resulting in new restructuring specialists joining the board.

5.3. *Management compensation in financial distress*

Compensation contracts are a common means to align managers' incentives. In financial distress, the compensation policy is often an integral part of the firm's overall restructuring strategy, for example, through providing incentives that facilitate negotiations with creditors or encourage a speedy resolution. Once in bankruptcy, contracts with key employees are subject to the approval of the bankruptcy court.

Gilson and Vetsuypens (1993) examine the compensation contracts of managers that are in place as the firm enters financial distress and the contracts of the managers replacing them. They find that managers who retain their position through a debt restructuring often take a substantial cut in salary and bonus. Replacement CEOs who were

previous employees of the firm earn a median of 35% less than their predecessors. In contrast, the median outside replacement CEO earns 35% more than the manager he or she replaces.

The compensation of CEOs of emerging firms exhibits high sensitivity to the post-bankruptcy stock performance (Gilson and Vetsuypens, 2003). For a sample of 63 Chapter 11 cases, Gilson, Hotchkiss, and Ruback (2000) show that half of the managers receive stock and options in the reorganized firm. Stock-based incentive compensation, however, may be associated with a downward bias in cash flows projected for the reorganized firm. A low reorganization value can create a windfall for managers if the option exercise price is set to that low value or the number of shares that managers receive increases with a lower initial stock price. Nevertheless, the form of the compensation contract for managers of the reorganized firm will affect management's efforts in developing a reorganization plan.

A common approach in financial distress is to tie management compensation to the successful resolution of the firm's bankruptcy or debt restructuring, or to the recovery of certain creditor groups. Gilson and Vetsuypens (2003) describe cases in which the CEO is granted a substantial salary increase as a reward for successfully bringing the firm through its financial restructuring or in which part of the CEO's compensation is deferred until the financial restructuring is completed. They further observe cases in which the CEO incentives are tied to the value of creditor claims, for example, by awarding claims with similar characteristics as those held by creditors, or paying a bonus based on the amount of cash creditors receive under the reorganization plan or as a result of asset sales.

Another prevalent practice that has been criticized is the granting of generous retention plans to certain executives and key employees for remaining with the company during the course of the bankruptcy reorganization. Such key employee retention plans (KERPs) led to widespread controversies since they were often accompanied by massive layoffs and wage concessions, and they are now severely limited by the 2005 amendments to the U.S. Bankruptcy Code. Two recent court rulings, however, circumvent these limitations by allowing the debtors to use bonus compensation plans to provide adequate financial incentives to management during the reorganization.¹²

The repricing of executive stock options for firms that have performed poorly has also received much attention. Repricing refers to the practice of lowering the strike price of previously issued employee stock options, typically following a significant stock price decline. Although repricing may reward management following a period of poor performance, it may also be necessary in order to restore appropriate incentives for management.¹³ Chidambaran and Prabhala (2003) show that a majority of the repriced options have a new vesting period or exercise restrictions related to continued employment. This suggests that repricing may be useful in the motivation and retention of key employees.

¹² In re Global Home Products, LLC 1 and In re Nellson Nutraceutical, 2.

¹³ See Acharya, John, and Sundaram (2000) for a theoretical analysis of the trade-off between reducing current-period incentives and restoring continuation incentives that determine the optimality of repricing options.

Repricing has more recently been replaced by a practice known as rescission. In a rescission, shares received by the employee from exercise of the options are returned to the company in exchange for a refund of the strike price. Similar to repricing, this practice has been criticized as symptomatic of poor governance, yet it may be necessary to restore incentive structures.

Overall, CEO salaries tend to decline when their firms become financially distressed. The distressed firms, however, often put in place new management compensation contracts that increase the sensitivity of pay either to a successful resolution of the restructuring or to post-bankruptcy equity performance. Stock or option grants in the emerging firms risk leading to a downward bias in the valuation on which a reorganization plan is based.

5.4. Changes in ownership and control

A distressed debt restructuring typically results in a substantial change in the ownership of the firm. The primary reason is that the poor performance has eroded the equity value, so that shareholders often receive little or no equity in the reorganized firm. Much of the reorganized firm's stock is distributed to a subset of existing creditors, who become the new owners of the firm.

In Gilson's (1990) study of 61 firms filing for bankruptcy, on average 80% of the common stock in the reorganized firm is distributed to creditors. The distribution of stock in exchange for pre-petition debt claims can frequently lead to a change in control. Federal and state banking laws provide U.S. banks with authority to hold common stock received in loan restructurings. For three-quarters of all 111 financially distressed firms in Gilson's (1990) sample, bank lenders and other creditors receive significant blocks of voting stock in the restructured firm. Banks receive on average 36% of the firm's common stock and frequently appoint representatives to the board of directors. James (1995) studies 102 distressed bank debt restructurings and finds that banks take equity positions in 31% of the transactions. Moreover, the banks typically maintain a substantial equity stake for at least two years following the restructuring.

Although asset sales are common, early studies of ownership changes of firms in Chapter 11 detect relatively few acquisitions of the bankrupt firm as a whole by other operating companies (Hotchkiss and Mooradian, 1998). A possible explanation is that Chapter 11, by allowing incumbent management to retain control, discourages potential acquirers. Furthermore, industry rivals may be distressed and lack the financial strength to bid for the bankrupt firm.

Hotchkiss and Mooradian (1998) examine a sample of 55 acquisitions of firms in Chapter 11 by other public companies. The bidding firm is often in the same industry and frequently has some prior relationship (such as a previous asset purchase) with the target. One-third of the transactions they examine involve multiple bidders, indicating substantial competition for the bankrupt targets. Transactions prices, however, are significantly lower than those paid for nonbankrupt firms matched on size and industry. More recently, as sales of businesses through Section 363 of the bankruptcy code have become

more common, M&A activity involving bankrupt targets is observed more frequently (Baird and Rasmussen, 2003).

Along with the increase in takeover activity in Chapter 11, changes in control through claims trading have also become more commonplace. The market for trading claims of distressed firms has grown dramatically since the early 1990s. This market provides banks and other creditors with an opportunity to exit the process earlier, with new investors taking the place of existing creditors in the negotiation of a restructuring plan. A common strategy for an investor who specifically seeks control of a distressed company is to purchase a large block of debt. With a stake sufficiently large to block a reorganization plan, the investor gains influence over the course of the restructuring. Depending on the final negotiated terms of the plan, the stake potentially can be converted into a controlling ownership position. The debt security that will ultimately be exchanged for equity is commonly referred to as the “fulcrum” security. Examining a sample of 288 firms defaulting on their debt between 1980 and 1993, Hotchkiss and Mooradian (1997) find that vulture investors become blockholders (owning more than 5% of the reorganized firm’s stock) for half of the sample firms and gain control of 16% of the firms. Some investors have developed a reputation for using this strategy to gain control of firms in bankruptcy, and as a result, they manage a portfolio of reorganized firms (Apollo Advisors, for example).

Equity infusions in the reorganized firm can also shift control to a new investor. Gilson, Hotchkiss, and Ruback (2000) find such equity investments for 12 of the 63 firms (19%) in their sample, resulting in the investors owning a median of 54% of the reorganized firm’s stock. The activity of these investors, together with high management and board turnover, contributes to significant changes in the governance of distressed firms.

6. Bankruptcy costs

A restructuring can be costly because of asymmetric information, coordination problems among creditors, and conflicting interests of different claimholders. Distressed firms incur direct expenses for lawyers, accountants, financial advisers, and other turnaround professionals. In addition, over the course of a distressed restructuring, the firm may pursue a suboptimal investment policy or inefficiently liquidate assets due to insufficient liquidity and limited ability to obtain new financing. Indirect costs of financial distress include unobservable opportunity costs, such as lost sales driven by the firm’s deteriorating financial condition and lack of management attention on the business itself. This section reviews estimates of the different costs related to financial distress and bankruptcy.

6.1. Direct costs

Studies estimating the direct costs for firms reorganizing in Chapter 11 are listed in Table 1 (Altman and Hotchkiss, 2006). The sample-size weighted average direct cost across the seven studies of Chapter 11 is 6.5% of the book value of assets. Since there is no single

Table 1
Estimates of direct costs of formal bankruptcy proceedings in the United States

Study	Sample	Time period	Estimated costs
Traditional Chapter 11 cases:			
Warner (1977)	11 bankrupt railroads; estimated mean market value \$50 million at filing.	1933–1955	Mean 4% of market value of firm one year prior to default.
Altman (1984)	19 Chapter 11 cases; mean assets \$110 million before filing.	1974–1978	Mean 4% (median 1.7%) of firm value just prior to bankruptcy for 12 retailers; 9.8% (6.4%) for 7 industrial firms.
Weiss (1990)	37 cases from 7 bankruptcy courts; average total assets before filing \$230 million.	1980–1986	Mean 3.1% (median 2.6%) of firm value prior to filing.
Betker (1997)	75 cases; mean assets FYE before restructuring \$675 million.	1986–1993	Mean 3.9% (median 3.4%).
Lubben (2000)	22 cases; median assets \$50 million.	1994	Mean 2.5%.
LoPucki and Doherty (2004)	48 cases from Delaware and Southern District of NY; mean assets at filing \$480 million.	1998–2002	Mean 1.4% of assets at beginning of case.
Bris, Welch, and Zhu (2006)	225 cases from Arizona and Southern District of NY; mean pre-bankruptcy assets \$19.8 million.	1995–2001	Mean 9.5%, median 2%.
Prepackaged bankruptcies:			
Betker (1997)	48 prepackaged Chapter 11 cases; mean assets FYE before restructuring \$675 million.	1986–1993	Mean 2.8% (median 2.4%) of pre-bankruptcy total assets.
Tashjian, Lease, and McConnell (1996)	39 prepackaged Chapter 11 cases; mean book value assets FYE before filing \$570 million.	1986–1993	Mean 1.8%, median 1.4% of book value of assets at fiscal year-end preceding filing.
Chapter 7 cases and liquidations:			
Ang, Chua, and McConnell (1982)	86 liquidations, Western District of Oklahoma; estimated mean pre-bankruptcy assets \$615,516.	1963–1979	Mean 7.5% (median 1.7%) of total liquidating value of assets.
Lawless and Ferris (1997)	98 Chapter 7 cases from 6 bankruptcy courts; median total assets \$107,603.	1991–1995	Mean 6.1% (median 1.1%) of total assets at filing.
Bris, Welch, and Zhu (2006)	61 Arizona and S.D.N.Y. Chapter 7 cases; mean pre-bankruptcy assets \$501,866.	1995–2001	Mean 8.1%, median 2.5% of pre-bankruptcy assets.

Source: Altman & Hotchkiss (2006), p. 95.

source of comprehensive information for Chapter 11 cases, studies make use of court documents collected from one or more of the federal bankruptcy courts. The studies cover a wide variety of firms, including everything from large railroads (Warner, 1977) to relatively small firms (Lawless and Ferris, 1997). The range of estimates of direct costs is therefore quite wide, with means ranging from 1 to 10% and medians from 2 to 6%.

Researchers generally interpret these numbers as evidence of relatively low direct costs, particularly in relation to the potential tax benefits of using debt. The direct costs also appear to have a fixed component, explaining why a Chapter 11 reorganization may not be feasible for some smaller firms. For large public companies in bankruptcy, the mean professional fees as a percentage of pre-filing assets ranges from 1 to 3% (Lubben, 2000; Weiss, 1990). Though relatively small on a percentage basis, the dollar amount of fees in large public bankruptcy cases can be significant.

Firms undertaking prepackaged bankruptcies seek agreement among claimholders on terms of the financial restructuring prior to filing. Prepackaged bankruptcies generally allow firms to exit bankruptcy within months and are therefore expected to have lower direct costs than a lengthier bankruptcy proceeding. Betker (1997) finds direct costs for prepackaged bankruptcies of on average 2.8% of the pre-bankruptcy total assets. This cost estimate includes all the pre-bankruptcy expenses of informal bondholder committees and banks, where most of the costs are incurred and for which the bankrupt firm routinely pays. Tashjian, Lease, and McConnell (1996) show that direct costs for prepacks average 1.8% of the book value of pre-filing assets and 1.6% for the subsample of cases that are pre-voted. Thus, the costs of prepackaged bankruptcies appear to fall somewhere between those observed for traditional Chapter 11 cases and those documented by Gilson, John, and Lang (1990) for out-of-court exchange offers.

While most attention is devoted to the costs of Chapter 11 proceedings, a few studies examine the costs of liquidations under Chapter 7. Bris, Welch, and Zhu (2006) document bankruptcy expenses of on average 8.1% (median 2.5%) of pre-bankruptcy assets for a sample of 61 smaller nonpublic firms. Based on their estimates of the post-bankruptcy remaining value, however, the bankruptcy fees exceed the value of the entire estate in two-thirds of the cases. Lawless and Ferris (1997) find that the fees in Chapter 7 on average amount to 6.1% of total assets.

Bankruptcy costs are likely to increase with the time that the firm spends in bankruptcy. Franks and Torous (1989) report that the average bankruptcy takes 2.7 years for 14 firms filing after the 1978 Bankruptcy Code took effect. The average time from filing of the bankruptcy petition to resolution is 2.5 years in Weiss (1990) and 2.2 years in Franks and Torous (1994). For the sample in Bris, Welsh, and Zhu (2006), which is both more recent and contains smaller firms, the average Chapter 11 proceeding lasts 2.3 years (median 2.4 years). They show that the length of the bankruptcy procedure is independent of firm size but varies with the specific judge overseeing the case. The duration of Chapter 11 reorganization is further found to decrease with the operating profitability of the industry

(Denis and Rodgers, 2007). Bharath, Panchapegesan, and Werner (2007) show that the time to resolution in Chapter 11 has declined and on average is 16 months in the 2000–2005 period. Morrison (2007) finds a median duration of 8 months for the 36 small business Chapter 11 cases in 1998 that emerge as going concerns.¹⁴

The relatively low direct costs of exchange offers discussed in Section 4.2, as well as the increasing use of prepackaged bankruptcies, suggest that cost savings can be significant for firms that successfully restructure without entering a traditional Chapter 11 procedure.

6.2. *Indirect costs*

The magnitude of indirect costs relative to direct costs, and therefore their importance to theories of debt structure and reorganization, can be large. Indirect costs, however, are unobservable and therefore more challenging to estimate empirically.

One of the first attempts to study indirect costs is Altman (1984). Altman compares expected profits to actual profits over the three years prior to bankruptcy (years -3 to -1) for a sample of 19 firms entering Chapter 11. Expected profits are based either on a comparison of each firm's sales and profit margin to industry levels prior to year -3 or on security analyst estimates. He finds that the indirect costs, that is, the difference in profits, average 10% of firm value just prior to bankruptcy. The combined direct and indirect costs are on average 17% of firm value. It is, however, impossible to distinguish whether the decline in profits is a result of the financial distress itself (and therefore is an indirect cost) or a result of the same economic factors that caused financial distress in the first place.

Opler and Titman (1994) address this causality problem by selecting firms in industries that experience economic distress, defined as declining industry sales and median stock returns below -30% . They find that firms with higher leverage ratios prior to the onset of industry economic distress experience a greater decline in market share and operating profits, consistent with the notion that there are significant indirect costs of financial distress.

Subsequent studies recognize that in order to provide specific estimates of indirect costs, it is useful to separate the effects of financial versus economic distress. Andrade and Kaplan (1998) examine 31 firms that become distressed subsequent to a highly leveraged transaction. Given the high ex-ante leverage of these firms, they are largely financially distressed but not economically distressed, allowing an observation of the costs of "pure" financial distress. Andrade and Kaplan (1998) report that the distressed firms cut capital expenditures, sell assets, and delay restructuring or filing for Chapter 11 in a way that appears to be costly. Based on changes in firm market value over time, they estimate the net costs of financial distress to range from 10 to 20% of firm value. In addition, they find that these costs are concentrated in the period after the firm becomes distressed, but

¹⁴ See also Flynn (1989), Gilson, John, and Lang (1990), Hotchkiss (1995), and Betker (1997) for evidence on the length of Chapter 11 proceedings.

before it enters Chapter 11, suggesting that the indirect costs are not caused by Chapter 11 itself.¹⁵

As discussed in Section 3.2, Maksimovic and Phillips (1998) show that industry conditions are much more important than bankruptcy status to explain the productivity, asset sales, and closure decisions of Chapter 11 firms. Similar to Andrade and Kaplan (1998), this indicates that few real economic costs are attributable to Chapter 11 and that bankruptcy status is marginal to indirect costs. Pulvino (1999), in contrast, finds that bankrupt airlines sell aircrafts at prices that generally are lower than those received by distressed but nonbankrupt firms, implying that bankruptcy status could influence these costs.

A bankruptcy filing may convey negative private information about industrywide business conditions. Studying the effect of the bankruptcy announcements of 59 failing firms, Lang and Stulz (1992) find a 1% price decline in a value-weighted portfolio of competitor stock. The effect is greater for relatively highly leveraged industries. In contrast, competitors in concentrated industries with low leverage experience positive announcement returns, perhaps because the exit creates a windfall for the surviving rival firms. The negative stock price reaction of industry rivals to the bankruptcy announcement of large firms is confirmed by Ferris, Jayaraman, and Makhija (1997). They further show that competitors who subsequently file for bankruptcy experience the greatest decline in equity value. Haensly, Theis, and Swanson (2001), in contrast, find insignificant announcement returns for industry rivals. The stock returns are negative, however, in industries with relatively high leverage. Hertzell, Li, Officer, and Rodgers (2007) show that distress related to bankruptcy filing also is associated with negative and significant stock price effects for suppliers, in particular when intra-industry contagion is severe.

Debt recovery rates, defined as the bankruptcy payoff to creditors as a fraction of the face value of their claims, reflect the value of the distressed firm's assets net of all direct and indirect costs. Franks and Torous (1994) report total recovery rates of on average 51% for 37 Chapter 11 cases. Bris, Welch, and Zhu (2006) document average recovery rates in Chapter 11 of 69% (median 79%). A caveat with these recovery rate estimates, however, is that a majority of the distributions are in the form of new claims valued at face value. For a subsample of 12 firms in Frank and Torous with available market values for all claims in the reorganized firm, the median recovery rate is a lower 41%.

Although the evidence is mixed with respect to whether indirect costs are largely incurred during the period of financial distress prior to bankruptcy or while in formal bankruptcy, such costs appear to be of greater magnitude than the direct bankruptcy costs. Thus, firms with potentially large opportunity costs of operating in financial distress are more likely to choose lower debt levels *ex ante* and, once in financial distress,

¹⁵ Kaplan (1989, 1994) provides an illustration of the indirect costs of financial distress in the context of Campeau's acquisition of Federated. See also Cutler and Summer's (1988) analysis of the Texaco-Pennzoil litigation.

select a restructuring mechanism that resolves the financial distress both faster and more fully.

7. The success of chapter 11 reorganization

One measure of a “successful” restructuring is that a consensual agreement between claimants is ultimately reached, putting in place a modified set of financial contracts and/or liquidating all or a portion of the firm’s assets to meet its obligations. In terms of Chapter 11, however, “success” implies that the firm is able to reorganize rather than liquidate. If the Bankruptcy Code is structured such that some inefficient firms are allowed to reorganize (i.e., their estimated going-concern value is less than their unobserved liquidation value at the time of reorganization), researchers need to consider the performance of the firm some time after it has emerged to ultimately argue whether the restructuring has been successful. In this section, we focus on these aspects of Chapter 11 restructurings, rather than on outcomes of private restructurings, as this literature relates to the important debate over the efficient design of a bankruptcy code.

7.1. Outcomes of chapter 11 filings

The Executive Office for U.S. Trustees provides statistics for confirmation rates of Chapter 11 cases in the United States. It is clear from their statistics that many firms entering Chapter 11 ultimately are not successful in having a plan of reorganization confirmed; for the years 1990 through 2003, confirmation rates do not exceed 45% in any single year. The national average confirmation rate for this time period is only 29% of cases. Furthermore, many of the plans that are confirmed are “liquidating Chapter 11” plans, providing an alternative mechanism for liquidation other than the Chapter 7 process. The large number of cases that do not reach confirmation are ultimately closed with no remaining value, or converted to a Chapter 7 case.¹⁶

For the subset of Chapter 11 cases successfully confirming a plan, the disposition of the firm’s assets can still vary in significant ways. Unfortunately, information is generally not available for nonpublic companies, and for public firms it must be compiled from various sources including news services. Hotchkiss and Mooradian (2004) examine 1770 public companies that filed for Chapter 11 between 1979 and 2002. A publicly cited resolution of the outcome by June 2004 is available for some 1400 cases (80%). The remaining cases are either still in bankruptcy as of 2004 or have likely ended in liquidation. The bankrupt firm emerges as a public company (44% of cases) or a deregistered private company (27%), is liquidated (21%, including conversions to Chapter 7), or merges with another operating company (8%). Similar proportions are

¹⁶ Statistics are available at <http://www.usdoj.gov/ust>. Statistics include all states except Alabama and North Carolina.

reported by Hotchkiss (1995) for the subset of firms filing prior to 1988. Using data from two courts (Arizona and the Southern District of New York) where bankruptcy documents are available electronically, Bris, Welch, and Zhu (2006) find that 52% of 150 firms reorganized under Chapter 11 firms continue as independent companies.¹⁷

A smaller number of firms merge with another operating company while in bankruptcy. Hotchkiss and Mooradian (1998) show that the combined cash flows of the merged company increase by more than is observed for similar nonbankrupt transactions, suggesting that these mergers represent a successful restructuring outcome. For smaller firms, acquisitions are more common. White (1984) finds that in a sample of 64 small corporations in Chapter 11, 23% of the firms are sold as going concerns, 47% adopt reorganization plans, and the remaining 30% are eventually liquidated. Examining 95 relatively small corporate bankruptcy filings in Chicago during 1998, Morrison (2007) reports that 9 firms (9%) are sold as a going concern and another 27 firms (28%) exit as a reorganized entity, while 28 firms (29%) are shut down in bankruptcy and the remaining 31 firms (33%) exit Chapter 11 without a new capital structure, typically followed by a subsequent liquidation.¹⁸

Several studies have examined factors influencing the probability that a firm successfully emerges from Chapter 11. Hotchkiss (1993) shows that firm size, measured by pre-petition assets, is the utmost important characteristic determining whether a firm will be successfully reorganized rather than liquidated. Many of the emerging firms have considerably downsized while in bankruptcy. She suggests that the ability to divest assets and use the proceeds to fund the remaining operations is critical to the firm's survival in Chapter 11. Similarly, Denis and Rodgers (2007) provide documentation that firms with significant reductions in assets and liabilities in bankruptcy are more likely to emerge as going concerns. If asset prices are temporarily depressed by low industry demand, a liquidation or sale may be relatively costly to the creditors of defaulted firms. Acharya, Bharath, and Srinivasan (2007) show that most distressed firms emerge as restructured entities during periods of industry distress, possibly as a way of avoiding costly asset fire sales.

Carapeto (1999) and Dahiya, John, Puri, and Ramirez (2003) argue that access to DIP financing is an important factor in a successful reorganization. The availability of DIP financing is particularly important to firms in desperate need of fresh working capital, such as retailers whose suppliers might otherwise discontinue business. Using a sample of 538 public companies in Chapter 11, Dahiya et al. (2003) show that the probability of emerging as a reorganized entity is higher for firms receiving DIP financing. The benefits from DIP financing are further documented by Chatterjee, Dhillon, and Ramirez (2004), who report significantly positive abnormal stock and bond returns at the announcement of DIP loans.

Another factor that could affect the reorganization is the individual judge's interpretation and application of the bankruptcy law. Chang and Schoar (2006) find significant

¹⁷ For evidence on the outcome of public firm Chapter 11 reorganization, see also Weiss (1990), LoPucki and Whitford (1993), Denis and Rodgers (2007), and Kalay, Singhal, and Tashjian (2007).

¹⁸ See also Flynn (1989) for the outcome of small-firm bankruptcies.

differences across judges in the propensity to grant or deny creditor motions (e.g., to dismiss a case, lift an automatic stay, extend the exclusivity period, and use cash collateral). Their evidence is consistent with Hotchkiss (1995): she uses a dummy variable to indicate cases filed in the Southern District of New York, which at the time had a reputation for pro-debtor rulings favoring management attempts to reorganize (Weiss, 1990; LoPucki and Whitford, 1991). Cases filed in this district have a somewhat higher probability of subsequently entering a second bankruptcy or distressed restructuring.

Baird and Rasmussen (2003) argue that modern Chapter 11 practices are quite different from those observed a decade ago, with creditor control now being a dominant theme. They examine the 93 public large firms that completed their Chapter 11 reorganization in 2002. Of these, 52 (or 56% of the sample) are sales under Section 363 of the Bankruptcy Code or as part of a reorganization plan. Of the remaining cases, two-thirds (26 firms) reach an agreement with creditors prior to filing a prepackaged bankruptcy and one-third (15 firms) are reorganized in a traditional Chapter 11 proceeding.

Although the use of Chapter 11 may have changed over time, it is still true that large public firms are more likely to survive Chapter 11 as a going concern, while small firms have a higher probability of liquidation.

7.2. *Post-bankruptcy performance*

In choosing a restructuring mechanism, firms consider both the cost of the restructuring itself and the extent to which the restructuring is able to resolve the financial difficulties. Distressed firms with plenty of intangible assets, and thus high indirect costs of bankruptcy, are more likely to choose a restructuring mechanism that minimizes the chance of a subsequent bankruptcy filing. In other words, these firms may choose to incur the immediate high costs of a comprehensive restructuring as long as it leads to greater debt reduction and a superior post-restructuring operating performance.

Conflicts of interests may further explain why firms fail to fully correct corporate investment policy in a restructuring. Incumbent managers are more likely to push for a continuation of the operations that preserves their private benefits of control rather than a more comprehensive restructuring involving the sale of a substantial part of the firm's assets. Management looking out for the interests of equityholders may also choose to file for Chapter 11 in order to take advantage of the bargaining power allocated to equity and the preservation of shareholder value.

If financial distress is not fully resolved for firms reorganizing in bankruptcy or if Chapter 11 suffers from economically important biases toward continuation of unprofitable firms, poor investment decisions will be reflected in the post-bankruptcy performance of emerging firms. Hotchkiss (1995) examines the operating performance of firms that emerge as public companies from Chapter 11 by 1989. Over 40% of the firms continue to experience operating losses in the first three years following bankruptcy. Accounting ratios such as return on assets and profit margins are substantially lower than for industry

rivals. In the first year after emerging from Chapter 11, almost 75% of the sample firms have a lower operating performance (EBITDA/sales) than that of nonbankrupt firms in the same industry. Hotchkiss and Mooradian (2004) find similar results for a more recent time period. More than two-thirds of their sample firms underperform industry peers for up to five years following bankruptcy, and over 18% of the firms have negative operating income in the year following emergence.

Maksimovic and Phillips (1998) examine changes in the asset composition for firms that survive Chapter 11. By tracking the productivity of individual plants, regardless of whether these plants are sold or closed down, they are able to avoid the impact of survivorship bias, since they can examine asset performance even if the original owner of the assets is liquidated or emerges from Chapter 11 as a private company. They show that plants that are retained by bankrupt firms have lower productivity compared to the assets that are sold off, suggesting that firms in bankruptcy retain their least profitable assets. Thus, the performance changes may partially be a result of asset sales and closures, and not of changes in the efficiency of the retained assets.

In a recent paper, Kalay, Singhal, and Tashjian (2007) study changes in the operating performance of 113 firms that reorganized in Chapter 11 in the 1990s. The failed firms experienced significant profitability improvements while in bankruptcy in absolute terms as well as compared to industry rivals, suggesting that the reorganization may provide net benefits to the distressed firms. The performance improvements are smaller for firms with complex debt structure (more classes of debt) and greater for firms with higher pre-filing debt ratios, possibly because the automatic stay on debt payments is particularly valuable to these firms.

An alternative to examining accounting-based performance measures is provided by Alderson and Betker (1999), who estimate the return that could have been earned by liquidating the firm's remaining assets and investing the proceeds in a portfolio of securities. Alderson and Betker (1999) compare the market value of 89 firms five years after emerging from bankruptcy (including all cash distributions to claimholders) to an estimated value if the assets would have been liquidated at emergence. The annualized return is then compared to the return of the S&P index over the same time period. They find that reorganized firms on average neither underperform nor overperform the S&P index. One interpretation of this study is that based on cash flow returns, emerging firms perform at par with the market overall, ignoring any differences in systematic risk.

Measures of operating profitability after emergence are likely to be strongly related to stock price performance as well. However, studies of stock price performance largely address the efficiency of pricing the securities at emergence, rather than the efficiency of the decision to reorganize. Still, these studies provide yet another view of post-bankruptcy success, in particular from an investment point of view. One difficulty in interpreting studies of emerging firm stock returns, however, is that only a fraction of firms that emerge relist their stock. For example, only 60% of the emerging firms studied by Hotchkiss (1995) relist their stock on NYSE, AMEX, or NASDAQ post-bankruptcy. If the worst firms are systematically unable to relist their stock, studies of post-bankruptcy stock performance may be biased to reflect the better performing firms.

The most comprehensive study of post-bankruptcy stock price performance to date is that of Eberhart, Altman, and Aggarwal (1999), who examine the equity performance of 131 firms emerging from Chapter 11 by 1993. They report large positive excess stock returns over the 200 trading days following emergence using different benchmarks. Compared to the return of a portfolio of nonbankrupt firms matched on industry and size, the average cumulative abnormal return (ACAR) is 25% (median 6%). Using the market model, the ACAR of the reorganized firms over the same period is 139% (median 5% to 7%). In sum, emerging firms exhibit large positive and significant abnormal stock returns in the first year post-bankruptcy. For a smaller sample but over a much longer time interval (five years subsequent to distress), Goyal, Kahl, and Torous (2003) document average abnormal returns close to zero using a value-weighted reference portfolio, but highly negative abnormal returns (−51%) using a size and book-to-market reference portfolio.

As a whole, the research suggests that a considerable portion of firms emerging from bankruptcy continue to perform poorly based on various performance measures. Underperformance may be related to firms that insufficiently reduced their debt burden with the restructuring, or that failed to undertake sufficient asset restructuring, enabling them to implement a feasible reorganization plan. The ultimate measure of success, therefore, is whether the firm is able to subsequently avoid another distressed restructuring or bankruptcy.

A number of studies have documented the incidence of repeated failures of distressed firms. The high rate of subsequent failures occurs despite the Chapter 11 requirements that the company must demonstrate the feasibility of the reorganization plan before it can be confirmed.¹⁹ Among the earliest, LoPucki and Whitford (1993) report that 32% of 43 large Chapter 11 cases confirmed by March 1988 reenter Chapter 11 within four years. Hotchkiss (1995) shows that one-third of the emerging firms in her sample need to again restructure either through a private workout, a second bankruptcy, or an out-of-court liquidation. Gilson (1997) reports a failure rate of 25% for 108 distressed firms that recontracted with creditors in Chapter 11 or out of court. More recent statistics for the incidence of “Chapter 22” filings show that this pattern continues.

The high rate of subsequent failures has several potential explanations. One possibility is that firms have not sufficiently reduced their debt in the restructuring. Gilson (1997) finds that firms remain highly leveraged after emerging from Chapter 11, though less so than firms completing an out-of-court restructuring. Firms emerging from bankruptcy have a median ratio of long-term debt to total capitalization of 47%, and three-quarters of the firms are more highly levered than their industry rivals. Another explanation is that management is overly optimistic about the prospects for the reorganized firm. Hotchkiss (1995) shows that the continued involvement of incumbent management in the restructuring process increases the probability of post-bankruptcy failure. Finally, it has been

¹⁹ According to §1129(a)(11) of the Bankruptcy Code, the reorganization plan must be feasible. The statute specifically requires the bankruptcy judge to find that approval of the reorganization plan “is not likely to be followed by the liquidation or the need for further financial reorganization of the debtor.”

suggested that the pro-debtor orientation of the Bankruptcy Code and the courts permit inefficient firms to reorganize.²⁰ It is likely that all these factors combined play a role in the high failure rate of firms reorganized under Chapter 11.

The governance structure of the reorganized firm, however, appears to have an important relationship to post-bankruptcy success. Hotchkiss and Mooradian (1997) find that when a vulture investor remains active in the governance of the firm post-Chapter 11, the fraction of firms experiencing operating losses is a mere 8%. Improvements in performance relative to pre-default levels are greater when a distressed investor joins the board, becomes the CEO or chairman, or gains control of the firm. When there is evidence of vulture involvement but this investor subsequently is passive in the restructured company, performance appears no better than for those firms with no evidence of vulture involvement. Thus, the continued presence of distressed investors in the governance of the restructured firm is strongly related to different measures of post-bankruptcy success.

To sum up, a majority of large public firms emerge from Chapter 11 as independent companies, while small private firms are more likely to be liquidated in bankruptcy. Surviving firms frequently exhibit poor operating performance and frequently default on their debt again. Nevertheless, stock returns of surviving firms exceed various benchmarks in the first year following bankruptcy, raising the possibility that the market initially undervalues some reorganized firms.

8. International evidence

Bankruptcy laws vary considerably across the world. All countries provide liquidation procedures, where control over the firm shifts to creditors and assets are sold piecemeal or as a going concern. There are, however, major differences in the provisions for court-supervised reorganization—that is, a court settlement that permits the firm to continue as an ongoing concern while the financial claims are restructured. Some countries offer few alternatives to a sale of the distressed firm's assets. Other codes provide substantial shelter for incumbent management and equityholders, typically favoring a continuation of the operations. The degree to which the company's business is protected from creditors also varies. In some bankruptcy systems, the existing debt contracts are stayed and new debt receives super-priority status. Under other codes, secured claimholders have the right to seize collateral, potentially thwarting a continuation of the business.²¹

Although there is substantial variation, two distinct systems stand out: reorganization and auction codes. A reorganization code provides strong provisions for a court-supervised renegotiation of the firm's capital structure. Creditors have limited influence over the bankrupt firm, and incumbent management is typically allowed to continue to

²⁰ See, for example, Bradley and Rosenzweig (1992). The Southern District of New York and Delaware have been mentioned in this context.

²¹ For a specific situation related to the enforcement of a debt contract against a hotel, Djankov, Hart, McLiesh, and Shleifer (2006) show that the contract is enforced more efficiently in countries with higher per capita income and quality of contract enforcement, and predicts debt market development.

run the operations. Chapter 11 of the U.S. Bankruptcy Code is a prominent example of a reorganization code. An auction code, in contrast, mandates a public sale of the bankrupt firm's assets.²² The bidder offering the highest price decides whether the firm is liquidated piecemeal or survives as a going concern. Creditor interests are at the forefront, and the fate of management is determined by the buyer in the auction. As discussed later in this section, the Swedish bankruptcy code is a good example of an auction code.

Proponents of reorganization codes point to the perceived weaknesses of auction codes. There are concerns that the markets for distressed firms' assets are illiquid, forcing fire sales at depressed prices and perhaps producing a suboptimal allocation of assets. Moreover, bidding costs may be prohibitive due to uncertainty about the distressed firm's prospects, deterring potential bidders from entering the auction (Aghion, Hart, and Moore, 1992). It has also been suggested that managers, dreading the uncertainty about their position that the auction implies, may delay filing and engage in value-destroying, risk-shifting activities in an attempt to entirely avoid bankruptcy (White, 1996; Hart, 2000). In contrast, managers may be encouraged to file promptly under a management-friendly reorganization code, hence preserving firm value and increasing the likelihood of a successful reorganization.

Obviously, reorganization codes embrace a different set of inefficiencies. While an auction makes use of the market, the reorganization code uses negotiations to determine the value and future use of the bankrupt firm's assets. Since a restructuring of the capital structure entails the distribution of new financial claims, the negotiations also involve how much and what type of securities the various creditors will receive. Reaching one negotiated solution covering all these aspects can be a lengthy and costly procedure for the distressed firm. The auction, on the other hand, separates these decisions and thus provides a speedier resolution.

Another potential issue associated with a reorganization code is the substantial control rights given to incumbent management, effectively removing the residual claimholders (creditors) from the decision making. While this approach may encourage management to file without delay, it also opens the way for decisions that benefit self-interested managers. It is possible that the default is a result of managerial incompetence. Allowing the incumbent managers to retain control of the firm may delay a necessary change in management or prevent closure of the operations when a piecemeal liquidation of the assets is optimal.²³ In contrast, in the auction, the highest bidder who has its own money at stake determines whether the firm will continue to operate as a going concern or whether the assets are to be redeployed.

The total costs imposed by the bankruptcy code determine claimholders' incentives to voluntarily restructure the claims outside of the formal bankruptcy procedure. Claessens

²² Mandatory auctions are often referred to as liquidations. In this context, however, liquidation simply implies that the assets are redeployed through a sale. This may or may not imply a termination of the operations.

²³ Franks and Loranth (2005) suggest that lack of court oversight and poorly designed trustee compensation contracts lead to inefficient continuation of poorly performing firms under the Hungarian reorganization code.

and Klapper (2005) find that the bankruptcy filing rate generally is higher in countries with an efficient judicial system. Moreover, controlling for judicial efficiency, bankruptcy tends to be used more frequently in countries where the insolvency procedures give creditors more rights.²⁴ Thus, when comparing outcomes under different bankruptcy codes, one should keep in mind the caveat that a distinct set of firms may file for bankruptcy under each code.²⁵

The magnitude of the potential inefficiencies in different bankruptcy systems is an empirical question. Nevertheless, evidence on bankruptcy reorganization outside the United States is sparse. In the following section, we review evidence on the restructuring of distressed firms in the UK, Sweden, France, Germany, and Japan.

8.1. *The United Kingdom: receivership*

UK companies have access to several court-supervised procedures. In the dominant procedure, *Receivership*, a secured creditor appoints a receiver representing the interests of this creditor. The receiver realizes the security and, after deducting his expenses and paying any higher priority claims, uses the proceeds to pay off the appointing creditor. If the claim is secured by floating charge collateral, an administrative receiver gets full control over the firm and can reorganize the firm or sell assets without permission from other creditors or the court.²⁶ There is no automatic stay of debt claims. Creditors secured with fixed liens on particular assets have the right to repossess their collateral, even if the assets are vital for the firm's operations. Any excess balance is distributed to remaining claimholders according to the absolute priority of their claims. Unsecured creditors have little influence over the procedure.

The UK also provides two court-administered reorganization procedures, *Administration* and, for small firms, *Company Voluntary Arrangements* (CVAs), which give the firm temporary relief from its creditors. A secured creditor can veto these procedures, however, and instead appoint a receiver. Thus, in practice, the court can appoint an administrator that represents all creditors only in the absence of secured creditors. Reformed UK insolvency procedures took effect in 2003. The new UK law cuts back the rights of creditors secured by floating charge, including that to appoint an administrative receiver. Holders of floating charge claims issued prior to September 15, 2003, however, retain the same rights as before. Overall, UK insolvency procedures are considered to be creditor-oriented.

In general, the UK receivership code provides little protection of the operations. The liquidation decision is typically left to secured creditors, who lack incentives to generate

²⁴ See also Claessens, Djankov, and Klapper (2003) for an examination of the use of bankruptcy in East Asia.

²⁵ The design of the bankruptcy code may also have other ex-ante effects. Acharya and Subramanian (2007) suggest, for example, that firms generate more patents in economies with weaker creditor rights.

²⁶ The collateral of a floating charge claim includes inventory, accounts receivables, working capital, and intangible assets.

proceeds above the value of their claim. Franks, Nyborg, and Torous (1996) propose that the allocation of control rights to secured creditors leads to underinvestment and excessive termination of economically viable firms. Franks and Nyborg (1996), however, argue that premature liquidation can be avoided if the creditor appointing the receiver has large private benefits of control associated with the survival of the bankrupt firm.

Interestingly, the evidence indicates that a large fraction of distressed UK firms indeed survive as ongoing concerns. Franks and Sussman (2005) examine 542 small-to-medium-sized financially distressed UK firms that are transferred to their bank's workout unit. They report that 60% of sample firms filing for the UK receivership code continue to operate as going concerns after bankruptcy. In a sample of UK firms filing for administrative receivership, Kaiser (1996) finds that almost half are sold as going concerns. Similarly, Davydenko and Franks (2006) show that 43% of small UK firms that default on their debt are liquidated piecemeal.

Franks, Nyborg, and Torous (1996) suggest that the UK receivership code is speedy, which would imply low direct costs. Nevertheless, Franks and Sussman (2005) report direct costs averaging 33% of asset values. They note that a lack of competition among receivers may explain the high costs and point to much lower costs (mean 14%) when the Royal Bank of Scotland recently required receivers to tender for their appointments. We are not aware of specific data on the duration of the UK bankruptcy procedure. Nevertheless, the firms in Franks and Sussman (2005) spend on average 7.5 months in the bank's workout unit, and the median length of reorganization is 1.4 years for a subset of the defaulted firms in Davydenko and Franks (2006).

Secured creditors seem to fare relatively well in the UK procedure, as expected. Franks and Sussman (2005) document average bank recovery rates of 75%, with a median of 100%. Nearly all of the firms' assets are pledged as collateral to the bank. Interestingly, banks tend to liquidate collateral at prices close to the face value of the secured claim, possibly because secured creditors have few incentives to generate additional proceeds for junior claimants. Similarly, Davydenko and Franks (2006) report an average bank recovery rate of 69% (median 82%).

Since secured creditors fare relatively well in formal bankruptcy, one would predict voluntary workouts to be relatively rare in the UK. Davydenko and Franks find that 75% of small firms that default on their debt enter formal bankruptcy, with the remaining 25% of firms reorganizing out of court. When large distressed companies issue new equity, however, UK banks appear quite willing to make concessions out of court. Franks and Sanzhar (2006) show that banks make concessions for one-third of 111 financially distressed, publicly traded UK firms that issue new equity. These concessions include forgiveness of principal, debt for equity swaps, and provisions for new loans. Concessions are offered to firms with higher leverage and greater debt impairment, representing situations where the expected wealth transfer to debtholders is relatively large.

Acharya, John, and Sundaram (2005) contend that the allocation of control rights in bankruptcy determines the impact of asset specificity on the firm's optimal capital structure. On one hand, when assets are specific to the industry, liquidation values may

be low and a forced liquidation relatively costly to the firm. On the other hand, when assets are nonspecific, the costs from inefficiently continuing the firm may be high. Thus, firms with high asset specificity will choose a lower debt level under a creditor-friendly system, which is prone to inefficient liquidations, than under a reorganization-oriented code. In contrast, firms with low asset specificity will choose a lower debt level under a debtor-oriented code, which risks allowing excessive continuation. Contrasting firms in the UK and the United States—classified as having creditor-friendly and debtor-friendly bankruptcy systems, respectively—Acharya, John, and Sundaram (2005) find variations in debt ratios consistent with their predictions.²⁷

Overall, the weak protection of the firm's operations and the strong rights allocated to secured creditors in UK bankruptcy may raise concerns of excessive liquidations. Nevertheless, firm survival and recovery rates in the UK compare well to the U.S. Chapter 11. Thus, the strong creditor orientation in formal bankruptcy does not appear to be detrimental to the restructuring of distressed UK firms.

8.2. Sweden: auctions

In Sweden, bankruptcy is resolved through a mandatory auction. The proceeding is run by a court-appointed trustee with fiduciary responsibility to all creditors. This trustee organizes the sale of the firm in an auction. The winning bidder determines whether the firm is liquidated piecemeal or continues to operate as an ongoing concern. Payment must be in cash, and creditors are paid strictly according to the absolute priority of their claims.

The trustee typically retains the incumbent management team to run the operations of the firm in bankruptcy. In contrast to the UK, the Swedish code restricts the liquidation rights of creditors. Debt payments are stayed, and collateral cannot be repossessed. Moreover, trade credits and other debt raised while in bankruptcy get super-priority. These provisions help protect the operations until the firm is auctioned off.

Swedish insolvency law provides a forum for renegotiation of unsecured debt called composition (*ackord*). Secured debt and priority claims (taxes and wages) must be offered full repayment, and junior creditors at least 25% of their claim. These high thresholds make composition unfeasible for the vast majority of distressed firms. A new reorganization law was enacted in 1996, but Buttwill and Wihlborg (2004) argue that the new law shares many of the weaknesses of the old composition procedures and is rarely used. Thus, in Sweden, court-supervised renegotiation of the firm's debt contracts is effectively not an alternative to auction bankruptcy.

Thorburn (2000) examines a sample of 263 small, private Swedish firms filing for bankruptcy between 1991 and 1998. Her evidence counters widespread fears that bankruptcy auctions tend to excessively force liquidation. She demonstrates that three-quarters of firms continue as a going concern under the buyer's reign, with the remaining

²⁷ See also Vig (2007), who argues that a recent change in bankruptcy law in India that strengthens the rights of secured creditors has had an important influence on capital structure and the use of secured financing.

one-quarter of firms being liquidated piecemeal.²⁸ The probability for a going concern sale increases in the fraction of intangible assets, perhaps because these assets generate little value in a piecemeal liquidation. To gauge the quality of the continuation decision, Eckbo and Thorburn (2003) examine the operating profitability of the Swedish firms emerging from bankruptcy. They show that auctioned firms perform at par with industry competitors for several years, also when the incumbent CEO retains control. This contrasts to the evidence in Hotchkiss (2005) that firms emerging from U.S. Chapter 11 tend to underperform their industry rivals.

Thorburn (2000) also estimates the costs of Swedish bankruptcy proceedings. She reports direct costs of on average 6% of pre-filing book value of assets, with an average of 4% for the one-third largest firms in her sample.²⁹ When measured as a fraction of the market value of assets in bankruptcy, costs average 19%, with a median of 13%. The direct costs decrease with firm size and increase with measures of industry distress, suggesting that trustees may increase their sales effort in periods when auction demand is relatively low. Importantly, the auction is speedy, with an average time from filing to sale of the assets of only two months, implying relatively low indirect costs.³⁰

The value of the assets remaining at the end of the bankruptcy process reflects all the different costs imposed on the financially distressed firm. This value is split between the firm's creditors. The higher the total costs of bankruptcy, the lower are creditor recovery rates. In Swedish bankruptcy, creditors' claims are paid with the cash generated in the auction. Thorburn (2000) reports average recovery rates of 35% (median 34%). Recovery rates are higher in going-concern sales (mean 39%) than in piecemeal liquidations (mean 27%). Secured creditors receive on average 69% (median 83%).³¹

A potential issue with a creditor-oriented code is that it may encourage management to delay filing and undertake value-reducing risk-shifting investments in an effort to stay out of bankruptcy. Eckbo and Thorburn (2003) argue, however, that managerial incentives to preserve private benefits of control may counteract potential risk-shifting incentives. Specifically, managers may implement a conservative value-maximizing investment policy for the financially distressed firm in an attempt to increase the joint likelihood that the firm survives as a going concern and that current management gets rehired by the buyer in the auction. For the sample of Swedish small-firm bankruptcy filings, Eckbo and Thorburn (2003) show that the probability that the incumbent manager continues to run the auctioned firm increases in a measure for the private benefits of control. They

²⁸ Prior to 1993, Finnish bankruptcy also mandated a sale of the firm. In a sample of 72 small firms filing under the old Finnish code, Ravid and Sundgren (1998) find that only 29% of the firms are sold as a going concern.

²⁹ Ravid and Sundgren (1998) report average direct costs of 8% of pre-filing book value of assets for the small firm bankruptcies in Finland.

³⁰ Note that while the firm's operations are auctioned off quickly, the bankruptcy proceeding continues and last on average around three years.

³¹ Ravid and Sundgren (1998) find average recovery rates of 34% in going-concern sales and 36% in piecemeal liquidations in Finnish bankruptcy.

also find that bidders screen managers on quality in the rehiring decision and that CEOs suffer large income declines conditional on bankruptcy filing (about 40% relative to CEOs of nonbankrupt companies). Their evidence supports the notion that managers' drive to retain control of the operations conditional on default may counterbalance ex-ante incentives to risk shift.

Most European countries hold directors and managers personally liable and impose civil and criminal penalties if they fail to file in a timely manner or to inform creditors when the firm becomes insolvent. To the extent that these laws are enforced, such penalties may help trigger prompt action, further offsetting potential tendencies to delay filing.

A common objection to auctioning firms in bankruptcy is the concern that markets for distressed firms' assets are illiquid, forcing fire sales at depressed prices. Stromberg (2000) suggests, however, that salebacks may help avoid costly asset fire sales in periods of industry distress. He shows that the probability that the old owner buys back the firm in the bankruptcy auction increases with industry leverage and operating performance, and decreases with the proportion of nonspecific assets.

Eckbo and Thorburn (2008) model the participation in the auction of a secured creditor with an impaired debt claim on the bankrupt firm. The more impaired the secured claim, the greater incentive the creditor has to provide financing to rival bidders and encourage aggressive bidding, thus increasing the expected recovery. Eckbo and Thorburn show that the bankrupt firm's bank frequently enhances auction liquidity by providing bid financing. The premiums paid by the winning bidder decrease with an estimate of the secured creditor's expected recovery in the event of piecemeal liquidation, consistent with the predicted bidding behavior.

In a companion paper, Eckbo and Thorburn (2007) test the implications of industry distress using prices paid and debt recovery rates in the bankruptcy auctions. They estimate fundamental values of the auctioned assets in a cross-sectional model and examine how industry liquidity factors (leverage and interest coverage ratios) affect the standardized residuals from the price regression. There is some evidence of fire-sales discounts in piecemeal liquidations, but not when the bankrupt firm is acquired as a going concern. Neither industry-wide distress nor the industry affiliations of the buyer affect the prices in going-concern sales. Eckbo and Thorburn (2007) further show that bids often are structured as leveraged buyouts, which relaxes liquidity constraints and reduces bidder underinvestment incentives in the presence of debt overhang. It is possible that distressed industry insiders overcome liquidity constraints by using LBO financing. Eckbo and Thorburn (2007) also find evidence that prices are lower in prepackaged filings than in other going-concern sales, suggesting that prepacks may help preempt excessive liquidation when the auction is expected to be illiquid. Liquidation preemption seems to be a risky strategy, however, as prepackaged bankruptcies have much higher refiling rates than firms sold in a regular auction.

Overall, the evidence on Swedish bankruptcy filings suggests that mandatory auctions provide a relatively efficient mechanism for restructuring financially distressed firms.

Survival rates, direct costs, and recovery rates compare well with extant evidence from the United States and the UK. Moreover, there is no evidence that firm value is destroyed because of distorted ex-ante incentives to risk-shift. While bankruptcy auctions risk forcing asset sales at depressed prices, the evidence suggests that the incentives of secured creditors and old owners combined with opportunities for LBO financing help increase auction demand, effectively counteracting fire-sales tendencies.

8.3. France: weak creditor rights

France provides very strong protection of distressed businesses through its formal reorganization procedure, *Redressement Judiciaire*.³² The objectives of the procedure are, in order of priority, to continue the firm's operations, to maintain employment, and to pay back creditors. A court-appointed administrator oversees the reorganization. Debtholders are restricted from directly participating in the restructuring process. They are represented by a court officer and can raise their concerns only through this court-appointed creditor representative. Employees, however, may appoint their own representative.

The administrator evaluates the prospects for reorganization and presents a reorganization plan to the court. Creditors cannot reject the court's decision, nor does confirmation of a reorganization plan or sale of collateral require approval of secured creditors. Creditors are offered new, altered claims in place of their old impaired debt claims. Although the court cannot force creditors to write down their claims, it can redefine the terms of the loan, including maturity. Thus, in practice, creditors often prefer to accept a write-down with timely repayment to a promised repayment in full in an uncertain distant future.

Debt payments are stayed during the bankruptcy process, and the administrator can raise new super-priority financing without creditor approval. If the firm is sold, the court can choose a lower bid that provides better prospects for continued operations and employment. Moreover, government and employee claims have first priority to proceeds generated in a sale of collateral, effectively forcing a deviation from absolute priority rules.³³

The French code, with its explicit objective to maintain operations and preserve jobs, has a predisposition to allow continuation of inefficient firms. Nevertheless, the evidence indicates that relatively few firms survive bankruptcy in France. Kaiser (1996) reports that only 15% of filing firms continue to operate as a going concern after bankruptcy reorganization. In a broader sample comprised of bankruptcy filings and voluntary workouts, Davydenko and Franks (2006) find that 62% of French firms are liquidated piecemeal, which is a higher fraction than in the UK. Despite the poor odds for survival, they show that a vast majority (87%) of firms that default on their debt enter formal bankruptcy.

³² French insolvency law also provides a separate proceeding for liquidation (*Liquidation Judiciaire*) and a rarely used procedure for renegotiation of debt contracts prior to default (*Reglement Amiable*).

³³ Certain types of collateral, such as receivables and guarantees, are exempt from this rule.

The low survival rates in France translate into relatively low creditor recovery rates. Davydenko and Franks (2006) document an average bank recovery rate in French proceedings of 47% (median 39%), which is much lower than the recovery rates reported for UK banks. The median reorganization takes three years. Moreover, French banks take more collateral than bank lenders in the UK and Germany, possibly reflecting the poor standing of banks in French bankruptcy.

Overall, although bankruptcy law in France is set up to promote firm survival, the actual result seems to be the opposite. Firm survival rates and creditor recovery in France compare poorly with evidence from the UK and the United States. It is possible that the costs associated with the extremely creditor-hostile French insolvency procedures ultimately are borne by the distressed firms and their claimholders. Or perhaps French firms restructure their debt prior to default in order to entirely avoid reaching the point where they are subject to insolvency laws, leaving only the lemons to the bankruptcy procedure.

8.4. Germany: bank-driven reorganizations

The German 1999 reorganization procedure, *Insolvenzordnung*, gives the financially distressed firm three months to engineer a reorganization plan under the supervision of a court-appointed administrator.³⁴ This plan outlines the financial and asset restructuring of the firm, including a potential sale of the firm as a going concern. The reorganization plan must receive creditor approval before it can be implemented. Creditors vote with a simple majority rule. Similar to the United States, the court may cram down a plan on a dissenting class of creditors as long as the plan leaves the class better off than would be the case with a piecemeal liquidation of the assets. Creditor claims are stayed during the three-month reorganization period. The firm can raise new debt financing with super-priority subject to creditor approval.

The evidence on distressed firms in Germany primarily dates from the period before the new reorganization code took effect. Davydenko and Franks (2006), for example, examine firms that defaulted on their debt between 1984 and 2003. They document that 57% of distressed German firms are liquidated piecemeal, which is higher than liquidation ratios reported for Sweden and the UK and lower than liquidation ratios in France. The median duration of the reorganization procedure in Germany is 3.8 years, and banks recover on average 59% (median 61%) of their claims.

An important impediment to out-of-court agreements is holdout problems among dispersed creditors. In Germany, the debt is typically concentrated with a house bank that often also has an equity interest. As a result, one should expect coordination failures to be relatively rare in Germany. According to Kaiser (1996), most German firms with a chance of survival are reorganized in an out-of-court workout. Davydenko and Franks (2006), however, find that 78% of the distressed firms in their sample enter formal

³⁴ Prior to 1999, German insolvency law offered an auction liquidation process (*Konkursordnung*) and a rarely used procedure for the reorganization of unsecured claims (*Vergleichsordnung*).

bankruptcy, with the remaining 22% of sample firms working things out with creditors informally.

Elsas and Krahnén (2002) study the role of lending relationships for 75 financially distressed German firms initiating private workouts. They find that house banks and banks holding a secured claim are more likely to participate in a voluntary restructuring. Brunner and Krahnén (2004) show that German bank lenders often coordinate their reorganization efforts by forming a bank pool when medium-sized firms become financially distressed. They report that banks strike a formal contractual pool arrangement for 45% of the distressed firms, and the probability of bank pool formation increases with the number of bank relationships and the degree of distress.

While the German procedure has some resemblance to the U.S. Chapter 11, it imposes a strict three-month limit on the reorganization. This period risks being too short to allow a firm with complex operations and capital structure to carefully develop a reorganization plan. The evidence on the new reorganization procedure, however, is at this point insufficient for us to draw any conclusions about how well the new German code works.

8.5. Japan: *keiretsu* banks

Japan's bankruptcy code has historically been oriented toward a liquidation of the filing firm. Managers typically lost their jobs, and creditors controlled the outcome of the bankruptcy proceeding. Over the last decade, however, Japan has undertaken a series of revisions of its insolvency procedures aimed at strengthening the provisions for restructuring financially distressed firms as ongoing concerns.

A prominent feature of the Japanese business environment is industrial groups called *keiretsus*. At the core of a *keiretsu* are banks, which finance much of the industrial operations, both as creditors and equityholders of the firms affiliated with the group. Hoshi, Kashyap, and Scharfstein (1990) examine the role of a *keiretsu* affiliation for a sample of 125 publicly traded firms that become financially distressed. They find that distressed firms associated with a *keiretsu* invest more and sell more than non-*keiretsu* firms in the years following the onset of financial distress. This suggests that *keiretsu* banks help relax financial constraints, possibly mitigating the costs of financial distress.³⁵ Helwege and Packer (2003) study the role of *keiretsu* banks for the outcome of bankruptcy for 172 troubled Japanese firms. They report that the probability of liquidation is higher for firms affiliated with *keiretsu* banks than for non-*keiretsu* firms, controlling for firm size. However, since there is no discernible difference in the profitability of the liquidated firms, they conclude that there is no evidence that *keiretsu* banks force excessive liquidations.

In sum, Japan has traditionally provided creditor-oriented insolvency procedures often dominated by large *keiretsu* banks. There is insufficient evidence at this point, however, to determine whether financial ties with *keiretsu* banks help or are detrimental to the reorganization of distressed firms.

³⁵ Claessens, Djankov, and Klapper (2003) show that financially distressed firms in East Asia are less likely to file for bankruptcy if they are owned by banks or affiliated with a business group.

9. Conclusion

This chapter surveys the body of empirical research that focuses on the use of private and court-supervised mechanisms for resolving default by restructuring companies in financial distress. We organize and synthesize this literature in the context of a simple model of financial distress. After a quick overview of the theoretical issues, we identify some main themes to anchor the empirical research in the areas of financial distress, asset and debt restructuring, and the formal bankruptcy procedures in the United States and abroad. Studies of out-of-court restructurings (workouts and exchange offers), corporate governance issues related to distressed restructurings, the magnitude of costs and outcomes of bankruptcy reorganizations, and the relative efficiency of bankruptcy codes in different countries are among the topics surveyed.

It is customary (as we have done in this survey) to make a distinction between two types of systems for resolving default: one in which the business is sold to a third party, possibly through an auction; and another in which the firm is reorganized under the current claimholders. Although these two philosophies of resolving default—liquidation and reorganization—have been viewed as entirely different approaches (we have discussed their relative merits in Section 8), claimholders in the U.S. Chapter 11 reorganization system are increasingly relying on the market to mimic solutions provided by an auction (liquidation) system. Most of the research on firms reorganizing under the U.S. Bankruptcy Code, however, dates from the 1980s and early 1990s. The peak in default rates in 2002, combined with creeping changes in insolvency practices and an escalation in the enforcement of creditor rights, has caused a growing demand for new research that can help us understand the process that governs the restructuring of financially distressed firms in the current environment.

The active trading of distressed debt at all priority levels combined with the participation of sophisticated investors is significantly affecting Chapter 11 mechanisms. The extensive trading in distressed debt has led to high turnover in the identity of the creditors of companies in financial distress. Nontraditional investors, such as private equity investors and hedge funds, have increased their role in these markets and therefore as creditors of troubled firms. Based on their estimate of the value of the business and the legal priority of the various claims, many strategic investors acquire the fulcrum class of claims, that is, the securities where they expect that the equity value will reside after the reorganization is completed. Taking a private equity perspective on their investment, these investors seek to become owners of the enterprise, fix it, and then sell it at an optimal time. In this manner, the multiple creditors basically replicate the characteristics of a third-party sale, although the restructuring process is that of a conventional reorganization. Moreover, creditors frequently require, and courts are more willing to approve of, an outright sale of major assets of the distressed firm, either through an auction under Section 363 of the U.S. Bankruptcy Code or as part of the reorganization plan. The overall effect of all these changes on the efficiency of the U.S. bankruptcy procedures yet remains to be documented and analyzed.

With emerging economies searching for an optimal bankruptcy system and the opportunity for the European Union to harmonize its insolvency rules, the efficiency of various systems across the industrial economies has received increasing attention. The differences in the insolvency codes of the advanced economies and the differential degree of creditor rights available in the legal systems of those economies have been the focus of policy makers in many countries. It is also recognized that changes in insolvency codes and their enforcement could have important influence on how firms access capital as well as on the efficiency of investment in the economy. It is evident from our review of the research on insolvency procedures outside the United States that a lot still remains to be done in this area. One important and still mainly unanswered question is how different institutional characteristics of individual countries interact with their respective insolvency rules. For example, to what degree is the success of Swedish bankruptcy auctions tied to the dominant role of banks in this economy?

The argument has often been made that the direct costs of bankruptcy seem too small to justify the relatively low leverage ratios that we typically observe. A response to this observation has been that leverage and financial distress might have other indirect costs that need to be taken into consideration. Our understanding of the nature and magnitude of these indirect costs of financial distress is still very preliminary. In some sense, the indirect costs of bankruptcy arise from the value lost from investments that optimally should but in practice are not undertaken (an opportunity cost). Finding reliable measures of such unobservable phenomena is very difficult and requires clever empirical strategies.

In designing bankruptcy systems, it is important to consider their effect on a variety of issues, including capital structure choices, investment incentives, and risk choices that arise from the law and its implementation. For obvious reasons, most of the existing literature has focused on the ex-post efficiency of the mechanisms for resolving default, that is, on events following the onset of financial distress. In order to assess the optimality of various mechanisms for resolving default, however, we also need to consider their ex-ante efficiency. The international evidence plays an important role in the search for an optimal bankruptcy system.

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PART 4

TAKEOVERS, RESTRUCTURINGS, AND
MANAGERIAL INCENTIVES

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CORPORATE TAKEOVERS*

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* Surveying the vast area of corporate takeovers is a daunting task, and we have undoubtedly missed many interesting contributions. We apologize to those who feel their research has been left out or improperly characterized, and welcome reactions and comments. Some of the material in Section 3 is also found in Eckbo (2008).

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Abstract

This chapter surveys the recent empirical literature and adds to the evidence on takeover bids for U.S. targets, 1980–2005. The availability of machine readable transaction databases have allowed empirical tests based on unprecedented sample sizes and detail. We review both aggregate takeover activity and the takeover process itself as it evolves from the initial bid through the final contest outcome. The evidence includes determinants of strategic choices such as the takeover method (merger v. tender offer), the size of opening bids and bid jumps, the payment method, toehold acquisition, the response to target defensive tactics, and regulatory intervention (antitrust), and it offers links to executive compensation. The data provides fertile grounds for tests of everything ranging from signaling theories under asymmetric information to strategic competition in product markets and to issues of agency and control. The evidence is supportive of neoclassical merger theories. For example, regulatory and technological changes, and shocks to aggregate liquidity, appear to drive out market-to-book ratios as fundamental drivers of merger waves. Despite the market boom in the second half of the 1990s, the proportion of all-stock offers in more than 13,000 merger bids did not change from the first half of the decade. While some bidders experience large losses (particularly in the years 1999 and 2000), combined value-weighted announcement-period returns to bidders and targets are significantly positive on average. Long-run post-takeover abnormal stock returns are not significantly different from zero when using a performance measure that replicates a feasible portfolio trading strategy. There are unresolved econometric issues of endogeneity and self-selection.

Keywords

takeover, merger, tender offer, auction, offer premium, bidder gains, toeholds, markups, hostility, executive compensation, arbitrage, announcement return, long-run performance, monopoly, antitrust

1. Introduction

Few economic phenomena attract as much public attention and empirical research as the various forms of transactions in what Manne (1965) dubbed “the market for corporate control.” Corporate takeovers are among the largest investments that a company ever will undertake, thus providing a unique window into the value implications of important managerial decisions and bid strategies, and into the complex set of contractual devices and procedures that have evolved to enable the deals to go through. Empirical research in this area has focused on a wide range of topics including the impact of statutory and regulatory restrictions on the acquisition process (disclosure and target defenses), strategic bidding behavior (preemption, markup pricing, bid jumps, toeholds, payment method choice, hostility), short- and long-run abnormal stock returns to bidders and targets (size and division of takeover gains), and the origin and competitive effects of corporate combinations (efficiency, market power, and antitrust policy). In this survey, we review empirical research on each of these and related topics.

The structure of our survey differs from most earlier empirical reviews, where the focus tends to be on the final bid in completed takeovers.¹ We follow the approach begun by Betton and Eckbo (2000) and examine the entire takeover process as it evolves from the first bid through bid revision(s) and toward the final outcome (success or failure). This more detailed focus on the takeover process is also found in more recent publications.² We provide new empirical updates in some areas, using takeovers found in the Thomson Financial SDC database for the period 1980–2005. One limitation of the survey is that we do not discuss the general interplay between the market for corporate control, ownership structure and corporate governance (with the exception of hostile bids).³ We also limit the review to empirical studies of takeovers of U.S. target firms.⁴ Takeovers by financial buyers such as leveraged buyouts (LBOs) are surveyed in Eckbo and Thorburn (2008a), Chapter 16 of this volume.

Throughout, we use the term *takeover* generically for any acquisition of corporate control through the purchase of the voting stock of the target firm, regardless of whether the bid is in the form of a merger agreement or a tender offer. Moreover, in our vernacular, the first observed bid for a specific target starts a takeover “contest” whether or not subsequent bids actually materialize. All initial bids start a contest in the sense of attracting potential competition from rival bidders and/or incumbent target management. This is true even after signing a merger agreement as director fiduciary duties require the target board to evaluate competing offers all the way until target shareholders have voted to accept the agreement (the fiduciary out). Also, we know from the data that a friendly

¹ Jensen and Ruback (1983), Jarrell, Brickley, and Netter (1988), Eckbo (1988), Andrade, Mitchell, and Stafford (2001), Martynova and Renneboog (2005, 2007).

² Bhagat, Dong, Hirshleifer, and Noah (2005), Boone and Mulherin (2007b), Betton, Eckbo, and Thorburn (2007). See also the survey by Burkart and Panunzi (2006).

³ Research on corporate ownership structure, managerial private benefits of control, shareholder activism and voting, etc., is surveyed in Becht, Bolton, and Roll (2003), Dyck and Zingales (2004), and Adams and Ferreira (2007).

⁴ See Martynova and Renneboog (2006) for the European takeover market.

merger negotiation is not a guarantee against the risk of turning the takeover process into an open auction for the target. The contest perspective helps us understand why initially friendly merger bids are sometimes followed by tender offers and vice versa, why we sometimes observe bid revisions even in the absence of rival bidders, why target hostility emerges even when the initial bidder appears to be friendly, and why the auction for the target sometimes fails altogether (no bidder wins).

We begin in Section 2, “Takeover activity,” with a brief discussion of takeover waves, followed by a detailed description of the initial bids in an unprecedented sample consisting of more than 35,000 takeover contests for U.S. public targets over the period 1980–2005. The description includes initial deal values, degree of actual competition (single-bid versus multiple-bid contests), success rates, the deal form (merger versus tender offer), payment method (cash, stock, or a mix), target attitude (hostile v. neutral or friendly), product market connection (horizontal v. nonhorizontal), public versus private status of the bidder and the target, time to second bid, and total contest duration. We also characterize the actual institutional environment in which firms are sold, including rules governing tender offers and various contractual innovations designed to support merger negotiations. Moreover, this section comments on the determinants of the choice between merger and tender offer, and it discusses the impact of mandatory disclosure rules on premiums in tender offers.

We then move to Section 3, “Bidding strategies.” In theory, a complex set of factors determine the design of optimal bids.⁵ These include auction design, the nature of bidder valuations, the private information environment, target ownership structure, and bidding costs. A key empirical challenge is to establish whether there is evidence of strategic bidding and/or signaling effects in the data. As the first mover in the takeover game, the initial bidder is in a unique position, so strategic bidding behavior is likely to be most evident in the first bid. Thus, our empirical analysis is structured around the actions of the first bidder making a control-offer for the target.

We begin Section 3 with a brief description of the classical free-rider model of Grossman and Hart (1980b) and of the standard auction setup in models with a single seller. This helps frame some of the subsequent empirical test results. We then review empirical work on strategic decisions, including the initial bidder’s choice between merger and tender offer, the payment method, pre-bid acquisition of target shares in the market (toehold bidding), markup pricing following a pre-bid target stock price runup, takeover defenses, and acquisitions of formally bankrupt targets. This section focuses on how the various actions affect the initial and final offer premium.

In the first part of Section 4, “Takeover gains,” we discuss estimates of the announcement effect of takeovers on the wealth of bidder and target shareholders. In their review of the empirical evidence from the 1960s and 1970s, Jensen and Ruback (1983) conclude that the average sum of the deal-related stock market gains to bidders and targets is significantly positive. Subsequent surveys have also made this conclusion (Jarrell, Brickley, and Netter, 1988; Andrade, Mitchell, and Stafford, 2001). On the other hand,

⁵ For surveys of takeover theories, see Spatt (1989), Hirshleifer (1995), Burkart and Panunzi (2006), and Dasgupta and Hansen (2007).

as pointed out by Roll (1986) and strongly emphasized in Moeller, Schlingemann, and Stulz (2004), bidder deal-related abnormal returns are often negative. Drawing on Betton, Eckbo, and Thorburn (2008c), we show that the value-weighted sum of announcement-induced three-day abnormal stock return to bidders and targets is significantly positive. This conclusion holds for the entire sample period 1980–2005 as well as for each of the five-year subperiods. We also discuss the large bidder dollar losses from the period 1998–2001 that are the central focus of Moeller, Schlingemann, and Stulz (2004).

In the second part of Section 4, we review and update estimates of abnormal stock returns to merged firms over the five-year period following successful completion of the takeover. We show that post-merger performance is on average negative if one benchmarks the returns with the returns to nonmerging firms matched on size and book-to-market ratio. However, the abnormal performance is insignificantly different from zero when using standard asset pricing benchmarks. These conflicting inferences concerning long-run performance produced by the matched-firm technique and the “Jensen’s alpha” (regression) procedure is reminiscent of the debate in the literature on security offerings.⁶

In Section 5, “Bondholders, executives, and arbitrageurs,” we review empirical studies of the wealth implications of mergers for bondholders, for bidder and target executives and directors, and for arbitrageurs. Issues for bondholders include the potential for a wealth transfer from stockholders to bondholders as a result of the coinsurance effect of takeovers, and protection against event-risk. For executives, a key issue is the disciplinary role of the market for corporate control, and whether undertaking value-decreasing takeovers is costly in terms of increased turnover and/or reduced compensation. Merger (risk) arbitrage is an investment strategy that tries to profit from the spread between the offer price and the target stock price while the offer is outstanding. It is essentially a bet on the likelihood that the proposed transaction closes. Research documents the determinants of the arbitrage spreads, trading volumes, the role of transaction costs in establishing these positions, and the returns to arbitrage activity.

Finally, in Section 6, “Takeovers, competition, and antitrust,” we broaden the focus to the industry of the bidder and target firms. The key empirical issue centers on the extent to which mergers are driven by opportunities for creating market power. While the potential for market power is most obvious for horizontal combinations (as recognized by the antitrust authorities), vertical mergers may generate buying power vis-à-vis suppliers. We review empirical tests employing estimates of abnormal stock returns to the industry rivals of the merging firms. These estimates show that mergers tend to cause a wealth effect throughout the industry of the target firm. One consistent interpretation is that synergy gains generated by takeovers represent quasi-rents from scarce resources owned throughout the target industry. The alternative hypothesis — that the industry wealth effect represents the present value of monopoly rents from collusive behavior—is consistently rejected by the empirical studies. We end this section with a brief discussion of implications for antitrust policy.

The survey concludes in Section 7 with a summary of the key findings and some directions for future research.

⁶ See the reviews by Ritter (2003) and Eckbo, Masulis, and Norli (2007).

2. Takeover activity

2.1. Merger waves

A merger wave is a clustering in time of successful takeover bids at the industry- or economy-wide level. This is shown in Figure 1 for U.S. publicly traded firms over the period 1926–2006. The figure plots the annual fraction of all firms on the University of Chicago’s Center for Research in Security Prices (CRSP) database in January of each year which delists from the stock exchange due to merger during the year. Looking back, aggregate takeover activity appears to occur in distinct waves—peaks of heavy activity followed by troughs of relatively few transactions.

Merger activity tends to be greatest in periods of general economic expansion. This is hardly surprising as external expansion through takeovers is just one of the available corporate growth strategies. As seen in Figure 1, aggregate takeover activity was relatively high in the late 1960s, throughout the 1980s, and again in the late 1990s. These waves are typically labeled the conglomerate merger wave of the 1960s, the refocusing wave of the 1980s, and the global wave or strategic merger wave of the 1990s.⁷

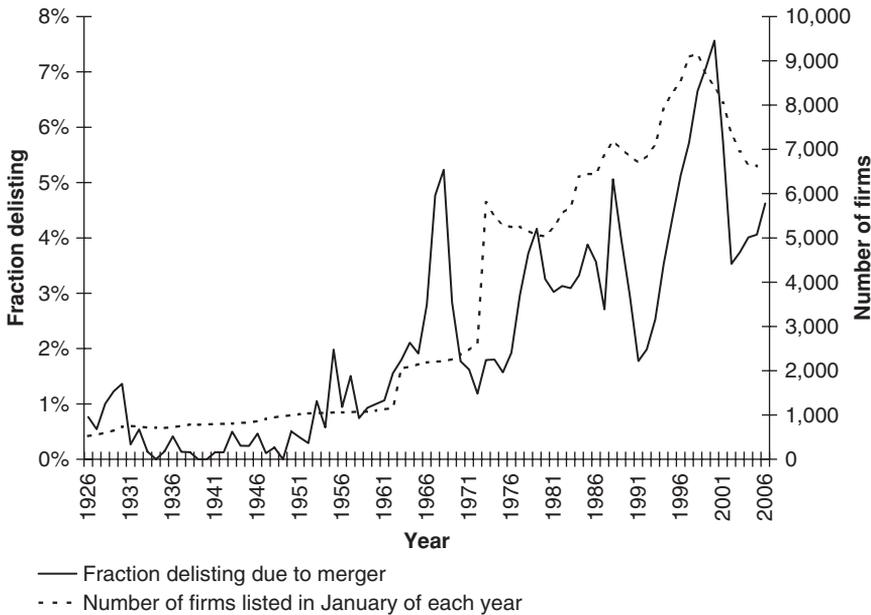


Fig. 1. Annual fraction of all publicly traded (CRSP) firms in January of each year which delists due to merger during the year, 1926–2006.

⁷ The merger wave of the late 1890s and early 1900s (not shown in Figure 1) has been referred to as the “Great merger wave” (O’Brien, 1988) or the monopolization wave (Stigler, 1950).

These labels indicate the character of the typical merger within the wave. Thus, a majority of the mergers in the 1960s were between firms operating in unrelated industries (conglomerate mergers). It is possible that the internal capital market created through conglomerate merger may have reduced financing costs for unrelated corporate entities.⁸ On the other hand, since conglomerates tend to reduce (diversify) the risk of managerial human capital and to create “business empires” perhaps valued excessively by CEOs, the conglomerate wave may also reflect an agency problem. The agency view is strengthened by the fact that executive compensation showed little sensitivity to firm performance at the time (Jensen and Murphy, 1990). Thus, value-reducing diversifying mergers may have had little consequence for CEOs, leading to excessive conglomeration. However, estimates of abnormal stock returns around the conglomerate takeovers of the 1960s do not indicate that these investments were on average detrimental to shareholder wealth.⁹

The merger wave of the 1980s includes a number of mergers designed either to downsize or to specialize operations. Some of these corrected excessive conglomeration, others responded to excess capacity created by the 1970s recession (following the creation of the OPEC oil cartel), while yet others responded to the important advances in information and communication technologies (Jensen, 1986, 1993). The 1980s also experienced the largest number of hostile bids in U.S. history. The subsequent spread of strong takeover defenses in the late 1980s halted the use of hostile bids, and the late 1990s saw a “friendly” merger wave, with a primary focus on mergers with global strategic partners.

A complex set of factors are at play in any given merger wave. For example, merger waves may be affected by changes in legal and regulatory regimes. Shleifer and Vishny (1991) suggest that the demand for conglomerate mergers in the 1960s may have been triggered by the stricter antitrust laws enacted in the early 1950s.¹⁰ While this may have had an effect in the United States, it is interesting that countries with lax antitrust laws (Canada, Germany, and France) also experienced diversification waves in the 1960s (Matsusaka, 1996). Industry-specific deregulations may also create merger waves, such as deregulations of the airline industry in 1970s (Spiller, 1983; Slovin, Sushka, and Hudson, 1991) and of the utility industry in 1992 (Jovanovic and Rousseau, 2004; Becher, Mulherin, and Walkling, 2008).

The perhaps most compelling theory of merger waves rests on the technological link between firms in the same industry. A merger implementing a new technological innovation may, as news of the innovation spreads, induce follow-on takeovers among industry rivals for these to remain competitive. This argument goes back at least to Coase (1937), who suggests that scale-increasing technological change is an important driver of merger

⁸ Hubbard and Palia (1999), Maksimovic and Phillips (2002). Maksimovic and Phillips (2007) reviews internal capital markets, while Eckbo and Thorburn (2008a) reviews breakup transactions that may follow excessive conglomeration.

⁹ Loderer and Martin (1990), Matsusaka (1993), Akbulut and Matsusaka (2003).

¹⁰ One important antitrust development was the 1950 Celler-Kefauver amendment of the 1914 Clayton Act. See Section 6.

activity. Jensen (1993) draws parallels between merger activity and the technological changes driving the great industrial revolutions of the nineteenth and twentieth centuries. Gort (1969) and Jovanovic and Rousseau (2002) use the related-technology notion to build theories of resource reallocations based on valuation discrepancies and Tobin's Q. Rhodes-Kropf and Robinson (2008) propose a search theory where bidders and targets match up based on the degree of complementarity of their resources.

There is substantial evidence of industry-clustering of mergers.¹¹ Andrade and Stafford (2004) find that mergers play both an expansionary and a contractionary role in industry restructurings. During the 1970s and 1980s, excess capacity tended to drive industry consolidation through merger, while peak capacity utilization triggered industry expansion through nonmerger investment (internal expansion). This phenomenon appears to have reversed itself in the 1990s, as industries with strong growth prospects, high profitability, and near capacity also experienced the most intense merger activity. Maksimovic and Phillips (2001) use performance improvements at the plant level to support the neoclassical reallocation theory of merger waves. Maksimovic, Phillips and Prabhala (2008) show that, for mergers in manufacturing industries, the acquirer on average closes or sells about half of the target firm's plants. Moreover, a simple neoclassical model of production helps predict the choice of which target plants to sell/close. The plants that are kept are often restructured, resulting in productivity increases. Servaes and Tamayo (2007) find that industry peers respond by financing and investment policies when another firm in the industry is the subject of a hostile takeover attempt, suggesting that firms in the same industry are linked by both technology and resource complementarities.

The fact that merger waves are correlated with economic expansions and high stock market valuations has also spurred the development of models in which merger waves result from market overvaluation and managerial timing. The idea is that bull markets may lead bidders with overvalued stock as currency to purchase the assets of undervalued (or less overvalued) targets. In Shleifer and Vishny (2003), target managements accept overpriced bidder stock as they are assumed to have a short time horizon. In Rhodes-Kropf and Viswanathan (2004), target management accepts more bids from overvalued bidders during market valuation peaks because they overestimate synergies during these periods. In both models, the bidder gets away with selling overpriced stock.

Eckbo, Giammarino, and Heinkel (1990) present a rational expectations model of the payment method in takeovers with two-sided information asymmetry (neither the bidder nor the target knows the true value of the shares of the other), in which the fraction of the deal paid in cash signals the bidder's true value. In equilibrium, the target receives correctly priced bidder stock as part of the payment. Their analysis suggests that the pooling equilibrium proposed by Shleifer and Vishny (2003) is sensitive to the possibility of mixed offers. As shown in Figure 7 below, mixed offers represent a substantial portion

¹¹ Mitchell and Mulherin (1996), Mulherin and Boone (2000), Andrade, Mitchell, and Stafford (2001), Maksimovic and Phillips (2001), Andrade and Stafford (2004), and Harford (2005).

of all takeovers: during the period 1980 through 2005, there were nearly as many mixed cash-stock offers as there were all-stock bids. Moreover, despite the market boom in the second half of the 1990s, the relative proportions of all-cash, all-stock, and mixed cash-stock offers in more than 15,000 merger bids did not change from the first half of the decade. Also, during the 1996–2000 period with peak market valuations, the sum of all-cash and mixed cash-stock bids in mergers equals the number of all-stock merger bids.

Rhodes-Kropf, Robinson and Viswanathan (2005), Ang and Cheng (2006) and Dong, Hirshleifer, Richardson, and Teoh (2006) find that merger waves coincide with high market-to-book (M/B) ratios. One argument is that the M/B ratio is a reliable proxy for market overvaluation and that investor misvaluations tend to drive merger waves. High market valuations may be a fundamental driver of merger waves as bidders attempt to sell overpriced stock to targets (and succeed). Rhodes-Kropf and Viswanathan (2004) present an interesting model in which *rational* (Bayesian) managers accept too many all-stock merger bids when the stock market booms and too few when the market is low. They assume that the market's pricing error has two components, one economywide and another that is firm-specific. When receiving a bid, the target attempts to filter out the marketwide error component. The Bayesian update puts some weight on there being high synergies in the merger, so when the marketwide overvaluation is high, the target is more likely to accept the offer. In other words, bids tend to look better in the eyes of the target when the market is overvalued.

Harford (2005) contrasts these predictions with a neoclassical argument in which the driver of merger waves is market liquidity. That is, under the neoclassical view, market liquidity is the fundamental driver of *both* M/B ratios and merger waves.¹² Harford (2005) constructs a measure of aggregate capital liquidity based on interest rate (default) spreads and uses this measure in a "horse race" with M/B ratios in predicting industry merger waves. He finds that waves are preceded by deregulatory events and high capital liquidity. More importantly, he shows that the capital liquidity variable eliminates the ability of M/B ratios to predict industry merger waves. He concludes that aggregate merger waves are caused by the clustering of shock-driven industry merger waves, not by attempts to time the market.

Patterns of merger waves notwithstanding, predicting individual target firms with any accuracy has proven difficult.¹³ Probability estimates are sensitive to the choice of size and type of control sample. Firm size consistently predicts targets across most studies, while results are mixed for other commonly used variables, including factors capturing growth, leverage, market-to-book ratios, and ownership structure.

¹² For example, Shleifer and Vishny (1992) argue that merger waves tend to occur in booms because increases in cash flows simultaneously raise fundamental values and relax financial constraints, bringing market values closer to fundamental values. Harford (1999) shows that firms that have built up large cash reserves are more prone to acquire other firms.

¹³ Hasbrouck (1985), Palepu (1986), Mork, Shleifer, and Vishny (1988), Mikkelsen and Partch (1989), Ambrose and Megginson (1992), Shivdasani (1993), Comment and Schwert (1995), Cremers, Nair, and John (2008).

2.2. Takeover contests, 1980–2005

As discussed in Section 2.3, after signing a merger agreement, the target board is normally required to consider new outside offers until target shareholders have given final approval of the takeover (the so-called fiduciary out clause). This means that no bidder can expect to lock up the target through negotiations but must be prepared for potential competition. All initial bidders, whether the initial bid is in the form of a merger or a tender offer, face this potential competition. We therefore refer to all initial bids as initiating a *control contest* whether or not multiple bids actually emerge ex-post.

The “contest tree” in Figure 2 shows the potential outcomes of any initial bid. In the first round of the contest, one of three outcomes will occur: (1) the bid is accepted by the target and the contest ends; (2) the bid is rejected and the contest ends; or (3) the bid is followed by one or more rival bids and/or bid revisions before the contest ends. After two or more rounds of bidding, one of three final outcomes will occur: (4) the initial bidder wins control; (5) a rival bidder wins control; or (6) no bidder wins control (the target remains independent). Later in this chapter, we use this contest-tree structure to organize successive bids for the same target and to describe recent bidding activity.

2.2.1. Initial bidders and offer characteristics

We collect bids from the Thomson Financial SDC mergers and acquisitions database. SDC provides records of individual bids based on information in the news and Securities and Exchange (SEC) filings by the bidder and target firms. As shown by Boone and Mulherin (2007b), targets increasingly initiate takeovers through a process where they privately solicit several potentially interested bidders and select a negotiating partner

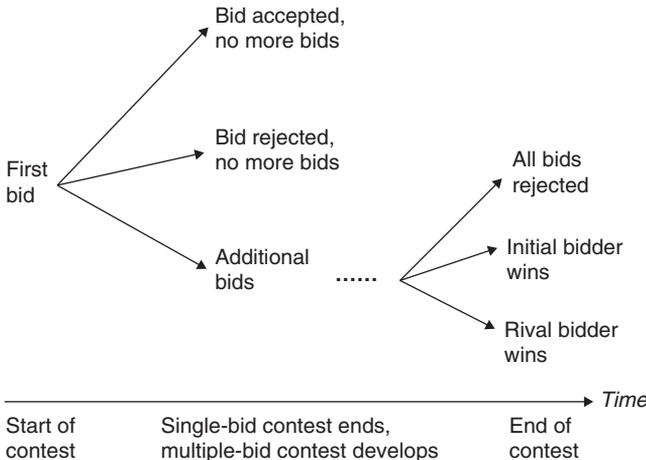


Fig. 2. Takeover contest structure and outcomes.

among the respondents. The initial bidder identified by the SDC may well have emerged from such a process. However, we follow standard practice and use the first *official* (public) bid for the target to start the contest.

The bids are by U.S. or foreign bidders for a U.S. public or private target announced between January 1980 and December 2006. We start by downloading all mergers (SDC deal form M), acquisition of majority interest (AM), acquisition of partial interest (AP), and acquisition of remaining interest (AR).¹⁴ This results in a total of 70,548 deals (bids). We then use the SDC tender flag to identify which of the bids are tender offers and control-block trades.¹⁵ Next, we organize the 70,548 bids into control contests, where a target is identified using the CUSIP number. A control bid is defined as a merger or acquisition (tender offer) of majority interest where the bidder holds less than 50% of the target shares at announcement.¹⁶ The control contest begins with the first control bid for a given target and continues until 126 trading days have passed without any additional offer (including acquisitions of minority interests). Each time an additional offer for the target is identified, the 126 trading day search window rolls forward.

A control bid is successful if SDC's deal status field states "completed." For successful contests, the formal contest ending date is the earlier of SDC's effective conclusion date and target delisting date. Unsuccessful contests (no bid is successful) end with the offer date of the last control bid or partial acquisition plus 126 trading days (given that there were no more bids in the 126-day period).¹⁷ This selection process produces a total of 35,727 contests. Control contests may be single-bid, multiple-bid but single bidder, or multiple bidder. A multiple-bid contest occurs either because there are multiple bidders or because the initial bidder submits a bid revision. Bid revisions are shown on SDC as a difference between the initial and final offer price within one SDC deal entry. For multiple-bidder contests, the identity of the successful bidder is determined by comparing the CUSIP of the successful bidder with the CUSIP of the initial control bidder. If they are the same, then the initial bidder is successful; otherwise a rival bidder is successful.

Tables 1 through 3 and Figures 3 through 6 describe the central characteristics of the total sample of 35,727 initial bids and their outcomes. Table 1 shows how the total sample is split between initial merger bids (28,994), tender offers (4,500), and control-block trades (2,224). Panel A of Figure 3 shows the annual distribution of the initial merger bids and tender offers, confirming the peak activity periods also shown earlier

¹⁴ We exclude all transactions classified as exchange offers, acquisition of assets, acquisition of certain assets, buybacks, recaps, and acquisition (of stock).

¹⁵ This identification proceeds as follows: If the tender flag is "no" and the deal form is a merger, then the deal is a merger. If the tender flag is "no" and the deal form is "acquisition of majority interest" and the effective date of the deal equals the announcement date, then the deal is classified as a control-block trade. If the tender flag is "yes", or if the tender flag is "no" and it is not a block trade, then the deal is a tender offer.

¹⁶ If information on the bidder's prior ownership in the target is missing from SDC, we assume that the prior shareholding is zero.

¹⁷ We removed a single contest due to missing target name, 23 contests due to multiple successful bids, and 36 contests where the target was a Prudential-Bache fund.

Table 1
Total number of takeover contests and characteristics of the initial control bid, 1980–2005.

Control bids (mergers and tender offers) and their characteristics are from SDC. Control contests begin with the first control bid for a company and continue until 126 trading days have passed without any offer (including acquisitions of minority interests). Each time an offer for the target is identified, the 126 trading day search window rolls forward. Multiple-bid contests occur when there are either multiple control bidders or the initial bidder revises the bid. Successful offers are identified as completed by the SDC status variable. Initial deal values provided by SDC for the first control offer in the contest are restated in constant 2000 dollars using the Consumer Price Index obtained from the Bureau of Labor Statistics (Series Id: CUUR0000SA0).

	Number of contests				Number of successful contests				Initial deal values			
	All contests	Single bid	Multiple bids		Single bid	Multiple bids		(millions of 2000 constant \$)				
			Single bidder	Multiple bidders		Single bidder	Multiple bidders	Number	Mean	Stdev	Median	
All Contests	35,727	33,836	671	1,220	26,012	476	732	646	21,476	419.43	2,610.1	36.39
Initial Deal Form												
Merger bid	28,994	27,663	481	850	21,087	349	481	462	17,367	426.33	2,838.2	34.57
Tender offer	4,509	3,955	188	366	2,707	125	246	183	3,267	481.36	1,384.3	79.01
Block trade	2,224	2,218	2	4	2,218	2	5	1	842	36.95	93.1	8.45

(Continued)

Table 1 (Continued)

	Number of contests				Number of successful contests				Initial deal values			
	All contests	Multiple bids			Single bid	Multiple bidders			(millions of 2000 constant \$)			
		Single bid	Single bidder	Multiple bidders		Single bidder	Multiple bidders	Initial bidder	Rival bidder	Number	Mean	Stdev
Initial Payment Method												
All-Cash	4,798	4,114	268	416	3,424	160	266	209	4,798	309.54	1,130.1	54.82
All-Stock	6,983	6,699	161	123	5,708	146	181	62	6,983	492.89	3,747.1	33.56
Mixed Cash-Sec.	6,995	6,516	172	307	5,672	133	221	167	6,995	538.41	2,410.9	38.56
No payment data	16,951	16,507	70	374	11,208	37	64	208	2,700	116.50	621.3	19.45
Initial Attitude												
Hostile	590	207	153	230	35	72	126	133	560	1611.8	4,055.0	301.06
Unsolicited	435	272	38	125	3	5	6	84	362	608.92	2,729.9	103.19
Friendly	34,702	33,357	480	865	25,974	399	600	429	20,554	383.61	2,549.4	33.94
Initial offer												
horizontal	10,452	10,043	154	255	7,953	130	198	128	6,080	562.48	3,172.0	40.17

Table 2

Bidder and target public status and initial bidder nationality in takeover contests, 1980–2005.

Control bids (mergers and tender offers) and their characteristics are from SDC. Control contests begin with the first control bid for a company and continue until 126 trading days have passed without any offer (including acquisitions of minority interests). Each time an offer for the target is identified, the 126 trading day search window rolls forward. Multiple bid contests occur when there are either multiple control bidders or the initial bidder revises the bid. Successful offers are identified as completed by the SDC status variable. Initial deal values provided by SDC for the first control offer in the contest are restated in constant 2000 dollars using the Consumer Price Index obtained from the Bureau of Labor Statistics (Series Id: CUUR0000SA0). Bidder nationality and the public status of target and initial bidder is from SDC. “Other bidder” status includes unknown (268), joint-venture (115), individual (54), mutual (23) and government (19).

	Number of contests				Number of successful contests				Initial deal values			
	All contests	Single bid	Multiple bids		Single bid	Multiple bidders		(millions of 2000 constant \$)				
			Single bidder	Multiple bidders		Single bidder	Multiple bidders	Initial bidder	Rival bidder	Number	Mean	Stdev
Public target and status of initial bidder												
Public bidder	8,259	7,364	397	498	5,822	321	449	248	7,088	957.38	4,337.4	115.75
Private bidder	3,656	3,012	180	464	1,710	93	162	263	2,424	388.07	1,523.9	61.65
Other bidder	1,270	1,125	47	98	841	32	55	52	986	502.83	1,806.4	84.87
Private target and status of initial bidder												
Public bidder	15,799	15,675	29	95	12,467	23	45	51	9,269	66.28	233.7	16.06
Private bidder	4,482	4,429	5	48	3,413	4	15	27	940	111.41	323.1	22.92
Other bidder	2,261	2,231	13	17	1,759	3	6	5	769	86.26	416.5	16.84
Nation of initial bidder												
United States	31,845	30,184	613	1,048	23,399	431	648	555	19,249	404.56	2,632.0	35.97
Canada	1,044	1,011	10	23	688	5	9	11	590	222.09	933.4	11.13
United Kingdom	716	681	5	30	574	4	18	14	514	701.45	3,364.2	41.43
Other international	2,122	1,960	43	119	1,351	36	57	66	1,123	649.00	2,409.7	77.88

Table 3

Distribution of the time to completion of control contests for successful U.S. target firms, classified by the type of initial offer and the public status of the bidder and target firms. Total sample of 25,166 successful targets, 1980–2005.

Control contests begin with the first control bid for a company and continue until 126 trading days have passed without any offer (including acquisitions of minority interests). Each time an offer for the target is identified, the 126 trading day search window rolls forward. The table reports the number of trading days from the date of the initial control bid to the effective merger date reported by the SDC. The effective date is the date target shareholders approve the merger agreement.

Public status Target	Bidder	No of Obs.	Trading days from initial control bid to effective date			
			Mean	Median	Quartiles Lowest Highest	
Entire sample		25,166	64.62	42	0	100
Merger		2,2030	62.42	39	0	100
Public	Public	5,147	107.92	96	63	136
Public	Private	1,766	97.84	86	42	136
Private	Public	11,131	48.42	19	0	73
Private	Private	3,986	27.09	0	0	28
Tender		3,136	80.06	52	30	98
Public	Public	1,257	71.44	49	31	85
Public	Private	1,030	97.8	67	34	123
Private	Public	533	73.61	43	21	84
Private	Private	316	67.38	41	19	92

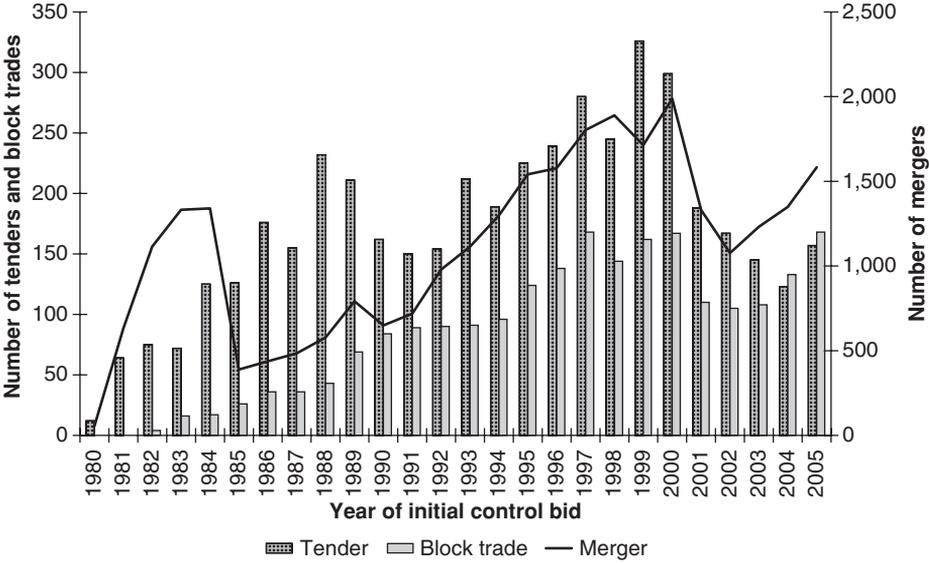
in Figure 1. The number of merger bids exceeds the number of tender offers by a factor of at least three in every sample year and by a factor of seven for the total period. The relative frequency of tender offers peaked in the second half of the 1980s.

The SDC deal value, converted to constant 2000 dollars using the Consumer Price Index of the Bureau of Labor Statistics (Series Id: CUUR0000SA0), averages \$436 million for initial merger bids, and \$480 million for initial tender offers.¹⁸ The distribution of deal values is highly skewed, with a median of only \$35 million for mergers and \$79 million for tender offers, respectively. The annual deal values plotted in Panel A of Figure 3 show that tender offers have somewhat greater deal values in the first half of the sample period, and that merger bids have slightly greater deal values than tender offers in the years 1998–2000.

Table 1 also provides information on the initial bidder's choice of payment method, the target's reaction to the initial bid, and the product-market relationship between the initial bidder and the target. SDC provides payment information for 53% of the

¹⁸ SDC deal values are available for 17,367 of the merger bids and for 3267 of the tender offers.

Panel A: Number of initial control bids by type



Panel B: Average deal value by type of initial control bid

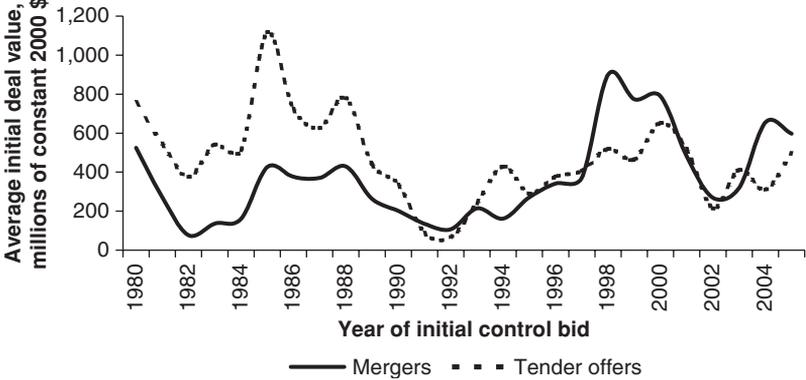
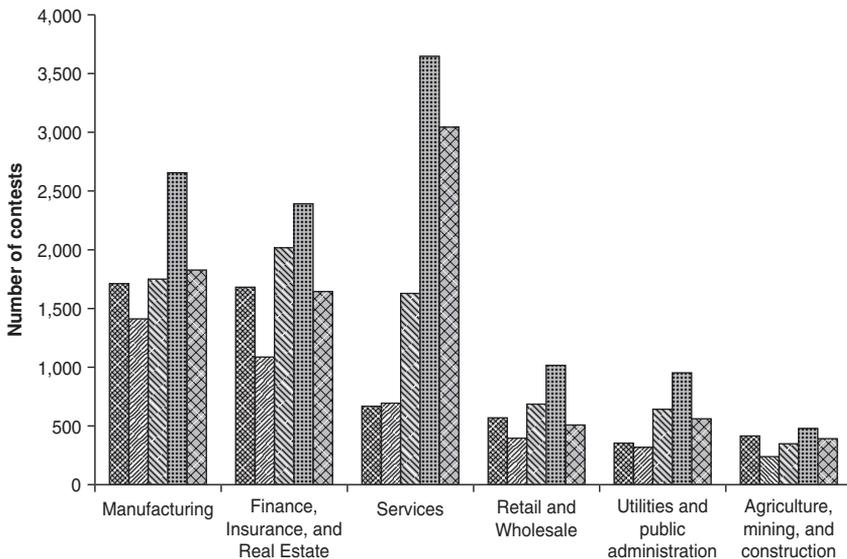


Fig. 3. Initial control bids for U.S. targets, 1980–2005: merger, tender offer, or block trade.

sample bids. Of these, 26% (4798) are classified as all-cash bids, in 37% the method of payment is all-stock, and for 37% the bidder pays with a mix of cash, bidder stock, and/or other (typically debt) securities. In terms of average deal size, mixed and all-stock offers have similar sizes (\$538 and \$493 million, respectively), while all-cash bids are somewhat lower with \$310 million. SDC classifies 590 initial bids as hostile and another 435 bids as unsolicited. All other bids are grouped here as

Panel A: Number of contests by time period and industry sector



Panel B: % of horizontal deals

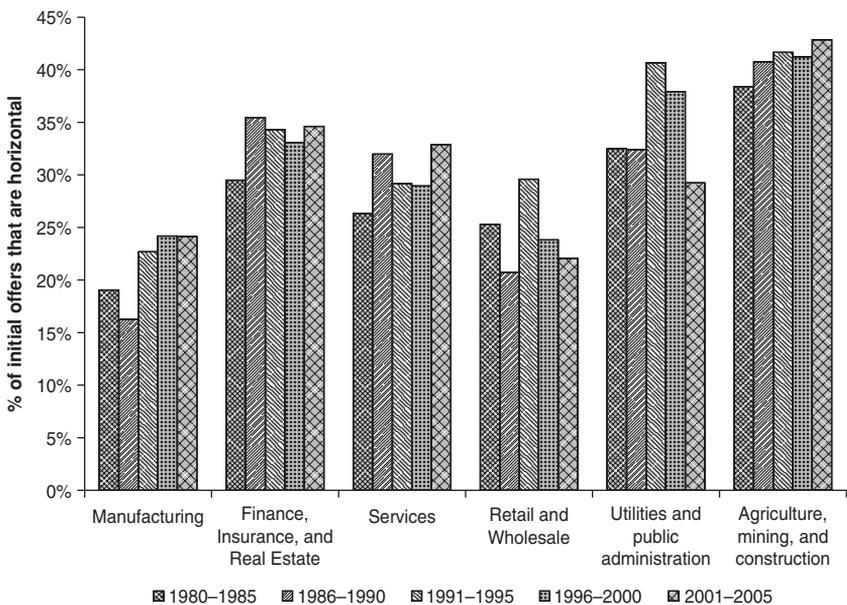
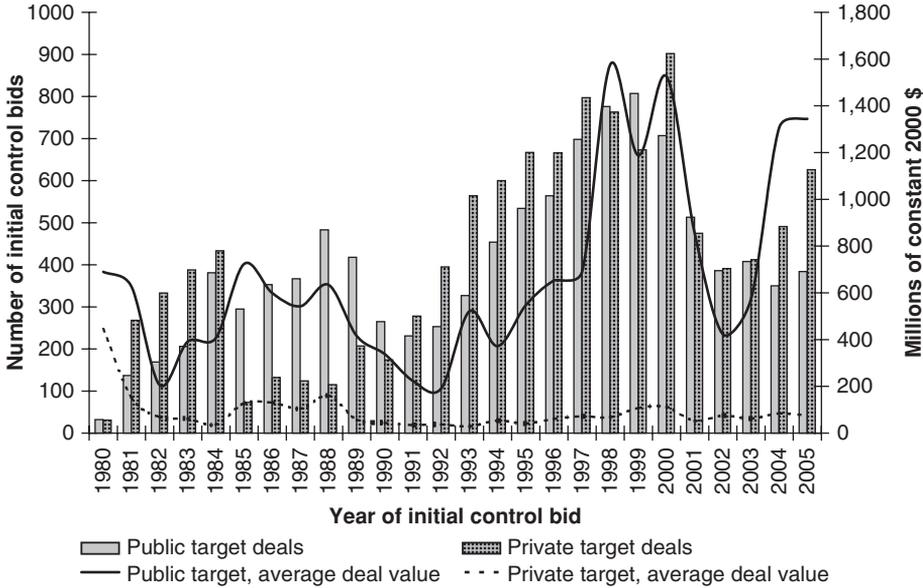


Fig. 4. Initial control bids for U.S. targets, 1980–2005, by 2-digit SIC target industry sector and 4-digit SIC horizontal within sector.

Panel A: Deal values by target public status



Panel B: Deal values by initial bidder public status

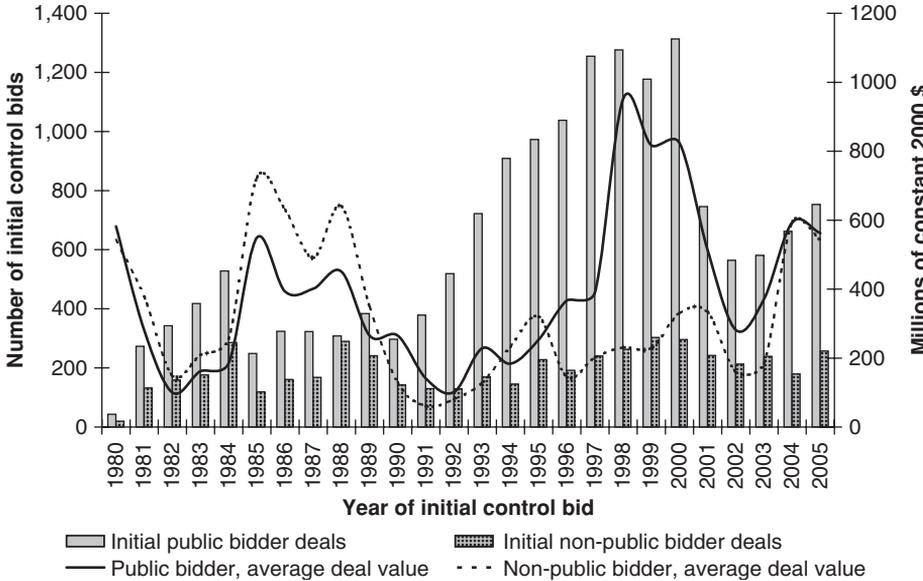


Fig. 5. Initial control bids for U.S. targets, by public status of bidder and target, 1980–2005.

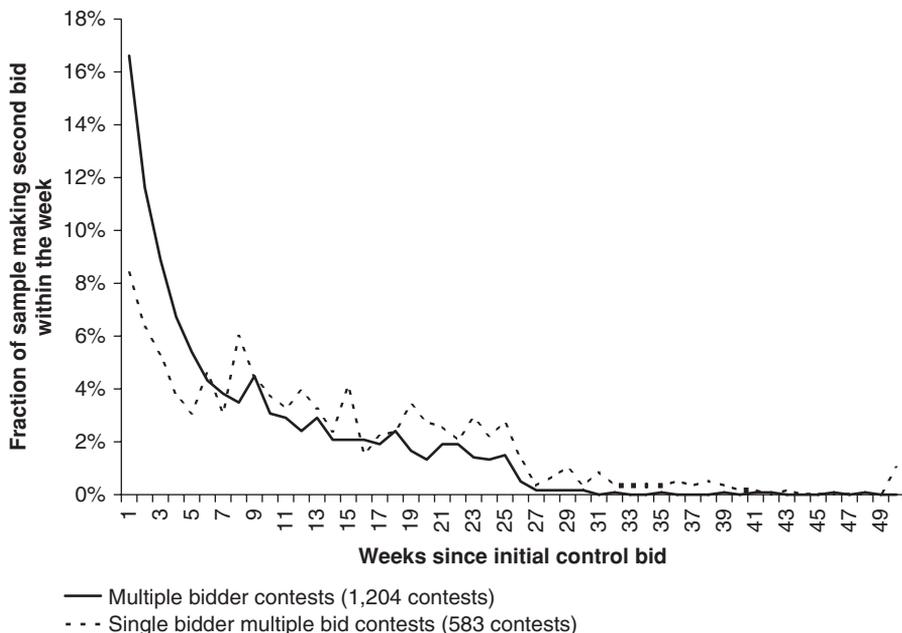


Fig. 6. Weeks from first to second bid in 1,787 contests with multiple bids for U.S. targets, 1980–2005. For the 1,204 contests with multiple bidders, the time from the initial to the second bid averages 5.7 calendar weeks (40 trading days) with a median of 3.7 weeks. For the 583 contests with a single bidder making multiple bids, the average time to the first bid revision is 9 weeks (63 trading days) with a median of 7.6 weeks. Under the 1968 Williams Act, any given tender offer must be open for at least 20 days, and a new bid extends the minimum period accordingly.

friendly—including bids for which SDC does not provide a classification. The hostile bids are by far the largest in terms of size, with an average deal size of \$1,612 million versus \$609 million for unsolicited offers and \$384 million for the average friendly deal.

The last panel in Table 1 shows that 10,452 or 29% of all bids are horizontal (defined as the initial bidder and the target operate in the same four-digit SIC industry). With an average deal value of \$562 million, the typical horizontal bid is somewhat larger than the sample average deal size. Figure 4 complements the industry information by listing the total number of bids (Panel A) and the fraction of horizontal initial bids (Panel B) by broad industry sectors and by time period. The industry sectors are Manufacturing; Finance, Insurance, and Real Estate; Services; Retail and Wholesale; Utilities and Public Administration; and Agriculture, Mining and Construction. The two first sectors (Manufacturing, and Finance, Insurance, and Real Estate) are by far the most takeover-intensive sectors in every one of the five five-year subperiods covering the total sample. The only exception is that Services experienced a peak takeover-intensity during 1996–2005. The

percentage of the takeover bids that are horizontal tends to be somewhat greater for the least takeover-intensive sectors such as Utilities and Public Administration, and Agriculture, Mining and Construction.

Table 2 and Figure 5 list the sample according to the public status of the target and initial bidder. Of the total sample of 35,727 initial bidders, 67% (24,058) are publicly traded. There are a total of 13,185 publicly traded targets, of which 8,259 receive initial bids from a public bidder. Not surprisingly, these are also the largest deals, with an average of \$957 million in constant 2000 dollars (median \$116 million). The largest single group is public bidders initiating a contest for a private target, with a total of 15,799 initial bids (44% of the sample). These deal values are typically small, with an average deal value of \$66 million (median \$16 million). There is also a group of 4,482 private bidder/private targets, comprising 13% of the total database and with an average deal value of \$114 million (median \$23 million).

Panel A of Figure 5 plots the number and total deal value (in constant 2000 dollars) for public and private target deals over the sample period, while Panel B repeats the plot based on the bidder being either public or private. The number of deals with public targets (Panel A) and with public bidders (Panel B) both increase sharply in the second half of the 1990s. The average deal values when the target is private (Panel A) is small and stable over the entire sample period. Deal values for private bidders (Panel B) are also relatively low, but fluctuate over time in direct proportion to the number of public targets in this group.

Recall that our sampling procedure requires the target but not the bidder to be a U.S. firm. The last panel of Table 2 shows how the bidders split according to nationality. A total of 3,882 or 11% of the total sample of initial bidders are domiciled outside of the United States. Of these, 1,044 bidders are from Canada, 716 from the United Kingdom, and the remaining 2,122 are from a variety of other nations. Interestingly, contests initiated by a foreign bidder are on average large, with a mean of \$701 million (median 41 million) when the bidder is from the UK, and \$649 million (median \$78 million) when the bidder is from the group of “other” countries.

2.2.2. *Duration, time to second bid, and success rates*

Recall that, starting with the initial offer, we identify the final bid in the contest when 126 trading days have passed without any new offer. Table 3 provides information on the duration of the 25,166 successful contests initiated by a merger or a tender offer. Duration is measured from the date of the initial bid to the effective date of the takeover. The effective date is the day of target shareholder approval of the deal. Given the stringent disclosure rules governing public offer, it is important to separate public from private firms. In the group where both the initial bidder and the target are public, the duration averages 108 trading days (median 96) when the initial bid is a merger offer and 71 days (median 49) when the initial bid is a tender offer. This confirms the conventional view that tender offers are quicker than merger negotiations.

These results are comparable to Betton and Eckbo (2000), who report contest durations for 1,353 tender offer contest, 1971–1990. Of these contests, 62% are single bid with an average duration of 40 trading days (median 29 and highest quartile 52 days). For the multibid contests, the average (median) duration is 70 (51) days. Thus, there is very little change in duration from the 1980s. Also, Table 3 shows clearly that a public target slows down the takeover process, whether or not the initial bid is a merger or a tender offer. Contests have the shortest duration when both firms are private: 27 days (median 0) for mergers and 67 days (median 41) for tender offers.¹⁹

Figure 6 shows the distribution of the number of weeks from the initial to the second bid in 1,787 of the 1,891 multibid contests in our sample (Table 1). In general, the expected time to arrival of a second bid depends on the cost to rival bidders of becoming informed of their own valuation of the target, as well as the time it takes to file a formal offer. For some rival bidders, the initial bid may have been largely anticipated based on general industry developments or prior rumors of the target being in play. However, in general, the observed time to the second bid sheds some light on the likelihood that rival bidders have ready access to the resources required to generate takeover gains.

For the 1,204 contests with multiple bidders, the time from the initial to the second bid averages 5.7 calendar weeks (29 trading days), with a median of 3.7 weeks. For the 583 contests with a single bidder making multiple bids, the average time to the first bid revision is 9 weeks (45 trading days) with a median of 7.6 weeks.²⁰ Thus, the time to the second bid is, on average, shorter when a rival bidder enters than when the second bid represents a bid revision by the initial bidder. These findings are comparable to those in Betton and Eckbo (2000), who report a mean of two weeks (14 trading days) and a highest quartile of 6 week days from the first to the second bid for their sample of 518 multibid tender offer contests.

Several studies provide estimates of the probability that the target will be successfully acquired by *some* bidder (the initial or a rival) following takeover bids. Given our contest focus (Figure 2), we are particularly interested in the probability that the *initial* bidder wins (possible after multiple bid rounds). Betton, Eckbo, and Thorburn (2007) estimate this probability using 7,470 initial merger bids and tender offers. They find that this probability is higher when the initial bidder has a toehold in the target and when the initial bid is all-cash (rather than all-stock or mixed cash-stock), when the bid is a tender offer (rather than merger), and when the bidder is a public company. The probability is also increasing in the pre-bid target stock price runup (the average cumulative target abnormal return from day –42 through day –2 relative to the initial offer day), when the target is traded on the NYSE or the Amex, and when the bidder and target are horizontally related in product markets. Finally, the probability that the initial bidder wins the contest

¹⁹ A contest duration of zero results when the initial offer is announced and accepted on the same day. This is possible in some private deals, provided bidder shareholders do not need to vote on a share issue to pay for the target, and provided the target vote is quick due, say, to high shareownership concentration.

²⁰ Under the 1968 Williams Act, any given tender offer must be open for at least 20 days, and a new bid extends the minimum period accordingly.

is lower if the target has a poison pill and if the target reaction is hostile. The negative impact of the presence of a poison pill is interesting, for it suggests that pills deter some bids. We return to this issue in Section 3.5.

Finally, Table 1 implies that the probability that all bids fail in a contest is 23% when the contest is initiated by merger and 28% when the initial bid is a tender offer. Thus, as noted by Betton, Eckbo, and Thorburn (2007) as well, merger negotiations are risky for the initial bidder. They are particularly risky when the initial bidder is private. As shown in Table 2, the probability that all bids fail is as high as 40% when the initial bidder is private and the target is public and the bidder approaches with a merger offer.

2.3. *Merger negotiation v. public tender offer*

2.3.1. *Merger agreement and deal protection devices*

A merger agreement is the result of negotiations between the bidder and target management teams. The agreement sets out how the bidder will settle any noncash portion of the merger payment. Frequently used contingent payment forms include stock swaps (discussed extensively in Section 3.2), collars, and clawbacks and earnouts.²¹ Contingent payment forms allow bidder and target shareholders to share the risk that the target and/or bidder shares are overvalued *ex ante*. Both parties typically supply fairness opinions as part of the due diligence process.²²

Whenever the bidder pays the target in the form of bidder stock, the merger agreement specifies the exchange ratio (the number of bidder shares to be exchanged for each target share). A collar provision provides for changes in the exchange ratio should the level of the bidder's stock price change before the effective date of the merger. This helps insulate target stockholders from volatility in the bidder's stock price. Collar bids may have floors and caps (or both), which define a range of bidder stock prices within which the exchange ratio is held fixed, and outside of which the exchange ratio is adjusted up or down. Thus, floors and caps guarantee the target a minimum and maximum payment.

The total payment to target shareholders may also be split between an upfront payment and additional future payments that are contingent upon some observable measure of performance (earnouts, often over a three-year period). This helps close the deal when the bidder is particularly uncertain about the true ability of the target to generate cash flow. It provides target managers with an incentive to remain with the firm over the earnout period, which may be important to the bidder. The downside is that the earnout may distort the incentives of target managers (an emphasis on short-term over longer-term cash flows), and it may induce the new controlling shareholder (the bidder) to manipulate earnings in order to lower the earnout payment. Thus, earnouts are not for everyone.

Merger negotiations protect the negotiating parties against opportunistic behavior while bargaining takes place. Before negotiations start, the parties sign agreements

²¹ Officer (2004), Officer (2006), Kohers and Ang (2000), Cain, Denis, and Denis (2005).

²² Kisgen, Qian, and Song (2006), Makhija and Narayanan (2007), Chen and Sami (2006).

covering confidentiality, standstill, and nonsolicitation. The confidentiality agreement allows the target board to negotiate a sale of the firm without having to publicly disclose the proceedings, and it permits the target to open its books to the bidder. The standstill commits the bidder not to purchase target shares in the market during negotiations, while nonsolicitation ensures that neither the bidder nor the target tries to hire key employees away from the other firm. It is also common for the bidder to obtain tender agreements from target insiders, under which these insiders forsake the right to tender to a rival bidder (Barger, 2005).

Delaware case law suggests that a merger agreement must include a fiduciary out clause enabling the target board to agree to a superior proposal if one is forthcoming from a third party.²³ As a result, the target board cannot give its negotiating partner exclusive rights to negotiate a control transfer: it must remain open to other bidders along the way. The resulting potential for bidder competition (after the merger agreement has been signed but before the shareholder vote) has given rise to target termination agreements, starting in the mid-1980s. A termination agreement provides the bidder with compensation in the form of a fixed fee (breakup fee) or an option to purchase target shares or assets at a discount (lockup option) should the target withdraw from the agreement (Burch, 2001; Officer, 2003; Bates and Lemmon, 2003; Boone and Mulherin, 2007a).²⁴ As discussed in Section 3.3, the value of a target termination agreement may be substantial, and it may affect the initial bidder's optimal toehold strategy.

When merger negotiations close, the bidder seeks SEC approval for any share issue required in the deal, and a merger prospectus is worked out. Writing the prospectus typically takes from 30 to 90 days, so the target shareholder vote is typically scheduled three to six months following the signing of the initial merger proposal.²⁵ The New York Stock Exchange requires that the shareholders of the bidder firm must also be allowed to vote on the merger if the agreement calls for the bidder to increase the number of shares outstanding by at least 20% in order to pay for the target.

2.3.2. *Mandatory disclosure and tender offer premiums*

In contrast to the merger process, a public tender offer is relatively quick. A tender offer is an offer made by the bidder directly to target shareholders to purchase target shares. The offer specifies the price per target share, the method of payment (cash, securities, or

²³ *Omnicare Inc. v. NCS Healthcare Inc.*, 818 A.2d 914 (Del. 2003). Delaware law is important as approximately 60% of all publicly traded companies in the United States are incorporated in the state of Delaware. Moreover, decisions in the Delaware Supreme Court tend to set a precedence for court decisions in other states.

²⁴ The Delaware court views termination fees anywhere in the range of 2 to 5% of the transaction value as reasonable. Termination agreements sometimes allow a reduction in the breakup fee if the target strikes a competing deal within a 30/45-day time frame. There are also cases where the deal includes a bidder termination agreement.

²⁵ During this waiting period, the bidder also performs a due diligence on key assumptions behind the merger agreement. If the bidder receives 90% of the target shares in a prior tender offer, the bidder can force a merger without calling for a vote among the remaining minority target shareholders (so-called short-form merger).

a mix of the two), whether the offer is restricted to less than 100% of the target shares, conditions for accepting tendered shares (e.g., all or nothing or any or all), and how long the offer is outstanding. The 1968 Williams Act, the main federal law governing public tender offers, requires an orderly auction mechanism: the tender offer must be open for a minimum of 20 business days; competing bid and material bid revisions automatically extend the offer period by 10 days; target shareholders may withdraw all tendered shares for any reason (typically in response to a higher bid) within 15 days; and the bidder must purchase target shares on a pro rata basis among those who tendered their shares.²⁶

The 1968 Williams Act also requires public information disclosure.²⁷ These provisions of the Act were in part a response to perceived takeover abuses in the 1960s, such as “creeping takeovers” and “Saturday night raids” where the bidder quickly gained control of the target shares using all-cash purchases in the market and privately from blockholders. While the stated intention of the Act is to protect target shareholders, a concern for potential bidders is that the mandatory disclosure rules also act to increase the ability of potential rival bidders to compete for the target. As pointed out by Grossman and Hart (1980a) and Jarrell and Bradley (1980), an active market for corporate control presupposes that initial bidders expect to have an advantage over potential rivals when search costs are sunk. Mandatory disclosure rules that increase expected competition among bidders possibly raise offer premiums and therefore deter some bids.²⁸

Did the disclosure provisions of the Williams Act raise tender offer premiums? Jarrell and Bradley (1980) examine this issue and find that the average cash tender offer premium increased from 32% to nearly 53% following passage of the Act in 1968. Consistent with higher premium costs, Schipper and Thompson (1983) present evidence indicating that a sample of frequent acquirers earned significantly negative abnormal returns over the months surrounding announcements of the introduction of the Williams Act. Also, Asquith, Bruner, and Mullins (1983), Loderer and Martin (1990), and others report that gains to bidder firms in mergers are on average lower after 1968.

Nathan and O’Keefe (1989) find that the premium increase after introduction of the Williams Act is not restricted to cash tender offers: Cash *mergers* experienced an increase in the average premium from 30% to 67%, while security exchange mergers saw the

²⁶ Note that, contrary to takeover regulations in many Western countries (Berglof and Burkart, 2003), the Williams Act does not include a mandatory bid rule. A mandatory bid rule requires the bidder to proceed with an offer for 100% of the target shares after acquiring a certain stake in the target (Burkart and Panunzi, 2003). Mandatory bid rules do, however, exist in certain states, including Pennsylvania and Maine. The mandatory bid price varies with jurisdiction but is typically a function of the price(s) the bidder paid for the initial stake.

²⁷ A tender offer is disclosed through a 14D filing with the SEC. Also, regardless of any plans to acquire the target, an investor purchasing 5% or more of the target shares must file Form 13D with the SEC within a 10-day period. The 13D includes statements concerning the purchaser’s intention with respect to the eventual purchase of control. Antifraud provisions were added to the Williams Act in 1970 to back up these disclosure requirements.

²⁸ However, severe penalties on the release of false (or misleading) information may benefit some bidder firms by making their otherwise voluntarily disclosed information more credible (Eckbo and Langohr, 1989). This positive effect is greater the lower the correlation between rival bidders’ private valuations of the target (i.e., the more unique the bidder’s contribution to total synergy creation).

average premium increase from 30 to 54%. They also show that the majority of the increase in the average offer premium takes place after 1972. This delay is puzzling and raises the question of whether the premium increase is due to the Williams Act or to some other economic phenomenon.

The Williams Act introduced both disclosure rules and a minimum 20-day offer period. Providing rival bidders with time to respond to the initial bid (the 20-day wait period) is obviously key to increased competition. Thus, studies of the Williams Act cannot isolate the premium impact of the disclosure rules. Specifically, these studies do not answer the fundamental question of whether the introduction of disclosure rules affects offer premiums in an environment where rival bidders already have time to respond.

Eckbo and Langohr (1989) provide evidence on this question using a different institutional setting. In 1970 France introduced mandatory disclosure rules for public tender offers—much like those in the Williams Act. The difference is that France had already established a minimum (four-week) tender offer period much earlier (in 1966). Eckbo and Langohr (1989) find that the average offer premium in successful cash tender offers increased from 34 percent to nearly 61 percent after the 1970 disclosure regulations. Since the minimum tender offer period remained at one month throughout their sample period, this indicates that disclosure requirements *alone* can cause a substantial increase in average offer premiums. Eckbo and Langohr (1989) also study a contemporaneous control sample of privately negotiated controlling-block trades, exempt from the 1970 disclosure regulations. Premiums in these alternative control acquisitions did not increase subsequent to the 1970 regulations.

2.3.3. *Determinants of the merger choice*

What are some of the determinants of the choice between merger negotiations and a public tender offer? From the bidder's point of view, two immediate advantages of the tender offer process is speed of execution (supported empirically by Table 3) and the fact that it does not require prior approval by—or even prior contact with—target management. Thus, the tender offer is an option for bidders who believe the target will refuse to negotiate *ex ante*, or should negotiations break down *ex-post*.²⁹ Also, many tender offers involve prior contact and even negotiations with the target management (Comment and Jarrell, 1987). Negotiated tender offers may help resolve bargaining issues (e.g., difference of opinions on what constitutes a reasonable bid price), and the arm's length transaction implied by a public tender offer helps protect target managements against charges *ex-post* that they “sold out” to the bidder.

As discussed in Section 3.5, the target takeover defenses developed in the 1980s, in particular the poison pill, have significantly raised the cost to the bidder of launching a hostile tender offer. This is evidenced by a substantial decline in the frequency of hostile bids over the past 20 years. In today's legal environment, it is likely that virtually

²⁹ Berkovitch and Khanna (1991), Aktas, deBodt, and Roll (2007), and Betton, Eckbo, and Thorburn (2007) present models in which a tender offer (auction) is an explicit outside option in merger negotiations.

all bidders (also those who intend to replace incumbent target management) prefer to approach the target management with a proposal to negotiate. Again, an initially friendly approach preserves the option of making a hostile tender offer down the line. Moreover, a significant benefit of a friendly cooperative approach is that it gives the bidder access to the target books, a crucial factor in pricing.

Systematic empirical evidence on the choice of merger versus tender offer is only beginning to emerge. Kohers, Kohers, and Kohers (2007) study 2,610 completed mergers and 795 successful tender offers for the period 1984–1999. They find that the probability of a tender offer is more likely when the form of payment is all-cash, when the target is defensive, and has high institutional ownership, and when there are multiple bidders. The tender offer form is less likely between two “glamor” companies (i.e., when the bidder and target have low book-to-market (B/M) ratios), and for deals after the 1980s.

Betton, Eckbo, and Thorburn (2008a) study the *initial* bidder’s choice between merger and tender offer for 4,618 merger bids and 1,638 tender offers for public U.S. target firms from 1980 through 2002. They separate public bidders (3,119) from private bidders (1,438) and test for differences in their choices. They show that bidder and target B/M values drive the merger choice only when these ratios exceed the median B/M of the respective industry rivals. Public bidders are significantly less likely to select merger over tender offer when the B/M values of the target or of the bidder exceed their respective industry medians. For private bidders, however, this glamor effect does not exist: private bidders are *more* likely to select merger over tender offer when the target’s B/M exceeds its industry median (data on private bidders’ B/M values are not available). In the 1980s, public bidders were less likely to choose merger, while private bidders were more likely to select this acquisition form. While the target’s asset size and target hostility both reduce a public bidder’s likelihood of selecting a merger, these factors do not influence the choice of private bidders. Moreover, the greater the concentration of the target’s industry, the less likely both public and private bidders are to select merger over tender offer.

3. Bidding strategies

3.1. Modeling the takeover process

Before reviewing the empirical evidence on various bidding strategies, it is instructive to briefly characterize the two most common theoretical settings used to model takeover bids. This in turn helps us understand the various empirical hypotheses and their relevance for actual takeover activity.

3.1.1. Free riders and post-offer dilution

An early workhorse in the theoretical takeover literature is the free-rider model of Grossman and Hart (1980b) and Bradley (1980). They analyze the incentives of

dispersed, noncooperative target shareholders to accept a tender offer from a single bidder and the resulting inefficiency of the takeover market. To illustrate, suppose the target's pre-offer (stand-alone) share price is equal to zero and that it is common knowledge that the post-takeover share price will equal $v > 0$. The value-increase v may be thought of as synergy gains resulting from the bidder taking control of the target. The bidder makes a conditional unrestricted bid b for 50% of the target shares (sufficient to transfer control of the target to the bidder).³⁰ A risk-neutral target shareholder tenders only if the offer price exceeds the expected value of her share if she retains it:

$$\text{Tender if } b \geq \Pr(\text{Success} | i \text{ Retain})v \quad (1)$$

where $\Pr(\cdot)$ denotes the probability that the offer succeeds given that the shareholder does not tender.³¹

By inspection of Equation (1), the target shareholder is more willing to tender the lower is the post-takeover value v , and the more she believes that retaining reduces the takeover's probability of success. As the number of target shareholder becomes larger, however, the probability that any single shareholder is pivotal for the outcome of the bid becomes arbitrarily small. For such shareholders, the tender criterion in (1) reduces to:

$$\text{Tender if } b \geq v \quad (2)$$

Since the bidder has no economic incentive to make the bid in Equation (2), these shareholders are in effect free-riding on a decision by others to tender. Of course, if all shareholders behave this way, the takeover opportunity never materializes.³²

Making *every* target shareholder pivotal by a conditional and restricted offer for 100% is unlikely to help. Because the bidder gains control after receiving 50% of the shares, refusing to purchase those shares if she is one share short of 100% is not credible. Also, allowing the bidder to be better informed than target shareholders (about v) does not solve the problem. Individual target shareholders now demand an offer price $b \geq E(v | \text{Offer})$ in order to tender, where the right-hand side is the expected valuation of the bidder given that he makes an offer. An offer below this expectation leads target shareholders to infer that $b < v$ and therefore to retain their shares. In this case, there does not exist a rational expectations (perfect Bayesian) equilibrium in which the bidder expects to make a profit from the takeover.³³

³⁰ "Conditional" means no shares will be purchased if less than 50% are tendered. "Unrestricted" means any or all tendered shares above 50% will be purchased.

³¹ We are ignoring taxes. For example, when b is paid in cash, the offer may trigger a capital gains tax liability.

³² Just as the free-rider problem can discourage value-increasing bids, value-reducing bids—bids where the post-takeover value of the target is less than its pre-offer value—may be encouraged due to a "pressure-to-tender" problem (Bebchuk, 1985): Conditional on the offer succeeding, tendering may dominate retaining and receiving an even lower value. Thus, paradoxically, there may be "pressure-to-tender" when the bidder is value-reducing. The root cause of this result is, as above, that each target shareholder bases the tendering decision on a comparison between b and v , ignoring the pre-takeover value.

³³ Hirshleifer and Titman (1990) prove the existence of a separating equilibrium in which the offer price fully reveals v .

There are a number of ways to mitigate the free-rider problem so that the bidder gains on the acquired target shares. Two frequently mentioned mechanisms are post-takeover dilution (Grossman and Hart, 1980b) and pre-takeover toehold acquisition (Shleifer and Vishny, 1986b). Post-takeover dilution reduces the “back-end” value of the takeover and may be enforced through a two-tiered tender offer. The first tier is a bid b while the back end is a minority buyout (enforced by the bidder after acquiring control in the front end) at a lower value $v_d < v$. Alternatively, if fair price rules prevent the minority buyout to take place at a price below the front-end price, the bidder may resort to self-dealing (“asset tunneling”), which is harmful to minority shareholders after the takeover. Examples of such dilution techniques are asset sales at prices below market value, transfer pricing favorable to the majority shareholder, excessive compensation schemes, and so on. These schemes create a wedge between the post-takeover share value to the acquirer and minority shareholders and enable the acquirer to make a profit. Although such transfers may enhance the ex ante efficiency of the takeover market, they are controversial and legally difficult to enforce ex-post.³⁴

A firm contemplating making a bid for the target may also decide to purchase target shares—a toehold—in the market at the pre-bid (no-information) target share price. The implications of such toehold acquisitions for optimal bidding are discussed in detail later in this chapter. In the context of the free-rider problem, the important point is that the toehold bidder may gain on the toehold while making zero profits on the shares acquired in the formal takeover bid. Let δ denote the fraction of the target post-takeover value that may be diluted ex-post, and α the fraction of the target shares held by the bidder prior to the offer, respectively. The bidder makes the conditional unrestricted offer of

$$b^* = (1 - \delta)v \quad (3)$$

which yields a bidder profit of

$$v - (1 - \alpha)b^* = \alpha v + (1 - \alpha)(v - b^*) = \alpha v + (1 - \alpha)\delta v \quad (4)$$

The first term, αv , is the gain on the toehold shares, while the second term is the profits on the shares purchased in the takeover. The second term, $(1 - \alpha)\delta v$, shows that dilution is costly for the bidder in that it also reduces the value of the bidder’s toehold shares. Thus, the larger the initial stake α , the lower the controlling shareholder’s incentive to dilute ex-post. In other words, a corporate insider with a larger equity stake is more prone to act in the outside (minority) shareholders’ interest (Jensen and Meckling, 1976; Burkart, Gromb, and Panunzi, 1998).

What is the empirical relevance of the free-rider problem in corporate takeovers? The most direct way to evaluate this question is to look at the frequency of (pivotal)

³⁴ Djankov, La Porta, Lopez-de-Silanes, and Shleifer (2007) survey the opportunities for corporate insiders around the world to dilute minority shareholder value through self-dealings deemed *legal* under a country’s corporate laws. Under the European Takeover Directive (article 14), member-states may grant acquirers a squeeze-out right, that is, the right to compel post-takeover minority shareholders to sell their shares after the acquirer has purchased 90% of the target shares.

blockholders in corporate shareownership structures. A large blockholder likely accounts for the possibility that her tendering decision affects the probability that the offer will succeed. In this case, shareholders are willing to tender at a price lower than indicated by expression (1) above (Bagnoli and Lipman, 1988; Holmstrom and Nalebuff, 1992).³⁵

The evidence on corporate ownership structures around the world suggests that the existence of one or more large blockholder is the rule rather than the exception.³⁶ In the United States and elsewhere, small and midsized publicly traded companies typically have one or more large shareholder (defined as a minimum 5% holding).³⁷ In large-cap firms, individual (or family) blockholdings are less frequent in the United States; however, large blocks held by financial institutions such as pension funds are common for our large firms. As highlighted by Holderness (2006), the evidence challenges the view—originating with Berle and Means (1932)—that U.S. ownership is largely dispersed, and it suggests that free-rider problems in takeovers may be a rarity.³⁸

A more indirect way to evaluate the empirical relevance of free-rider problems is to examine characteristics of observed takeover bids. For example, the unequal distribution of takeover gains between target and bidder firms—with most, if not all, of the total gains typically accruing to the target—is often cited in support of the existence of the free-rider problem (Hirshleifer, 1995; Burkart and Panunzi, 2006). However, as discussed in Section 4, there are a number of alternative and plausible reasons for the observed uneven distribution of takeover gains. Moreover, toehold bidding—perhaps the most obvious

³⁵ In Holmstrom and Nalebuff (1992), there are N target shareholders of equal size, and the bidder needs K of these to tender in order to acquire control. They show that there exists a mixed strategy equilibrium where the takeover succeeds and the bidder makes a positive expected profit. In this equilibrium, individual target shareholders tender with a probability $p = K/N$. Expected profits go to zero when N becomes large.

³⁶ Following the early international evidence of La Porta, Lopez-de-Silanes, and Shleifer (1999), detailed information on corporate ownership structures has appeared for East Asia (Claessens, Djankov, and Lang, 2000), Western Europe (Faccio and Lang, 2002; Franks, Mayer, and Rossi, 2005), and the United States (Holderness, Kroszner, and Sheehan, 1999; Holderness, 2006; Helwege, Pirinsky, and Stulz, 2007; Dlugosz, Fahlenbrach, Gompers, and Metrick, 2006).

³⁷ The definition of a block varies in the literature from 5% to 20%. Note that a relatively small block may become pivotal depending on the ownership distribution of the remaining shares. A natural empirical measure of “pivotal” is the Shapley transformation of the block (Shapley, 1953). The Shapley value is the probability that the block will be pivotal, computed using all possible shareholder coalitions (with the block) in which the coalition determines the voting outcome. See, for example, Eckbo and Verma (1994) and Zingales (1994) for applications in corporate finance.

³⁸ Holderness (2006) studies a random sample of 10% of the firms trading on the NYSE, Amex, and NASDAQ. Large shareholders (which include institutional holdings) on average own 39% of the voting power of the common stock. Moreover, 96% of the firms have at least one 5%+ blockholder, and the average holding of the largest blockholder is 26%. Holderness also reports that 89% of the firms in the S&P 500 Index have large blockholders. Thus, free-rider problems are unlikely. Whether the evidence also challenges the seriousness of the Berle-Means warnings of agency costs associated with delegated management in public firms is, of course, a different issue. It is possible that a large block held by a financial institution (as opposed to an individual investor) carries with it serious agency problems when seen from the point of view of the firm’s individual shareholders.

way to mitigate expected free-rider problems—is extremely rare in control-oriented acquisitions (Betton, Eckbo, and Thorburn, 2007).

3.1.2. Auction with single seller

A second workhorse in the theoretical literature on takeover bidding is the competitive auction. Here, the bidder faces a single seller in the form of a large target shareholder or a target management with sufficient authority to commit to selling in the auction. As noted by Dasgupta and Hansen (2007), auction theory plays an important prescriptive role: to inform a company’s board or regulators about the impact of selling processes or rules on shareholder wealth, efficiency, and welfare. They also note that, for such prescriptions to be useful, the auction model must reasonably mimic the actual takeover bidding environment. One important characteristic of any auction is the seller’s commitment to stick to the rules of the game. For auction-theoretic results to apply, the seller must be trying to secure the best price for the firm’s shareholders by committing to a selling mechanism.³⁹ As noted earlier, since a publicly traded target’s board of directors has a fiduciary obligation to accept the highest offer (provided the board has placed the target “in play”), a takeover is arguably much like an auction even if the target initially negotiates a merger agreement.

The typical assumption is of an open, ascending (English) auction with zero entry and bidding costs, and where the winning bidder pays the second-highest bid.⁴⁰ Bidder valuations v (synergies) are private knowledge, but the seller knows the probability distribution function over v , $G(v)$. Since bidders tend to have different skill levels in terms of managing the target assets, it is often assumed that the valuations v are uncorrelated across bidders—a “private value.” Alternatively, bidder valuations may be correlated—a “common value” environment that requires bidders to shave their bids in anticipation of the “winners curse.”⁴¹

It is also commonly assumed that the bidder’s outside option is status quo. That is, the payoff to the bidder is zero when losing the auction. This assumption is effectively relaxed when the bidder has a toehold⁴² or a target termination agreement, or when the takeover is a response to changes in industry competition (Morellec and Zhdanov, 2005;

³⁹ For example, in a first-price auction, in which bidders optimally shave their bids, the seller must be able to commit not to allow further bid revisions by the losing bidder (who, after losing, may want to submit a bid higher than the winning bid).

⁴⁰ With zero entry and bidding costs, optimal bid increments are infinitesimal, so the winning bidder pays the second highest price whether or not the auction is defined formally at a first-price or second-price auction.

⁴¹ In a common-value setting, bidders receive private and noisy signals as to the true (common) value of the target. Bidding the full value of the signal would cause the bidder with the largest positive signal error to win and overpay (the “curse”). Optimal bidding takes this possibility into account by reducing the bid to the point where the expected value of the bid *conditional on winning* is nonnegative. Thus, testing for the presence of a winner’s curse is equivalent to testing the hypothesis that bidders are irrational (cannot compute). See Boone and Mulherin (2008) for same evidence inconsistent with this hypothesis. In a private value setting, bidders know their true valuations and thus do not face a winner’s curse.

⁴² Burkart (1995), Bulow, Huang, and Klemperer (1999), Betton, Eckbo, and Thorburn (2007).

Akdogu, 2007b; Molnar, 2008). The toehold provides a positive payoff when the toehold bidder loses to a rival (who purchases the toehold). A termination contract also pays off when the bidder loses and no other bidder wins (the target remains independent). Also, a worsening of the competitive industry equilibrium can place the unsuccessful bidder at a competitive disadvantage vis-à-vis the winner.

3.2. *The payment method choice*

As discussed earlier (Table 1), the payment method in takeovers includes all-stock payment, various debt securities, mixes of securities and cash, and all-cash payment.⁴³ As Table 1 shows for the total sample, 26% of the initial bidders use the all-cash method while the groups of all-stock and mixed offers each cover 37% of the initial bids. Figure 7 plots the fraction of all initial bids that are in the form of each of these three payment methods over the 1980–2005 period. Use of the various payment methods clearly differs between merger bids (Panel A) and tender offers (Panel B): the majority of tender offers use all-cash or a mix of cash and stock, while the majority of merger bids are in the form of all-stock (with the exception of the 1980–1985 period when 90% of the initial merger bids offered a mix of cash and securities).

Notice that in the two subperiods 1990–1995 and 1996–2000, the percentage of all-stock offers in initial merger bids was approximately 55% in *both* periods. This means that (1) nearly half of the initial merger bids in the 1990s used some cash as payment, and (2) the percentage of all-stock merger bids remained unaffected by the significant runup in overall market valuations in the 1996–2000 period.

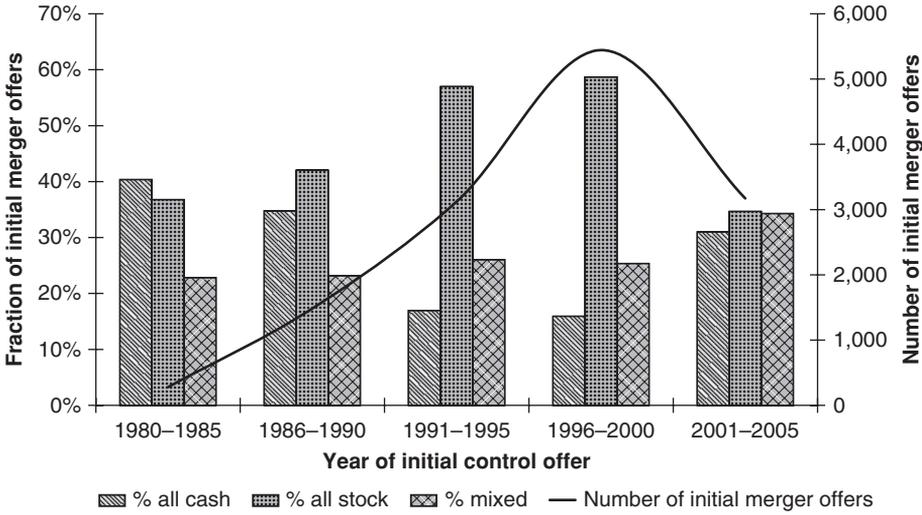
Table 4 summarizes a number of economic hypotheses and related empirical evidence concerning the choice of payment method. The associated empirical evidence is a combination of determinants of the probability of a specific payment method choice (e.g., all-cash versus all-stock), and announcement-induced abnormal stock returns as a function of the payment method. The hypotheses deal with tax effects, deal financing costs under asymmetric information, agency and corporate control motives, and behavioral arguments. These hypotheses are not necessarily mutually exclusive, so a given payment choice may reflect elements of several theories.

3.2.1. *Taxes*

The U.S. Internal Revenue Code (IRC) requires target shareholders to immediately pay capital gains taxes in an all-cash purchase. If the merger qualifies as a tax-free reorganization under Section 368 of IRC, for example by using all-stock as method of payment, target shareholder capital gains taxes are deferred until the shares received in the deal are sold. Mixed cash-stock offers are treated as either all-cash bids or the stock part is treated as an all-stock bid depending on the cash portion and other characteristics of

⁴³ The cash amount is typically financed using accumulated retained earnings (financial slack) or debt issues prior to the takeover.

Panel A: Distribution of mergers by time period and method of payment



Panel B: Distribution of tender offers by time period by method of payment

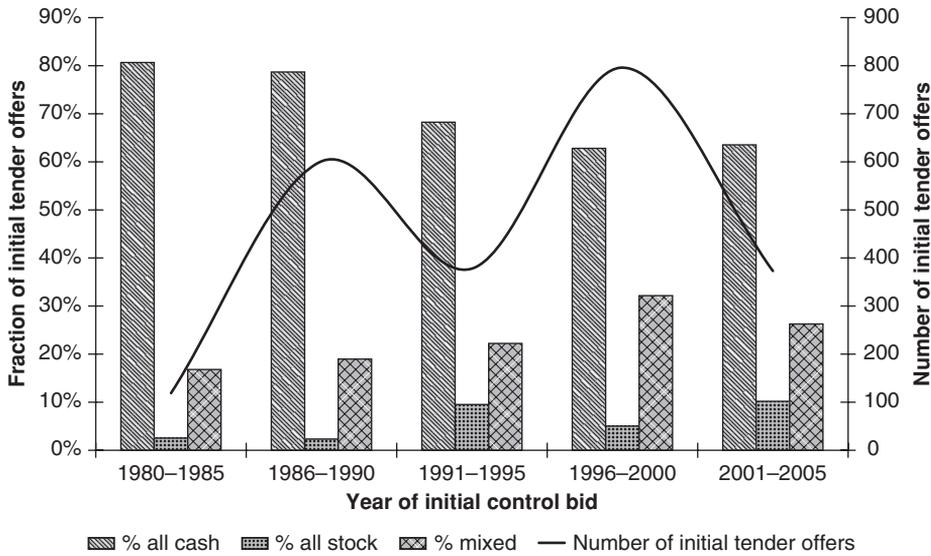


Fig. 7. The initial control bidder's use of all-cash, all-stock, and mixed cash-stock as method of payment. Total sample of 13,503 merger bids and 2,678 tender offers with SDC information on payment method. U.S. targets, 1980-2005.

Table 4

Selected hypotheses and U.S. evidence concerning the choice of payment method in takeovers.

Theories	Hypotheses	Evidence
A. Taxes and the payment method		
U.S. Internal Revenue Code, Section 368 governing statutory merger.	H1: <i>Cash deals may be relatively costly as the implied capital gains tax penalty forces higher target premiums.</i>	Carleton, Guilkey, Harris, and Stewart (1983): Probability of stock offer increases in bidder's market-to-book ratio.
Gilson, Scholes, and Wolfson (1988)	In a cash-for-stock deal, target shareholders pay capital gains tax immediately (the deal is taxable if target shareholders receive less than fifty percent of the deal in bidder stock). The buyer steps up the tax basis with the takeover premium. In a Stock deal, however, target capital gains taxes are deferred until shares received are sold. No step-up of tax basis for buyer. Buyer in stock deal may make a Section 338 election to be treated as cash deal (Bruner, 2004).	Huang and Walkling (1987), Hayn (1989): Target announcement returns in U.S. deals higher for taxable than tax-deferred transactions. Franks, Harris, and Mayer (1988): Reach similar conclusion for control-oriented takeovers in U.K.. However, the all-cash premium effect is present also <i>before</i> the introduction on capital gains taxes. Eckbo and Langohr (1989): Find higher target premiums in all-cash tenders offers for control as well as for minority buyouts in France. Brown and Ryngaert (1991): Find empirical support for their proposition that stock should not be used by bidders selecting taxable offers.
B. The payment method choice motivated by asymmetric information		
Myers and Majluf (1984)	H2: <i>One-sided information asymmetry: Investor concern with adverse selection produces a negative market reaction to the news of a stock deal.</i>	Travlos (1987); Asquith, Bruner, and Mullins (1987); Servaes (1991); Brown and Ryngaert (1991); Smith and Kim (1994); Martin (1996); Emery and Switzer (1999); Heron and Lie (2004); Schlingemann (2004) and many others show that bidder announcement-induced abnormal stock returns are on average negative in all-stock offers for public targets. However, bidder announcement returns are non-negative in all-stock offers for private targets (Chang, 1998; Fuller, Netter, and Stegemoller, 2002; Moeller, Schlingemann, and Stulz, 2004; Bradley and Sundaram, 2006; Officer, Poulsen, and Stegemoller, 2007).

(Continued)

Table 4 (Continued)

Theories	Hypotheses	Evidence
Hansen (1987) Fishman (1989)	<p>H3: <i>Two-sided information asymmetry: Paying with securities induce targets to make more efficient accept/reject decisions than with cash. Stock offers are less likely when (i) the bidder has a relatively large total equity size, and (ii) when the target undervalues the bidder's shares.</i></p> <p>The value of a stock offer is contingent on the true values of both the bidder and the target. A cash offer that undervalues the target will be rejected, while an equivalent stock offer may be accepted because the stock offer will rise in value ex-post. This ex-post price effect is smaller the smaller the size of bidder's total equity relative to the target's.</p> <p>The more the target undervalues the bidder's stock, the more costly a given stock offer, and the more likely the bidder is to use cash.</p>	<p>Hansen (1987): Probability of stock offer increases in bidder's asset size as well as in the size of its liabilities.</p> <p>Chemmanur and Paeglis (2003): Probability of stock offer increases in a measure of market mispricing of bidder shares and falls as the dispersion of analyst forecast of bidder earnings increases.</p> <p>Betton and Eckbo (2000): Probability that the target accepts the initial bid in tender offer contests is lower for stock offers than for cash bids.</p> <p>Travlos (1987): Bidder's announcement-induced abnormal stock returns lower for stock offers than for cash bids.</p>
Eckbo, Giammarino, and Heinkel (1990) Berkovitch and Narayanan (1990)	<p>H4: <i>Two-sided information asymmetry where bidders in equilibrium choose a mix of cash and stock. There exists a fully revealing separating equilibrium in which the greater the proportion of the deal paid in cash, the greater the true value of the bidder.</i></p> <p>In Eckbo, Giammarino, and Heinkel (1990), target adverse selection pushes the bidder towards using stock as payment method, while target undervaluation of bidder shares pushes the bidder towards cash. The market uses the proportion of the deal paid in cash to separate low-value from high-value bidders. In equilibrium, bidder announcement-induced abnormal stock returns are an increasing and convex function of the cash portion of the deal.</p> <p>In Berkovitch and Narayanan (1990), the bidder's choice of cash-stock mix affects target returns as well. Greater potential bidder competition raises the optimal amount of cash, and with actual competition all but the lowest type make all-cash offers.</p>	<p>Eckbo, Giammarino, and Heinkel (1990); Eckbo, and Thorburn (2000): The average announcement-induced abnormal stock returns to bidders are highest for all-cash deals, lowest for all-stock deals, with mixed cash-stock deals in between.</p> <p>Eckbo, Giammarino, and Heinkel (1990): In cross-sectional regressions, bidder announcement-induced abnormal stock returns are increasing in the cash portion of the deal as predicted. However, the data rejects convexity.</p> <p>Betton, Eckbo, and Thorburn (2008c): Shows frequent use of mixed cash-stock offers in tender offers (see also Figure 7). Moreover, there is evidence that multiple bids raise the use of cash, however, the amount of stock used in competitive contests remains significant.</p>

(Continued)

Table 4 (Continued)

Theories	Hypotheses	Evidence
C. Capital structure and corporate control motives for the payment method choice		
Ross (1977)	<p>H5: <i>The payment method is selected as part of a broader capital structure choice. Moreover, some bidder managements select (possibly debt financed) cash over stock as payment method in order to avoid diluting their private benefits of control in the merged firm.</i></p> <p>In Ross (1977) increased leverage raises expected managerial-specific bankruptcy costs. In Jensen (1986), paying with cash drains free-cash flow and reduces agency costs. In Harris and Raviv (1988); Stulz (1988), managers act to protect private benefits of control.</p>	<p>Capital structure: The cash portion of the bid must be financed internally or by a previous security issue. Schlingemann (2004); Toffanin (2005) find a link between the market reaction to takeover announcements and financing decision in the previous year.</p> <p>Yook (2003) find greater bidder gains in all-cash offers when the takeover causes downgrading of the merged firm's debt (due to increased leverage). The results are consistent with agency costs of free cash flow (Jensen, 1986).</p> <p>Control: Amihud, Lev, and Travlos (1990); Martin (1996); Ghosh and Ruland (1998) find that bidder management shareholdings in the U.S. have negative effect on stock financing.</p> <p>Studying European mergers, Faccio and Masulis (2005) find that corporate control incentives to choose cash are particularly strong when in bidder firms with relatively concentrated shareownership structures. Martynova and Renneboog (2006) finds a link between the quality of a country's corporate governance system and the market reaction to stock as payment form.</p>
Jensen (1986)		
Harris and Raviv (1988)		
Stulz (1988)		
D. Behavioral motives for the payment method choice		
Shleifer and Vishny (2003)	<p>H6: <i>Bidders are able to sell overpriced stock to less overpriced targets</i></p> <p>Bidders attempt to cash in on a temporary market overvaluation of their stocks. In Shleifer and Vishny (2003) they succeed because targets have "short time horizon". In Rhodes-Kropf and Viswanathan (2004) they succeed because targets accept more bids from overvalued bidders during market valuation peaks because they tend overestimate synergies during these periods.</p>	<p>The propensity of all-stock offers increases with M/B ratios (Rhodes-Kropf, Robinson, and Viswanathan, 2005; Aug and Cheng, 2006; Dong, Hirshleifer, Richardson, and Teoh, 2006). This supports the behavioral argument provided M/B is a fundamental driver of takeovers.</p> <p>Harford (2005): A macroeconomic measure of capital liquidity (interest rate spreads) drives merger activity and drives out M/B as a predictor of merger activity. This is inconsistent with the behavioral argument.</p>
Rhodes-Kropf and Viswanathan (2004)		

(Continued)

Table 4 (Continued)

Theories	Hypotheses	Evidence
		Betton, Eckbo, and Thorburn (2008c): There are nearly as many mixed cash-stock offers as all-stock offers, also in the recent period of high market valuations and peak merger activity (1996–2000). Mixed offers are an enigma in the model of Shleifer and Vishny (2003). The fact that the substantial market runup prior to year 2000 did not induce a greater use of all-stock offers as a proportion of all merger bids is inconsistent with the behavioral argument.

the deal. There is a carry-over of the tax basis in the target to the acquiring company, unless a 338 election is made. Under a 338 election, there is a step-up of the tax-basis of the target assets to the price paid in the takeover (Bruner, 2004). Such elections imply a capital gains tax in the target, and are used only in rare circumstances such as when there are substantial target net operating losses (NOLs) due to expire, or when the target is a subsidiary.

Given these differences in the tax treatment, there is little doubt that taxes play an important role in the bidder's choice of payment method. The more difficult empirical issue is whether the bidder in all-cash offers must pay target shareholders a compensation up front both for the realization of a potential capital gains tax penalty and for the value of the target's unused tax benefits. This depends, of course, on the relative bargaining power of the bidder and the target and is therefore transaction specific. For example, targets that have low-cost substitute ways of capitalizing on unused tax benefits will force bidders to pay for these in the deal (Gilson, Scholes, and Wolfson, 1988).

Hypothesis H1 in Table 4 holds that targets will receive higher offer premiums in all-cash bids than in all-stock offers, where the difference is compensation for the capital gains tax penalty inherent in the cash bid. Early studies that classify takeover premiums according to the payment method include Huang and Walkling (1987) and Hayn (1989) on U.S. data, and Franks, Harris, and Mayer (1988) and Eckbo and Langohr (1989) on acquisitions in the UK and France, respectively. This evidence shows that takeover premiums are indeed significantly greater in all-cash deals than in all-stock offers, which is consistent with H1. Also, Brown and Ryngaert (1991) find empirical support for their hypothesis that stocks are less likely to be found in taxable offers (offers where less than 50% of the offer is to be paid in bidder stock).

On the other hand, Franks, Harris, and Mayer (1988) show that takeover premiums in the UK were greater in cash deals even *before* the introduction of capital gains taxes. Moreover, Eckbo and Langohr (1989) argue that for a tax compensation to induce tendering behavior, it must be included in the value of the option to tender (as opposed

to keeping) the target shares. They approximate this option value with the difference between the offer price and the expected post-offer target share price, and they find that this difference is indistinguishable across all-stock and all-cash offers. They also show that the larger total premium in all-cash offers carries over to minority buyouts that convey few if any bidder tax benefits (as the two firms are already consolidated for accounting purposes). This evidence does not support the view that the larger takeover premiums observed in all-cash deals are driven by the tax hypothesis H1.

3.2.2. Information asymmetries

Hypotheses H2–H4 in Panel B of Table 4 suggest that the payment method choice may be economically important—and give rise to premium effects—even in the absence of taxes. When the bidder and target are asymmetrically informed about the true value of their respective shares, the payment method may cause information revelation and affect both the division of synergy gains and the probability that the offer is successful. Hypothesis H2 is motivated by the adverse selection argument of Myers and Majluf (1984) and the associated financing “pecking order” suggested by Myers (1984). H2 focuses on the implication for the market’s reaction to the all-stock vs. all-cash announcement: Equity issues to relatively uninformed target shareholders may cause a negative market reaction as investors hedge against the possibility that the bidder’s stock is overpriced.

There is substantial empirical evidence that seasoned equity offerings (SEO) are on average met with a negative market reaction (approximately -3%)—even when the SEOs are fully underwritten by reputable investment banks. This is consistent with the hypothesis that outside investors are somewhat nervous that the typical equity issue may be overpriced—despite the substantial due diligence effort and reputational risk exposure of underwriters. The evidence on takeovers indicates that all-equity acquisition announcements also tend to cause a statistically significant (approximately 1%) price bidder price drop when the target is a public company.⁴⁴ However, bidder announcement returns are nonnegative (or even positive) in all-stock offers for *private* targets.⁴⁵

Hansen (1987), Fishman (1989), and Eckbo, Giammarino, and Heinkel (1990) provide theoretical analyses that also incorporate adverse selection but where the bidder’s choice of payment method is modeled explicitly. An important insight of Hansen (1987) is that ex-post means of payments such as stock can increase the seller’s revenue beyond what cash payments can do.⁴⁶ This point is easily illustrated using our second-price, independent private value auction with two bidders ($v_1 > v_2$). If bidder 1 (B1) wins with

⁴⁴ Travlos (1987), Asquith, Bruner, and Mullins (1987), Servaes (1991), Brown and Ryngaert (1991), Martin (1996), Emery and Switzer (1999), Heron and Lie (2004), and Schlingemann (2004). Because the level of communication between bidder and target management teams in merger negotiations is greater than that between underwriters and the market in SEOs, the potential for adverse selection is also smaller, thus the smaller price drop in all-equity bids than in SEOs.

⁴⁵ Chang (1998), Fuller, Netter, and Stegemoller (2002), Moeller, Schlingemann, and Stulz (2004), Bradley and Sundaram (2006), Officer, Poulsen, and Stegemoller (2007). Faccio, McConnell, and Stolin (2006) find a similar positive bidder announcement effect of all-stock offers in Europe.

an all-cash offer, the target receives v_2 (the second price). Alternatively, with all-stock as the payment method, the bidder offers the target the ownership fraction z_i in the merged firm. Suppose B1 and B2 have the same stand-alone value v . The optimal bid is the fraction z_i , which satisfies

$$(v + v_i)(1 - z_i) = v \quad (5)$$

or $z_i = v_i/(v + v_i)$. This leaves each bidder with a post-acquisition value equal to the pre-acquisition (stand-alone) value. If B1 wins, the target receives

$$z_2(v + v_1) = \frac{v + v_1}{v + v_2} v_2 > v_2 \quad (6)$$

since $v_1 \geq v_2$. In other words, the all-stock offer extracts a higher revenue from the winning bidder than does the all-cash bid, resulting in more efficient sell/don't sell decisions by the target.⁴⁷

Another insight is that all-stock payment may increase the expected deal value for the bidder if there is little or no uncertainty concerning the true bidder value. Consider a single bidder B who has all the bargaining power. Denote B's with-synergy value as $v_B \equiv v + v_i$. Assume that v_B is known to everyone and that B only knows the probability distribution over the true target value, $v_T \in [\underline{v}_T, \bar{v}_T]$, where $\underline{v}_T < \bar{v}_T$. Moreover, suppose B's strategy is to ensure bid success.⁴⁸ The all-cash offer is therefore $c = \bar{v}_T$. This means that B expects to overpay for the target by the amount $\bar{v}_T - E(v_T | \text{accept})$, where the expectation is conditional on the target accepting the bid. The corresponding all-stock offer solves $z(v_B + \bar{v}_T) = \bar{v}_T$, or $z = \bar{v}_T/(v_B + \bar{v}_T)$. The expected overpayment cost is now

$$z[v_B + E(v_T | \text{accept})] - E(v_T | \text{accept}) = \frac{v_B}{v_B + \bar{v}_T} [\bar{v}_T - E(v_T | \text{accept})] \quad (7)$$

Since $v_B/(v_B + \bar{v}_T) < 1$, the expected overpayment cost of securities is less than that of cash, reflecting the contingent nature of stock as payment form (payment in shares causes the target to share in the overpayment ex-post). Cash, on the other hand, precommits the bidder to a target value ex ante.

If we also allow v_B to be private information (two-sided information asymmetry), then the above preference for a stock offer is reversed provided the bidder shares are sufficiently undervalued by the target. With two-sided information asymmetry, let \hat{v}_B denote target beliefs about bidder value. In this case, the all-stock offer which guarantees

⁴⁶ See also Hansen (1985) and DeMarzo, Kremer, and Skrzypacz (2005), and Dasgupta and Hansen (2007) for a review.

⁴⁷ In Fishman (1989), the alternative to cash is a debt instrument secured in the target's asset. This also eliminates target uncertainty about the true value of the bidder's payment for all-security offers and leads to efficient target accept/reject decisions.

⁴⁸ This bid strategy is maintained in the model of Eckbo, Giammarino, and Heinkel (1990). In Hansen (1987), high-value bidders separate themselves by lowering their all-stock offers z , which is costly as it reduces the probability that the target will accept. The signaling cost is the reduction in the bidder's expected synergy gains from a reduction in z .

success solves $z(\hat{v}_B + \bar{v}_T) = \bar{v}_T$, and the difference between the expected overpayment cost of an all-stock and an all-cash offer becomes

$$\bar{v}_T \frac{(v_B - \hat{v}_B) - (\bar{v}_T - E(v_T | \text{accept}))}{v_B + E(v_T | \text{accept})} \quad (8)$$

which is positive or negative depending on whether the target undervalues ($v_B - \hat{v}_B > 0$) or overvalues ($v_B - \hat{v}_B < 0$) the bidder shares, respectively. Consistent with this, Chemmanur and Paeglis (2003) find that the probability of a stock offer falls when measures of bidder share underpricing increase.

As discussed earlier (see Figure 7), mixed cash-stock offers are pervasive across the entire sample period. Eckbo, Giammarino, and Heinkel (1990) and Berkovitch and Narayanan (1990) model equilibrium mixed offers.⁴⁹ In the separating equilibrium of Eckbo, Giammarino, and Heinkel (1990), bidder types are separated by the fraction of the total target payment that is paid in cash. Consistent with a separating equilibrium, Eckbo, Giammarino, and Heinkel (1990) and Eckbo and Thorburn (2000) find that abnormal announcement returns are, on average, highest in all-cash offers and lowest in all-stock deals, with mixed offers in between.⁵⁰

Eckbo, Giammarino, and Heinkel (1990) present cross-sectional regressions tests of their signaling model. To illustrate, let γ_j denote the announcement-induced bidder abnormal return. The separating equilibrium implies that

$$\gamma_j = h_j \left(\frac{c_j}{v_T} \right), \quad h'_j, h''_j > 0, \quad (9)$$

where c_j is the cash payment, v_T is the average pre-bid target value, and the superscripts h'_j and h''_j denote first and second derivatives, respectively. That is, in the separating equilibrium, the market reaction to the takeover announcement is an increasing and convex function of the cash portion of the deal. The cross-sectional regression tests confirm the “increasing” part, but fails to identify a significant second derivative (convexity). Additional empirical tests are required to sort out why convexity fails.

3.2.3. Capital structure and control motives

Under hypothesis H5 in Panel C of Table 4, the payment method is selected as part of a broader capital structure choice. Moreover, some bidder managements select cash over stock to avoid diluting private benefits of control. Attempts to link the payment method choice to financing sources for the cash portion of the bid are only starting to emerge. For example, Yook (2003) finds greater bidder gains in all-cash offers when the takeover causes downgrading of the merged firm’s debt (due to increased leverage). He interprets this as consistent with the free-cash flow argument of Jensen (1986).

⁴⁹ In Hansen (1987) and Fishman (1989), bidders select between all-stock and all-cash offers but do not mix the two.

⁵⁰ These two studies use mergers in Canada where offering less than 50% of the deal in cash does not trigger capital gains taxes. In the United States, the tax code confounds the analysis as it in of itself discourages mixed offers where the cash portion exceeds 50% (Brown and Ryngaert, 1991).

Schlingemann (2004) and Toffanin (2005) examine whether the market reaction to the payment method choice is a function of the type of cash financing. While the market is aware of any pre-bid public security issues, the acquisition bid announcement possibly resolves uncertainty regarding use of the issue proceeds. If this resolution is economically important, the source of financing for the cash portion of the bid will affect the market reaction to the takeover attempt. The empirical results indicate a prior-cash-financing-source component in acquisition announcement returns.

Schlingemann (2004) reports that, after controlling for the form of payment, financing decisions during the year before a takeover play an important role in explaining the cross section of bidder gains. Bidder announcement period abnormal returns are positively and significantly related to the amount of ex-ante equity financing. This relation is particularly strong for high q firms. He further reports a negative and significant relation between bidder gains and free cash flow. This relation is particularly strong for firms classified as having poor investment opportunities. The amount of debt financing before a takeover announcement is not significantly related to bidder gains. Interestingly, Toffanin (2005) finds that the well-known positive market reaction to all-cash bids requires the cash to have been financed either using internal funds (retained earnings) or borrowing. All-cash acquisitions financed by a prior equity issue earn zero or negative abnormal returns.

Early theories incorporating private benefits of control in the contexts of takeovers and capital structure choice are Stulz (1988) and Harris and Raviv (1988). In our context, an all-cash offer preserves the bidder's control position, while an all-stock offer may significantly dilute this position (e.g., a merger of equals). The potential for control dilution may therefore drive the use of cash. Several empirical papers examine the payment method choice from this angle. For example, Amihud, Lev, and Travlos (1990), Martin (1996), and Ghosh and Ruland (1998) all find that bidder management shareholdings in the United States have negative effects on stock financing. Similarly, studying European mergers, Faccio and Masulis (2005) find that corporate control incentives to choose cash are particularly strong in bidder firms with relatively concentrated shareownership structures. Overall, corporate control motives are likely to play a role in some all-cash mergers. Martynova and Renneboog (2006), who also examine acquisitions in Europe, find a link between the quality of a country's corporate governance system and the market reaction to stock as payment form. All-stock offers are more likely in countries with greater levels of shareholder rights protection.

3.2.4. Behavioral arguments for all-stock

The hypothesis here is that bidders are able to sell overpriced stock to less overpriced targets (H6). We discussed this hypothesis in Section 2.1 on merger waves and so will provide only a summary here. In the model of Shleifer and Vishny (2003), bidders succeed in selling overpriced stock to target managers with a short time horizon. In Rhodes-Kropf and Viswanathan (2004), bidders succeed as targets (rationally) accept more bids from overvalued bidders during market valuation peaks because they tend to overestimate synergies during these periods. Empirically, the propensity to select all-stock offers increases with M/B ratios. If one views the M/B ratio as a proxy for stock overvaluation, then

this empirical regularity supports the behavioral argument for all-stock selections.⁵¹ On the other hand, Harford (2005) finds that a macroeconomic measure of capital liquidity (interest rate spreads) drives merger activity and drives out M/B as a predictor of merger activity. This finding reduces the likelihood that market overvaluation systematically drives the bidder's selection of all-stock as the payment method.

Earlier we reported that there are nearly as many mixed cash-stock offers as all-stock offers, even in the recent period of high market valuations and peak merger activity (1996–2000). Because mixing cash and stock increases the ability of undervalued bidders to separate out from the pool of overvalued bidders (Eckbo, Giammarino, and Heinkel, 1990), the substantial presence of mixed offers undermines the pooling equilibrium of Shleifer and Vishny (2003). Also, our finding in Figure 7 that the substantial market runup prior to year 2000 did not induce greater use of all-stock offers as a proportion of all merger bids further undermines the behavioral argument. In sum, while some bidders undoubtedly get away with selling overpriced stock to their targets, additional research is needed to systematically contrast behavioral to rational theories of the payment method choice in takeovers.

3.3. Toehold bidding

In this section, we first discuss optimal bids when the initial bidder has a toehold and has also negotiated a termination agreement. We then review the empirical evidence on toehold bidding.

3.3.1. Optimal bids

We use a standard auction setting with two risk-neutral bidders. The bidders have private valuations that are independent and identical distributed (i.i.d.) with distribution and density functions $G(v)$ and $g(v)$, respectively. The initial bidder (B1) has toehold $\alpha \in [0, 0.5)$ acquired at the normalized pre-takeover target share price of zero. B1 has negotiated a merger agreement with the target management that includes a termination fee $t \in (0, v)$. A rival bidder (B2) challenges the agreement and forces an open auction. The termination fee is paid by B2 if B2 wins, or by the target if neither B1 nor B2 wins (the target remains independent). The no-bidder-wins outcome occurs with an exogenous probability θ .⁵²

Since the termination fee represents a claim of t on the target, the fee reduces B2's private valuation to $v_2 - t$. B2's optimal bid is therefore $b_2^* = v_2 - t$: bidding less risks foregoing a profitable takeover, while bidding more risks overpaying for the target. Given

⁵¹ Rhodes-Kropf, Robinson, and Viswanathan (2005), Ang and Cheng (2006), Dong, Hirshleifer, Richardson, and Teoh (2006).

⁵² The probability θ captures exogenous factors that may derail merger negotiations or cause all bidders to abandon a takeover auction. For example, the market may revise upwards its estimate of the target's stand-alone value during the contest, causing the takeover to be unprofitable for both B1 and B2. Betton, Eckbo, and Thorburn (2007) reports that close to 30% of takeover contests end up in the no-bidder-wins state. This issue is discussed further below.

B2's optimal bid, and noting that the net termination fee paid to B1 if B2 wins is $(1 - \alpha)t$, B1's expected profits from bidding b is

$$E(\Pi) = \{(v)G(b + t) - (1 - \alpha) \int_t^{b+t} (v_2 - t)g(v_2)dv_2 + (t + \alpha b)[1 - G(b + t)]\}(1 - \theta) + t(1 - \alpha)\theta \quad (10)$$

The right-hand side is the sum of four components. The first three (inside the curly bracket) are, respectively, B1's expected private value, the expected payment for the target, and the expected value from selling the toehold α and receiving t when B2 wins the auction. The fourth term is the expected payoff when no bidder wins. Using Equation (10), the first-order condition for profit maximization, $\partial E(\Pi)/\partial b = 0$, implies an optimal bid for B1 of⁵³

$$b_1^* = v_1 - t + \alpha h(b_1^*) \quad (11)$$

where $h(b_1^*) \equiv \frac{1 - G(b_1^*)}{g(b_1^*)}$. Notice the following from Equation (11):

- The toehold induces overbidding, that is, a bid greater than the private valuation v_1 . This means that B1 may win even if B2 is the higher-valuation bidder (when $v_1 < v_2 < b_1^*$).
- The effect of the termination fee is to induce underbidding. For example, a bidder with zero toehold and a termination agreement walks away from the target when rival bids exceed $v_1 - t$ (quitting means receiving t while continued bidding implies an expected profit of less than t).
- Since B1's optimal bid is increasing in the toehold, the probability that B1 wins the auction is also increasing in the toehold. This gives economic content to the frequently heard notion among practitioners that toehold bidding is "aggressive" toward the target.
- When $\alpha = 1$, the optimal bid b_1^* is equivalent to the optimal reserve price by a monopolist seller in a take-it-or-leave-it offer (Eckbo and Thorburn, 2008b).

Bulow, Huang, and Klemperer (1999) and Dasgupta and Tsui (2003) examine toehold bidding in a pure common-value setting where both B1 and B2 have toeholds but of unequal size (asymmetric toeholds). Toehold bidding also induces overbidding in a common-value setting, and these researchers show that holding B1's toehold constant, B2's probability of winning goes to zero as B2's toehold becomes arbitrarily small. Even small differences in toeholds can produce significant benefits for the bidder with the greater toehold. Moreover, the expected winning sales price is decreasing in the difference between the toeholds of B1 and B2. This suggests an incentive on the part of the target to sell a toehold to B2—and for B2 to purchase a toehold—in order to even the playing field. Consistent with this, Betton and Eckbo (2000) find that when a rival bidder enters a takeover contest with a toehold, the toehold size is on average roughly the same size as that of the initial bidder (approximately 5%).

⁵³ To ensure uniqueness, $G(v)$ must be twice continuously differentiable and satisfy the monotonicity condition $\partial(1 - G(v))/\partial g(v) \geq 0$.

3.3.2. *The toehold puzzle*

A priori, there is a compelling case for acquiring a toehold prior to initiating a takeover bid. The toehold not only reduces the number of shares that must be purchased at the full takeover premium, but it may also be sold at an even greater premium should a rival bidder enter the contest and win the target. This expected toehold gain raises the bidder's valuation of the target, which in turn helps overcome free-rider problems and makes the toehold bidder a more aggressive competitor in the presence of rivals. Early empirical research supports the existence of toehold benefits. Walkling (1985), Jennings and Mazzeo (1993), and Betton and Eckbo (2000) show that toehold bidding increases the probability of winning the target. Consistent with entry deterrence effects of toeholds, Betton and Eckbo (2000) also find that toeholds are associated with lower offer premiums in winning bids.

However, toehold bidding has in fact been declining dramatically over the past two decades and is now surprisingly rare. This decline is apparent in Figure 8, which plots toehold data from Betton, Eckbo, and Thorburn (2007). The toeholds in Figure 8 include target shares held by the bidder long term as well as shares purchased within six months of the actual offer date (short-term toeholds). Betton, Eckbo, and Thorburn (2007) report a sample-wide toehold frequency of 13%. Moreover, the sample-wide frequency of short-term toeholds—defined as target shares purchased within six months of the offer—is only 2%. In sum, toehold benefits notwithstanding, toeholds acquired as part of an active bidding strategy are almost nonexistent.

Presumably, rational bidders avoid toeholds as a response to large toehold costs. Several potential sources of toehold costs have been suggested in the literature, ranging from mandatory information disclosure and market illiquidity to costs associated with target management resistance to the takeover. Consider first the argument that mandatory disclosure rules make toeholds too costly because they reveal the bidder's intentions early in the takeover process. As discussed above, toehold purchases of 5% or more have triggered mandatory disclosure requirements (13d filings with the SEC) since the 1968 Williams Act. Also, under the 1976 Hart-Scott-Rodino Antitrust Improvements Act, share acquisitions exceeding a certain threshold (\$60 million in 2007) trigger notification to the antitrust agencies.

As shown in Figure 8, however, toehold bidding was relatively common in the early 1980s. The passage of disclosure rules in the 1970s cannot explain this time-series pattern. Also, the decline in toehold bidding has occurred despite a steady increase in market liquidity over the entire sample period.⁵⁴ Furthermore, Betton, Eckbo, and Thorburn (2007) report that the average toehold size (when positive) is as large as 20%, and 13% for short-term toeholds. It is difficult to explain the observed bimodal toehold distribution (centered on either zero or large toeholds) by appealing to general market illiquidity.

⁵⁴ Small toeholds, for which concerns with liquidity and disclosure are unimportant, can also have significant investment value as they retain many of the strategic benefits of larger ones. Toehold benefits arise as long as the toehold is greater than that of the rival bidder (Bulow, Huang, and Klemperer, 1999; Dasgupta and Tsui, 2004).

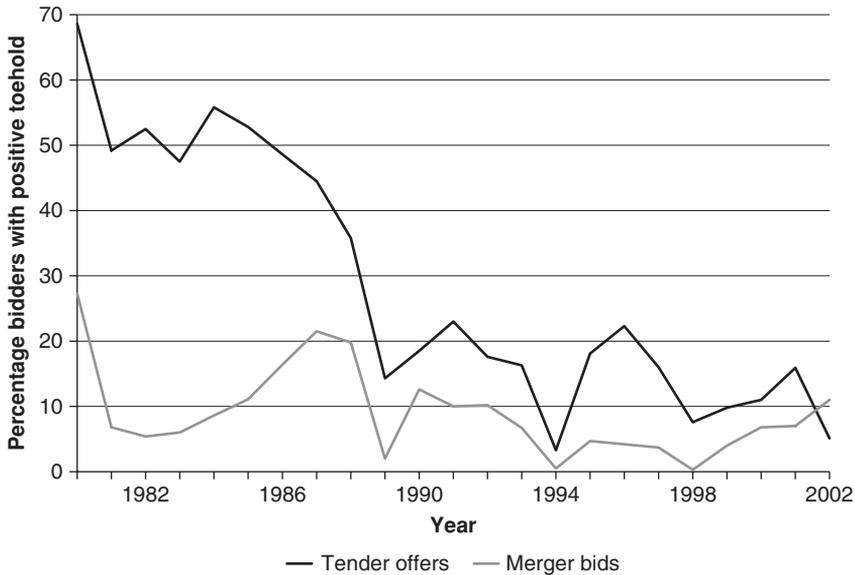


Fig. 8. Annual percentage of initial control bidders with a positive toehold in the target, classified by the type of the initial bid. U.S. public targets. Data source: Betton, Eckbo, and Thorburn (2007).

Goldman and Qian (2005) point to a toehold cost when entrenched target management successfully thwarts the takeover bid. In their model, entrenched target managements may resist a bidder in order to retain the private benefits of control. The degree of target entrenchment is unknown *ex ante* and, in equilibrium, is signaled *ex-post* through the size of the bidder's toehold in successfully resisted offers. Successful resistance causes the target share price to drop, and the price drop is greater the greater the bidder's toehold. Bidders trade off expected toehold benefits (greater success probability) with expected toehold costs (greater target price decline when the bid fails), causing some bidders to select small or even zero toeholds. However, the evidence in Betton, Eckbo, and Thorburn (2007) rejects the predicted negative correlation between the sizes of bidder toeholds and target price declines conditional on all bids failing. The potential for a toehold loss in the event that all bids fail following target resistance does not appear to explain the toehold puzzle.

Betton, Eckbo, and Thorburn (2007) develop and test a model in which toehold costs arise endogenously. The takeover game starts with the initial bidder approaching the target with an invitation to negotiate a merger. In line with the fiduciary out requirement discussed earlier, a merger agreement is always followed by a period during which the target board is required to consider any rival bids (until the shareholder vote). The expected outcome of this open auction period determines the outcome of merger negotiations. Since a toehold affects the expected auction outcome (recall the optimal bid in Equation (11)), it also affects the willingness of entrenched target managements to

accept the bidder's invitation to negotiate. If the target management rejects negotiations, the bidder foregoes the benefit of the termination agreement and incurs resistance costs during the takeover process.

These toehold-induced bidder costs make it optimal for some bidders to approach the target without a toehold. That is, the expected toehold cost creates a *toehold threshold* (a minimum toehold size), below which the optimal toehold is zero. Betton, Eckbo, and Thorburn (2007) show that the toehold threshold averages 9% in the data, which is consistent with the observed bimodal distribution of observed toeholds (centered on zero or large toeholds). That is, some bidders find that the toehold threshold is too costly to purchase in the market (e.g., due to market illiquidity) and select zero toehold. The key model prediction is that the likelihood of toehold bidding decreases in the toehold threshold estimate (the expected opportunity loss of the termination agreement), which the empirical evidence supports.

The threshold model is also consistent with another stylized fact: toeholds are much more common in hostile than in friendly takeovers. While 11% of initial bidders have toehold when the target is friendly, 50% of the initial bidders in hostile contests have toeholds. The threshold theory suggests that one should observe toehold bidding when the opportunity cost of the toehold is relatively low. A special case is when the opportunity cost is *zero*, which occurs whenever the target's optimal resistance strategy is independent of the toehold. That is, if target management is expected to resist regardless of toeholds, acquiring a toehold is always optimal.⁵⁵ Thus, the toehold threshold model predicts a higher toehold frequency in hostile bids, and it is consistent with the observed decline in the frequency of toehold bidding over the 1990s (Figure 8). This decline coincides with a general reduction in hostile bids due to a widespread adoption of strong takeover defenses such as poison pills.

Finally, in the absence of synergistic opportunities with the target ($v = 0$), the owner of a toehold may contemplate making a (false) bid in an attempt to put the target in play. The idea is to try to sell the toehold to a potential rival bidder or (anonymously) to an unwitting market anticipating a successful takeover. Bagnoli and Lipman (1996) present a model with a single bidder selling the toehold shares to individual noise traders through a market maker before calling off the takeover bid. While charges of price manipulation go back at least to the greenmail episodes of the late 1970s, systematic empirical evidence on the feasibility of this type of price manipulation is virtually nonexistent. The context of hostile bids is potentially interesting since hostility may induce the target to produce a white knight committed to purchase the toehold.

3.4. Bid jumps and markup pricing

In this section we examine evidence on the size of bid jumps in multiple-bid contests and investigate how pre-bid target runups affect the initial and final offer prices. Also,

⁵⁵ Similarly, toehold bidding occurs when the target's optimal strategy is to never resist.

an interesting question is whether target runups and markup pricing deter toehold acquisitions by the initial bidder.

3.4.1. Preemption and bid jumps

As indicated earlier, the high premiums observed in takeovers are consistent with the hypothesis that takeover benefits are partly common to several potential bidders. This is likely when takeover benefits emanate, for example, from replacing inefficient target management or using voting control to extract value from ex-post minority shareholders in the merged firm. These and other forms of bidder–target complementarities often do not require specialized resources owned by a single potential bidder firm. As a result, the first bidder is concerned that the initial bid will alert potential rivals to a profit opportunity. The empirical issue is whether this possibility affects observed bid strategies.

Fishman (1988) analyzes this issue assuming that bidders must pay an investigation cost to identify their respective private valuations of the target. If both bidders enter (so that both investigation costs are sunk), an open English auction with costless bidding ensues and produces the “ratchet” solution $\min[v_1, v_2]$ (Hirshleifer, 1995). However, there exists an initial bid that deters the second bidder from paying the investigation cost and entering the auction. The high initial (all-cash) bid signals that the initial bidder has a relatively high private valuation for the target, which reduces rival bidders’ expected value of winning. For a sufficiently large investigation cost, the expected value is negative and the rival does not enter.

Testing preemption arguments is difficult since one obviously cannot observe deterred bids nor bidder private valuations in observed bids. One must look to auxiliary or related predictions, and the following four categories of results seem relevant. First, entry is rapid when it occurs: the average number of trading days between the first and second control bid is 40 in our sample (Figure 6) and 15 days in Betton and Eckbo (2000). This suggests that the rival bidder’s investigation process required to establish its own valuation of the target is not very time-consuming in these cases. Also, some rivals may have completed much of the evaluation prior to the initial bid. Observing the initial bid event may produce a sufficient target valuation estimate to make a bid.

Second, auction outcomes are sensitive to bidder asymmetries. One important form of bidder asymmetry is the size of bidder toeholds. Even small toehold differences can have a large impact on entry and competition. Empirically, Betton and Eckbo (2000) find that when a rival bidder enters a takeover contest with a positive toehold, the toehold size is on average of roughly the same size as that of the initial bidder (approximately 5%). It is as if the rival bidder realizes the initial bidder’s toehold advantage and wants to neutralize it upon entry.

Third, both Betton and Eckbo (2000) and Betton, Eckbo, and Thorburn (2007) report that the average offer premium in single-bidder successful tender offer contests (the first node in Figure 2) is slightly higher than the average *initial* offer premium in contests that developed into multiple bids. This is consistent with the argument that the premiums in single-bid successful contests are preemptive in the sense of Fishman (1988). However,

the premium effect is weak: the probability of rival bidder entry appears unaffected by the initial offer premium (Betton, Eckbo, and Thorburn, 2008b).

Fourth, Betton and Eckbo (2000) report evidence of significant bid jumps throughout the tender offer contests. For example, the average jump from the initial to the second bid price in the contest is 10%, implying a 31% change in the initial offer premium. The jump from the first to the final bid average 14% (a 65% revision in the initial offer premium), and the average bid jump throughout the entire contest, is 5% (average premium increments of 17%). The evidence of significant bid jumps throughout the contest is consistent with the presence of bidding costs. This in turn supports the notion in Fishman (1988) that initial bidders may strategically raise the first bid in an attempt to deter competition.⁵⁶

3.4.2. *Runups and markups*

We now turn to the markup pricing phenomenon first documented by Schwert (1996). Initial takeover bids are typically preceded by substantial target stock price runups. The runup reflects takeover rumors generated from various public sources, such as Schedule 13(d) filings with SEC disclosing stake purchases of 5% or more in the target, media speculations, and street talk. The conventional view is that runups reflect takeover rumors based on information that is already known to the bidder.⁵⁷ If this view is correct, the runup anticipates an already planned offer premium and does not require a premium revision before the offer is made.

This is not the only possible scenario, however. Schwert (1996) begins his paper with the following question:

Suppose that you are planning to bid for control of a company and, before you can announce the offer, the price of the target firm's stock begins to rise coincident with unusually high trading volume. You have not been buying the target company's stock, and there is no reliable evidence to show who has been buying. Do you go forward with the offer exactly as you had planned? Or do you take into account the recent movement in the target's stock price and adjust your bidding strategy? (pp. 153–154).

Bidders need a plan for how to react to the runup before making the initial bid. Moreover, such a plan requires an understanding of the true nature of the pre-bid target runup. For example, it is possible that the target runup represents an increase in the target's fundamental (stand-alone) value, in which case the target management may demand a higher price. If so, the bidder may be forced to mark up the offer price to reflect the higher target stock price on the day before the offer is made.

To examine the extent of markup pricing, Schwert (1996) writes the total offer premium as $Premium \equiv Markup + Runup$, where *Runup* is the cumulative target abnormal stock return from day -42 through day -1 relative to the first bid for the

⁵⁶ See also Hirshleifer and Ping (1990) and Daniel and Hirshleifer (2008) for discussions of the implication of bidding costs for optimal bidding strategies.

⁵⁷ Jarrell and Poulsen (1989) and King and Padalko (2005) conclude that runups are primarily a result of public information. Meulbroek (1992) and Schwert (1996) find greater target runups in cases where the SEC subsequently alleges insider trading.

target (day 0), and *Markup* is the cumulative abnormal target stock return from day 0 through day 126 (or until delisting, whatever comes first). He then estimates the coefficient b in the following cross-sectional regression:

$$\text{Premium}_i = a + b\text{Runup}_i + u_i \quad (12)$$

where u is an error term. With a sample of 1,814 mergers and tender offers from the period 1975–1991, Schwert finds a statistically significant $b = 1.13$ for the total sample (with a t -value of 2.88 for the null hypothesis of $b = 1$). In other words, in the total sample, a dollar runup in the target stock price raises the total offer premium by approximately a dollar. Under the more conventional view of the runup, *Markup* and *Runup* are substitutes (predicting $b = 0$ in regression (12)), which Schwert's evidence rejects.

Swert's estimate of the markup is impacted by events occurring *after* the initial offer, such as the entry of rival bidders and bid revisions by the initial bidder, target management resistance, and ultimate target shareholder voting outcomes. Betton, Eckbo, and Thorburn (2008b) use the initial offer price p_{initial} to measure the initial markup directly as $\text{Markup} = \ln(p_{\text{initial}}/p_{-1})$, where p_{-1} is the target share price on the day prior to the initial bid. The runup is measured as $\text{Runup} = \ln(p_{-1}/p_{-42})$. With a sample of six thousand initial takeover bids for U.S. public targets from the period 1980–2002, they estimate the coefficient b' in the following regression,

$$\text{Markup}_i = a' + b'\text{Runup}_i + cX + u_i \quad (13)$$

where X is a set of bidder- and target-specific deal characteristics. Betton, Eckbo, and Thorburn find that $b' = -0.18$ for the total sample (t -value of -15.44). Thus, in the cross section of bids, a dollar increase in the target runup is associated with an increase in the average initial offer price by \$0.82.⁵⁸ They also show that the degree of substitution between the markup and the runup is greater when the bidder purchases a target toehold in the runup period, and they conclude that target runups are an unlikely explanation for the sparsity of toehold purchases by initial bidders in the runup period.

Is markup pricing costly in the sense of reducing bidder synergies? To examine this issue, Betton, Eckbo, and Thorburn (2008b) estimate the following cross-sectional regression with bidder takeover-induced abnormal stock returns, BCAR, as dependent variable:

$$\text{BCAR}_i = a_b + b_b\text{Runup}_i + c_bX_i + u_i \quad (14)$$

where *Runup* is the *target* runup (as before). The coefficient b_b is positive and highly significant in a sample exceeding 4,000 public bidders. That is, greater target runups are simultaneously associated with markup pricing and greater bidder synergies from the takeover.

Since target synergies are also (obviously) increasing in target runups, the positive estimate of b_b means that the runup is a proxy for *total* synergies in the cross section.

⁵⁸ If one changes the dependent variable in Equation (13) to the total initial offer premium premium, $\ln(p_{\text{initial}}/p_{-42})$, the slope coefficient changes to $1 + b' = 0.82$.

This finding affects the interpretation of the coefficients b and b' in Equations (12) and (13). To illustrate, suppose takeover rumors allow market investors to not only identify the target but also to distinguish targets with high and low expected total synergies. Moreover, suppose competition always forces bidders to grant target shareholders (in the form of a takeover premium) a fixed portion of the total synergies. Bidders expecting the takeover to be profitable now also expect a high pre-bid runup, and mark up the initial offer price ex ante (before the runup). This also produces a markup that is independent of the runup ex-post ($b = 1$), although there are no actual bid revisions following the runup. Ultimately, distinguishing between this total synergy hypothesis and Schwert (1996)'s ex-post markup proposition requires evidence on actual offer price changes made by the initial bidder during the runup period. However, either scenario is consistent with a positive association with target runups and bidder takeover gains.

3.5. Takeover defenses

In this section, we briefly characterize the legal basis for target takeover defenses, and then we examine the empirical evidence on the shareholder wealth effects of antitakeover measures, in particular poison pills, classified boards, and defensive payouts (greenmail). Figure 9 shows the annual frequency of the sample of 1,052 unfriendly (unsolicited and outright hostile) initial bids previously listed in Table 1.

Since target hostility may simply represent posturing to improve the target's bargaining position, several definitions of hostility exist (Schwert, 2000). The SDC definition probably casts a relatively wide net, as all it ensures is that (1) the bidder (and not the target) initiates the takeover and (2) the target board is initially unprepared and/or unwilling to enter into merger negotiations. Specifically, the SDC classification does *not* necessarily mean that the target is dead set against negotiations, nor does it mean that it is going to implement defensive tactics. However, target defensive actions are more likely in this sample than in cases where initial bids are classified by SDC as solicited or friendly. Notice also that the SDC definition allows a hostile initial bid to be in the form of either a merger or a tender offer (although, as shown in Figure 9, unfriendly initial bids are typically in the form of a tender offer). An example of an initially hostile merger bid is a "bear hug," in which the bidder invites the target to negotiate while reminding the target board that the bidder is likely to pursue a tender offer should the board refuse negotiations.

As shown in Figure 9, the fraction of bids that are unfriendly is relatively high throughout the 1980s and then drops sharply after 1989. Comment and Schwert (1995) analyze the drop in hostility, which is closely associated with the spread of takeover defenses and the development of state antitakeover statutes (control share and business combinations laws). Given this close association, it is natural to view the drop as being caused by increased managerial entrenchment afforded by strong takeover defenses. Comment and Schwert (1995), however, argue that the emergence of takeover defenses played only

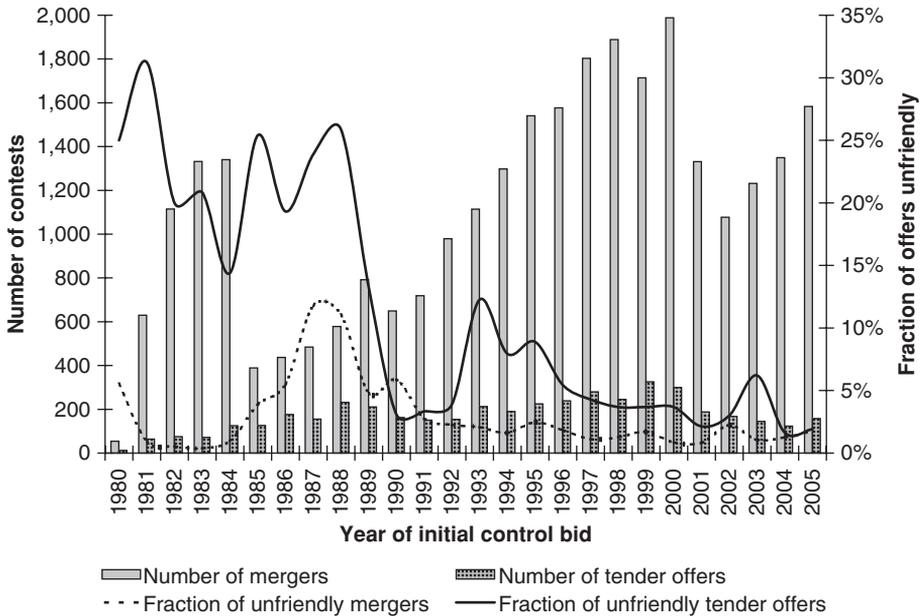


Fig. 9. Target attitude toward the initial control bidder in mergers and tender offers. The attitude is shown as “unfriendly” ($N = 1,025$) if the SDC lists the offer as either “hostile” or “unsolicited.” All other offers are shown as “friendly” ($N = 34,702$). U.S. targets, 1980–2005.

a minor role in ending the 1980s merger wave. They point instead to the development of a general economic recession beginning in 1989, which caused a collapse in net new lending to the nonfinancial sector by commercial banks from \$33 billion in 1989 to \$2 billion in 1990. Commercial banks were the dominant providers of bridge or transaction financing for large, cash acquisitions at the time. Takeover activity was also generally reduced as a result of a drop in the availability of long-term and subordinated financing, in part due to government intervention in the junk bonds in 1989.⁵⁹

While the overall credit crunch undoubtedly slowed the economy and reduced takeover activity, there is also little doubt that the sharp reduction in *unfriendly* takeovers in large part reflects the legal certification and spread of strong antitakeover measures. Indeed, Jensen (1993) argues that the regulatory attack on the junk bond market around 1989

⁵⁹ “In August 1989, Congress passed the Financial Institutions Reform, Recovery and Enforcement Act (FIRREA), which penalized savings and loans for holding junk bonds and mandated their sale, while regulators issued guidelines barring commercial bank participation in highly leveraged transactions (including all acquisition loans that raised liabilities to 75% of assets, or doubled the debt ratio while raising it to 50% of assets). The junk bond market crashed in September 1989” (Comment and Schwert, 1995, p. 9).

in of itself may be understood as a broadly organized defensive tactic against unwanted takeovers.⁶⁰ While the combination of a poison pill and staggered board is not viewed as a draconian defense in the eyes of the law (see below), there can be no question that these measures when used in combination effectively bar or seriously delay a hostile bid. As discussed in the following, however, the overall degree of deterrence remains unclear from the empirical literature.

3.5.1. *Legal basis for defensive measures*

In this section, we summarize certain aspects of the highly complex case law governing takeover defenses.⁶¹ We focus on Delaware case law since a majority of U.S. public companies (and more than 60% of the Fortune 500 firms) are incorporated in the state of Delaware.

Delaware case law sanctions the right of a board to “just say no” to an unsolicited takeover bid and to defend itself against that bid if necessary to remain an independent corporation. The case law rests on director fiduciary duties and the judicially developed principle referred to as the business judgement rule. Director fiduciary duties include duty of care and duty of loyalty. Duty of care is typically satisfied as long as the board examines fairness opinions of a bid and spends a minimum amount of board time discussing the value of the proposed deal.⁶² Duty of loyalty is typically satisfied as long as the proposed deal does not imply a personal benefit for directors. Moreover, the presence of a majority of independent directors is viewed as a strong indication of the satisfaction of duty of loyalty.

The business judgment rule presumes, when director action is challenged, that the director of a corporation acted on an informed basis, in good faith, and in the best interest of the company. If the board is found to have acted this way, a court will not substitute its judgment for that of the board, and the court is inclined to find some rational purpose for the board action. In the context of a takeover bid, the board may determine in good faith that the continuing independence of the corporation is in the long-term best interests of the corporation and its stockholders. The board “is under no obligation, in

⁶⁰ The critical view many business leaders had of the junk bond market is illustrated by the sentiment expressed by J. Richard Munro, chairman and CEO of Time, Inc., in a speech in 1989: “Notwithstanding television ads to the contrary, junk bonds are designed as the currency of ‘casino economics’ . . . they’ve been used not to create new plants or jobs or products but to do the opposite: to dismantle existing companies so the players can make their profit. This isn’t the Seventh Cavalry coming to the rescue. It’s a scalping party” (Munro, 1989, p. 472).

⁶¹ We have benefited greatly from conversations with John G. Gorman, partner in the law firm Luse Gorman Pomerenk & Shtik, P.C. (Washington D.C.). For comprehensive reviews of federal and state rules governing corporate control changes, see, for example, Wasserstein (2000), Lipton and Steinberger (2004), and Gaughan (2007).

⁶² The standard for determining breach of the duty of care is generally considered to be gross negligence. *Smith v. Van Gorkam*, 488 A.2d 858 (Del. 1985).

the abstract, to submit to an external summons to the auction block or otherwise transfer control of corporate assets.”⁶³

A board may even be legally required to oppose an offer that it believes is not in the best interest of the corporation and its stockholders.⁶⁴ The board is not obligated to accept an offer simply because it represents a premium over a current market price. Refusal of such an offer is not *prima facie* evidence of a breach of fiduciary duty,⁶⁵ *except* when a sale of control of the corporation has been decided. If a determination is made to enter into a sale of control transaction, the fiduciary duties of the directors are enhanced and the directors have an obligation to seek the transaction offering the best value (which may mean highest price) reasonably available to stockholders — the so-called Revlon-duties.⁶⁶

Case law sanctions a wide range of target defensive mechanisms against an unsolicited bid. However, the courts have noted that given the “omnipresent-specter that a board may be acting primarily in its own interests, there is an enhanced duty which calls for judicial examination at the threshold before the protections of the business judgment rule may be conferred.”⁶⁷ This modified business judgment rule requires that the board initially establishes that (i) it had reasonable grounds for believing there was a danger to corporate policy and effectiveness, and (ii) the measure adopted in response to the threat was reasonable in relation to the threat posed.⁶⁸

If the board’s defensive response is not draconian (i.e., it is neither coercive nor preclusive) but within the range of reasonableness given the perceived threat, the board is protected by the modified business judgment rule. The following excerpt from the *Unitrin* decision, the leading case on a board of directors’ ability to use defensive measures to prevent a hostile takeover, illustrates the court’s mind-set:⁶⁹

Proper and proportionate defensive responses are intended and permitted to thwart perceived threats. When a corporation is not for sale, the board of directors is the defender of the metaphorical medieval corporate bastion and the protector of the corporation’s shareholders. The fact that a defensive action must not be coercive or preclusive does not prevent a board from responding defensively before a bidder is at the corporate gate Thus, continuing with the medieval metaphor, if a board reasonably

⁶³ *Paramount Communications, Inc. v. Time, Inc.*, 571 A.2d 1140 (Del. 1990).

⁶⁴ *Gilbert v. El Paso Co.*, 575 A.2d 1131 (Del. 1990).

⁶⁵ *Pogostin v. Rice*, 480 A.2d 619 (Del. 1984).

⁶⁶ See *Revlon, Inc. v. MacAndrews and Forbes Holdings, Inc.*, 506 A.2d 182 (Del. 1986), and *Paramount Communications, Inc. v. QVC Network, Inc.*, 637 A.2d 34 (Del. 1994).

⁶⁷ *Unocal Corp. v. Mesa Petroleum Co.*, 493 A.2d 946 (Del. 1985).

⁶⁸ The burden of proving reasonable grounds as to the danger to corporate policy and effectiveness can be met by showing good faith and reasonable investigation. A board’s ability to show the reasonableness of the response adopted is enhanced when a majority of the board consists of outside, independent directors, or when the actions taken precede an actual threatened change in control. An “inadequate” offer price can be a reasonably perceived threat. The concern that shareholders may be ignorant of the true value of the company may be considered by the board, and the interests of long-term shareholders versus short-term speculators (such as arbitrageurs) may be taken into account.

⁶⁹ *Unitrin, Inc. v. American General Corp.*, 651 A.2d 1361 (Del. 1995).

perceives that a threat is on the horizon, it has broad authority to respond with a panoply of individual or combined defensive precautions, e.g., staffing the barbican, raising the drawbridge, and lowering the portcullis. Stated more directly, depending upon the circumstances, the board may respond to a reasonably perceived threat by adopting individually or sometimes in combination: advance notice by-laws, supermajority voting provisions, shareholder rights plans, repurchase programs, etc.

A defense that is deemed preclusive because it frustrates, impedes, or disenfranchises a shareholder vote will be held to the so-called Blasius standard of compelling justification⁷⁰ and is unlikely to be upheld.⁷¹ For example, a stock repurchase designed primarily to preclude a third party from winning a proxy contest for the selection of directors may not pass the Blasius standard. Also, defensive measures have not fared well in court when the defense has involved a transaction in which existing management will have an equity interest or where the purpose is to favor one party over another.

3.5.2. *Defenses and offer premiums*

Following the reference made by Manne (1965) to the “external” and “internal” market for corporate control, several authors have similarly categorized antitakeover provisions.⁷² The external control market involves takeover bids and specific target responses, while the internal market involves general board actions and shareholder voting. Examples of internal antitakeover provisions are classified (staggered) board (directors are divided into separate classes—typically three—and elected to overlapping terms), unequal voting rights (e.g., two classes of common stock, one with zero voting rights), and various restrictions on shareholder rights to amend company charter and bylaws, to act by written consent, and to call special meetings. Examples of external antitakeover provisions include antigreenmail provisions (prohibition on paying greenmail—the targeted repurchase of a single shareholder’s stockholding at a premium), supermajority requirements to approve a merger, blank check preferred stock (used to implement a poison pill), fair price provisions (requires a large shareholder to pay a minimum price set by formula for all shares acquired in the back end of a two-tiered acquisition), and poison pills or shareholder rights plans.

The development of the poison pill is tied directly to the history of greenmail. Following several occurrences of greenmail payments during the late 1970s and early 1980s, Unocal made what turned out to be a landmark decision to reverse the greenmail payment. In 1983, Mr. T. Boone Pickens Jr. and his Mesa Partners II, who held 13.6% of Unocal’s

⁷⁰ *Blasius Indus., Inc. v. Atlas Corp.*, 564 A.2d 651, 660 (Del. 1988).

⁷¹ *MM Companies v. Liquid Audio, Inc.*, 813 A.2d 1118 (Del. 2003). In this case, the court invalidated the board’s decision to add two new directors to prevent the acquirer from obtaining board control at the subsequent shareholder meeting. The Blasius standard “is to be applied sparingly, and only in circumstances in which self-interested or faithless fiduciaries act to deprive stockholders of a full and fair opportunity to participate and to thwart what appears to be the will of a majority of stockholders” (*MONY Group, Inc. Shareholder Litigation*, Del. (class action that was settled)).

⁷² Jarrell and Poulsen (1987), Danielsen and Karpoff (1998), Gompers, Ishi, and Metrick (2003), Moussawi (2004). Bebchuk, Coates, and Subramanian (2002) summarize case law concerning antitakeover provisions.

stock, made an \$8.1 billion takeover bid for Unocal. The offer was for \$54 a share in cash for 37% of Unocal's stock and \$54 a share in junior securities for the rest. Unocal's board responded by offering to exchange \$72 a share in senior securities for 50.1% of the company's total shares, but barred the Mesa group from participating in the stock repurchase. Delaware Supreme Court upheld Unocal's right to undertake the targeted repurchase.⁷³

Attorney Martin Lipton of Wachtell, Lipton, Rosen & Katz was a key legal strategist working for Unocal. Subsequently, Mr. Lipton's law firm proceeded to develop the "shareholder rights plan"—popularly referred to as the poison pill—which is an ongoing commitment to trigger what in essence is a reverse greenmail payment.⁷⁴ When adopting the poison pill, the corporation issues to its stockholders (usually by means of a dividend) certain rights to purchase stock. The rights are out of the money (the exercise price exceeds the then market price) and not exercisable until a triggering event. The triggering event is that someone acquires a certain percentage (e.g., 15%) of the firm's voting shares. Pending their exercise, the rights may be redeemed for a nominal value by the board. If triggered, the rights give each holder, other than the stockholder who triggered the pill, the right to purchase shares of the issuing corporation (flip-in) or of the acquirer (flip-over) at a deep discount (e.g., 50%) to the market price. The board may offer pills without prior stockholder approval, and the pills may be issued after having received a hostile bid ("morning after" pill).⁷⁵

In 1985, the Delaware Supreme Court upheld Household International's adoption of a shareholder rights plan as reasonable under the Unocal standard, even though the company did not face a hostile threat.⁷⁶ Subsequently, Delaware has upheld the right of a board to refuse to redeem a pill in the face of an all-cash, noncoercive tender offer, even though a majority of the company's stockholders had tendered their shares to the bidder.⁷⁷ On the other hand, Delaware courts have invalidated the so-called dead-hand poison pill, which attempted to provide that only incumbent directors could redeem the rights, thus preventing newly elected directors from unwinding the pill.⁷⁸ This is an important decision, as one (though costly) way to circumvent the pill is to launch a proxy contest simultaneously with the hostile offer, in the hope of winning enough board seats to have the board rescind the pill and let the offer go through.

The combination of a hostile bid and a proxy contest does not work if the target board is classified or staggered. For example, if only one-third of the board is up for election, the hostile bidder cannot win the majority needed to rescind the pill. Indeed,

⁷³ *Unocal Corp. v. Mesa Petroleum Co.*, 493 A.2d 946 (Del. 1985).

⁷⁴ Mr. Lipton's law firm became a dominant supplier of poison pills to U.S. public companies thereafter.

⁷⁵ Pill adoption does not require a shareholder vote since it is akin to a dividend payment. Recently, there has been a growing demand from large institutional shareholders such as pension funds to allow shareholders to vote on pill adoptions.

⁷⁶ *Moran v. Household International, Inc.* 500 A.2d 1346 (Del. 1985).

⁷⁷ *Moore Corp., Ltd. v. Wallace Computer Services, Inc.*, 907 F. Supp. 1545 (D. Del. 1995).

⁷⁸ *Quickturn Design Systems, Inc. v. Shapiro* 721 A.2d 1281 (Del. 1998). This version of the pill had been upheld under Georgia Law, but also invalidated under New York law.

as argued by Bebchuk, Coates, and Subramanian (2002), Bebchuk, Cohen, and Ferrell (2004), and Bebchuk and Cohen (2005), board classification may in and of itself constitute an antitakeover device. Bebchuk and Cohen (2005) examine the cross-sectional relationship between board classification and firm value, and find that board classification is negatively correlated with industry-adjusted Tobin's *Q*. Also, Masulis, Wand, and Xie (2007) find that acquisition announcement-period stock returns are significantly lower for bidders with staggered boards, possibly because board classification reduces forced board turnover and quality. On the other hand, Bates, Becher, and Lemmon (2008) find that board classification does not reduce the probability that a firm, once it is targeted, is ultimately acquired. Moreover, targets with classified boards appear to extract premiums equivalent to those of single-class boards. However, they do find that board classification is associated with a small reduction in the probability of receiving a takeover bid. Rose (2008) also concludes that the presence of staggered boards has more of a detrimental impact on firm value when management is relatively entrenched.

The ambiguities in interpreting the overall consequences for shareholders of a defensive measure such as a staggered board are also present in the debate over the poison pill defense. There is substantial empirical evidence that targets that have adopted poison pills receive offer premiums that are, on average, indistinguishable from offer premiums received by nonpill targets.⁷⁹ This evidence is consistent with the following four alternative hypotheses:

- H1 Poison pills are irrelevant for determining final takeover premiums.
- H2 Poison pills convey bargaining power, which increases the final takeover premium relative to what the premium would have been for the same target without a pill.
- H3 Poison pills convey bargaining power that is used to benefit target management at the expense of target shareholders.
- H4 Poison pills provide bargaining power, but "shadow" pills are as effective as adopted pills.

Hypotheses H2–H4 maintain that pills do convey bargaining power but that a comparison of offer premiums in samples of firms with or without pills is difficult from an econometric point of view. Pill adoptions are voluntary, which raises complex issues of endogeneity (H2). Controlling for self-selection is difficult because the marginal effect of a poison pill depends on the firm's entire governance system, including executive compensation (H3).⁸⁰ Also, in order to isolate the true premium effects of pills, empirical work relies on the existence of two samples, one representing "poison" and the

⁷⁹ Comment and Schwert (1995), Field and Karpoff (2002), Heron and Lie (2006), Betton, Eckbo, and Thorburn (2007).

⁸⁰ Compensation effects of takeovers are discussed in Section 5.2. Heron and Lie (2006) find that the targets of hostile bids are more likely to adopt poison pills when they have classified boards, suggesting that the two antitakeover devices are interdependent.

other “placebo” effects (Comment and Schwert, 1995). This sampling is difficult, if not impossible, if, as in H4, *all* firms effectively have ready access to the pill (Coates, 2000).

H1 maintains that pills may simply be ineffective and therefore irrelevant for final offer premiums. At first blush, H1 seems to be rejected by the fact that no bidder (to our knowledge) has yet triggered a pill. However, why trigger an ineffective pill if the trigger itself is costly—also to target management? Consider the failed 1996 takeover attempt by U.S. Surgical Corporation of medical device maker Circon Corporation. Exercising the Circon pill would have required Circon shareholders to pay approximately \$800 million in cash into a company with a pre-takeover total equity value of \$150 million. In return for this massive (and expensive) cash infusion, Circon shareholders would lose a 70% takeover premium and stood to gain only \$10 million from the resulting dilution of U.S. Surgical’s shareholding in Circon. In general, a pill with this structure may lack credibility and therefore have little effect on bargaining outcomes.⁸¹

Moreover, the definition of target “hostility” used in the literature probably captures many targets that are ready to negotiate with or without the pill (Schwert, 2000). Bidders that are able to look beyond the pill and determine whether negotiations are possible (based on observable target characteristics or on the bidder’s own ability to persuade a hostile target management) may reach a final bargaining outcome that is largely indistinguishable from that observed in samples of ex-ante “friendly” targets. Empirical evidence shows that the probability of receiving a bid (and ultimate bid success) is either unaffected or slightly lower for targets with strong antitakeover defenses.⁸²

Finally, several studies estimate the valuation effects of antitakeover charter amendments (which require a shareholder vote), with data primarily from the 1980s. An advantage of studying charter amendments is that the market reaction isolates the net present value of the expected impact of the antitakeover measures on all future takeover activity. A disadvantage, however, is that the lengthy process toward a vote at the shareholder meeting leaks information and leads the market to partially anticipate the event, thus reducing power to register significant changes in market expectations. There is also some controversy over which event date is the most appropriate: the shareholder meeting date, the proxy announcement date, or the proxy mailing date (Bhagat and Jefferis, 1991). Also, as with studies of poison pills, it is important but difficult to properly account for the endogenous nature of the amendment choice, as it is part of the amending firm’s entire governance system.⁸³

Since the amendments must pass a shareholder vote, a natural null hypothesis is that these serve the interests of shareholders. Under this hypothesis, a takeover amendment

⁸¹ In the Circon case, Circon chairman and CEO Richard Auhll appeared to be protecting large private benefits of control. Using information on SDC, approximately half of all pills are cash pills (the exercise price is paid in cash rather than by an exchange of securities).

⁸² Comment and Schwert (1995), Field and Karpoff (2002), Heron and Lie (2006).

⁸³ Malekzadeh, McWilliams, and Sen (1998), Bhagat and Jefferis (2002).

increases the expected future takeover premium (the change in the probability of a takeover times the change in the premium conditional on a takeover). For example, the amendments may help resolve a target shareholder coordination (holdout) problem and increase the expected takeover price, especially in a two-tier tender offer setting (DeAngelo and Rice, 1983). Or, in the context of optimal contracting, the amendment decreases the expected future takeover premium in return for greater managerial incentives to invest in firm-specific human capital (Shleifer and Vishny, 1989). The main alternative hypothesis is that the amendments further entrench incumbent management (with insufficient offsetting benefits) and that the voting mechanism is unable to prevent the management proposal from passing.⁸⁴

Early studies of share price effects of fair price amendments, classified boards, supermajority requirements, and other “shark repellents” adopted by publicly traded firms find a zero or small negative market reaction. These include DeAngelo and Rice (1983), Linn and McConnell (1983), and Jarrell and Poulsen (1987). Fair-price amendments (the bulk of the sample amendments) are met with an insignificant market reaction, while board classification elicits significantly negative abnormal stock returns. Jarrell and Poulsen (1987) also find that the amendments having the most negative effects are adopted by firms with the lowest percentage of institutional holdings and the greatest percentage of insider holdings. Malatesta and Walkling (1988) distinguish between takeover defenses that do or do not require shareholder approval, and conclude that defenses that are not ratified by a shareholder vote reduce shareholder wealth. Ryngaert (1988) also finds evidence that poison pill adoptions reduce shareholder value, as do news of court decisions upholding poison pill defenses. More recent studies of the market reaction to antitakeover amendments tend to confirm the conclusions of this literature, also after providing a more detailed picture of the interaction with the adopting firm’s corporate governance and ownership structures.⁸⁵

Finally, a number of papers examine the valuation effects of greenmail—the precursor to the poison pill—and antigreenmail charter amendments. As indicated above, greenmail refers to an arrangement in which a company repurchases the stock held by a large shareholder, usually at a substantial above-market price. In return, the large stockholder signs a standstill agreement committing not to purchase additional target shares or launch a control bid for typically a 10-year period. Bradley and Wakeman (1983), Dann and DeAngelo (1983), and Mikkelsen and Ruback (1991) find that the announcement of greenmail transactions are associated with significantly negative abnormal stock returns of approximately -2% . Mikkelsen and Ruback (1991) find that the market reaction is negative only if the stockholder signs a standstill agreement or if it aborts a control

⁸⁴ It is well understood that a vote may not necessarily safeguard shareholder interests. See, for example, Austen-Smith and O’Brien (1986), Jarrell and Poulsen (1987), Brickley, Lease, and Smith (1988), and Gordon and Pound (1993) for evidence of voting on antitakeover amendments. Since the 1980s, increasing institutional shareholder activism has made it more difficult for incumbents to secure shareholder support for defensive measures.

⁸⁵ Mahoney and Mahoney (1993), McWilliams and Sen (1997), Sundaramurthy, Mahoney, and Mahoney (1997).

contest.⁸⁶ Mikkelsen and Ruback (1985) show that the total abnormal stock return from the initial 13D filing by the toehold investor until he receives the greenmail payment is significantly positive. In other words, the greenmail payment and standstill do not eliminate all gains from having had a significant blockholder in the firm's ownership structure.

Eckbo (1990b) and Bhagat and Jefferis (1991) present evidence on antigreenmail charter amendments. The typical amendment prohibits the firm from repurchasing some or all of the common (voting) stock of an *interested shareholder*—normally defined as a shareholder who owns 5% or more of the outstanding common stock and who acquired this ownership position within the past two to three years. Virtually all firms retain the option to pay greenmail as long as (1) two-thirds or more of the *disinterested shareholders* approve of the action, or (2) if the shares are repurchased at a fair price, usually defined as an average of the stock's trading prices over the 90 days immediately preceding the share repurchase.

The market reaction to greenmail prohibitions represents the value of the *option* to pay greenmail in the future. If the option value is negative, the market reaction to the amendment will be positive. The option value is negative if the sum of the repurchase premium (greenmail payment), the marginal increase in agency costs from successfully rebuffing future hostile takeover bids, and the increased likelihood of receiving purely extortive bids (bids designed exclusively to generate greenmail payments) exceed the expected benefits. Thus, evidence of a positive market reaction to the greenmail prohibition would support the widely held view that greenmail payments harm nonselling shareholders.⁸⁷

For a subsample where the antigreenmail amendment is proposed by itself (without other simultaneous antitakeover proposals), Eckbo (1990b) has found the average market reaction to the charter amendments to be weakly negative. The market reacts negatively to the greenmail prohibition if the value of the unrestricted option to pay greenmail is positive. However, cross-sectional regressions further indicate that the market reaction is strongly positive when the firm has experienced a recent stock price runup along with takeover rumors. Eckbo (1990b) concludes that the option to pay greenmail is costly when the firm likely has been identified as a target, in which case the antigreenmail amendment removes a possible barrier to the pending takeover.

3.6. Targets in bankruptcy

In this section, we consider evidence on the acquisitions of target firms that have filed for bankruptcy. Since bankruptcy law alters the bargaining position of the target, one

⁸⁶ They also report that even with the standstill, 40% of the firms paying greenmail experience a control change within the subsequent three years.

⁸⁷ It is not, however, the only possible interpretation. In the asymmetric information model of Shleifer and Vishny (1986a), greenmail payments increase the intrinsic value of the firm while at the same time causing the firm's stock price to fall.

expects the outcome for bidders to be different from that for out-of-court acquisitions. We begin with targets in Chapter 11 of the U.S. Bankruptcy Code, where a decision to put the bankrupt firm up for sale is driven jointly by incumbent management and creditor committee votes. We then consider targets sold in the automatic auction bankruptcy system in Sweden. This code essentially eliminates the target's bargaining opportunities and relies on bidder competition to maximize debt recovery and an efficient reallocation of the target assets.

3.6.1. Chapter 11 targets

Beginning with U.S. bankruptcies, there is growing use of market-based mechanisms to lower the costs of traditional Chapter 11 proceedings. These include prepackaged bankruptcies with a reorganization plan in place at filing (Betker, 1995; Lease, McConnell, and Tashjian, 1996), acquisition of distressed debt by "vulture" investors in order to make voting more efficient (Hotchkiss and Mooradian, 1997), and voluntary sales in Chapter 11 (Hotchkiss and Mooradian, 1998; Maksimovic and Phillips, 1998). Baird and Rasmussen (2003) report that more than half of all large Chapter 11 cases resolved in 2002 used the auction mechanism in one form or another, and that another quarter were prepacks.

Hotchkiss and Mooradian (1998) study acquisitions of targets in Chapter 11. There are two ways in which a firm in Chapter 11 can sell substantially all of its assets: through a Section 363 (of the U.S. Bankruptcy Code) sale or as part of a confirmed reorganization plan. Under a Section 363 sale, management must first obtain an offer and then notify the court, which in turn notifies creditors. The Bankruptcy Code invalidates no-shop agreements and allows creditors to retain advisers at the expense of the debtor firm to search for competing buyers. If there are several potential buyers, the court holds an auction.

Chapter 11 grants the incumbent management exclusive rights within a limited time period (rolling six months) to propose a reorganization plan. As a consequence, hostile acquisitions are difficult and the targets will be more likely for firms whose management has already been replaced or for which managerial private benefits of control are small. It is also possible that management is willing to put the target up for sale when it has private information that the target assets are of relatively low quality. Furthermore, since acquisition bids are subject to creditor approval (just as for any other reorganization plan), complex debt structure makes it more difficult to generate the necessary votes. Thus, targets are also likely to have relatively simple capital structures.

Hotchkiss and Mooradian (1998) start with 1,200 public companies that filed for Chapter 11 between October 1970 and December 1992. Using SEC and Compustat information, they identify 339 firms that reorganized as independent public companies and 111 firms that were acquired by another operating company. Of these, 55 acquirers are publicly traded firms. Target firms spend a median time in bankruptcy of 14 months, compared to 17 months for independently reorganized firms. They find little evidence that acquired firms have unusually simple capital structures (although they tend to have

less public debt) or that incumbent management is particularly entrenched. Acquirers tend to be firms in the same industry as the target and have some prior relationship with the target such as an ownership stake. Of the 55 takeovers, 18 transactions have multiple bidders.

Hotchkiss and Mooradian (1998) also report that the bankrupt targets on average are purchased at a 45% discount relative to prices paid for nonbankrupt targets in the same industry. However, they do not consider this as evidence of allocative inefficiency: “Although the transactions are at discount prices, the high proportion of acquirers operating in the same industry as the target, as well as the competitive bidding environment, does not support the conclusion that acquisitions in bankruptcy are sales to lower value users” (p. 243). This conclusion is further supported by their finding that the postmerger cash flow performance of firms combined with bankrupt targets is better than that reported by Hotchkiss (1995) for firms emerging from Chapter 11. Finally, there is evidence of positive and significant abnormal stock returns to both bidders and bankrupt targets for the days surrounding the announcement of the acquisition.

3.6.2. *Bankruptcy auctions and fire sales*

Next, we consider bankruptcies in Sweden’s mandatory auction system. Here, a firm filing for bankruptcy is turned over to a court-appointed trustee who puts the firm up for sale in an auction. This mandatory auction system has an attractive simplicity. All debt claims are stayed during the auction period and the bids determine whether the firm will be continued as a going concern or liquidated piecemeal. A going-concern sale takes place by merging the assets and operations of the auctioned firm into the bidder firm, or into an empty corporate shell—much like a leveraged buyout transaction. Payment must be in cash, allowing the auction proceeds to be distributed to creditors strictly according to absolute priority.

As surveyed by Hotchkiss, John, Mooradian, and Thorburn (2008), bid premiums observed in the mandatory auction bankruptcy system in Sweden provide an important empirical perspective on the viability auctions as a mechanism for resolving bankruptcy. Proponents of the market-oriented auction system point to costs associated with conflicts of interests and excessive continuation of operations due to managerial control over the restructuring process in Chapter 11.⁸⁸ These costs most likely explain the trend toward increased use of market-based mechanisms in the United States. On the other hand, opponents of an auction-based system argue that the time pressure of an auction system is costly as it may cause excessive liquidation and fire sales of economically viable firms when potential bidders in the auction are themselves financially constrained.

A series of papers study the Swedish auction system using a sample of 260 auctioned firms.⁸⁹ The average auctioned firm has \$5 million in sales and assets of \$2 million

⁸⁸ See, for example, Baird (1986), Bebchuk (1988), Jensen (1989), Aghion, Hart, and Moore (1992), Bebchuk and Chang (1992), Bradley and Rosenzweig (1992), and Baird (1993). Hotchkiss (1995) finds that firms emerging from Chapter 11 tend to underperform their industry rivals which is consistent with excessive continuation.

⁸⁹ Thorburn (2000), Strömberg (2000), Eckbo and Thorburn (2003, 2007, 2008b).

(\$8 million and \$4 million, respectively, in 2007 dollars), and it has an average of 45 employees.⁹⁰ Thorburn (2000) reports that the auctions are quick—lasting an average of two months—and relatively cost-efficient. Moreover, three-quarters of the filing firms survive the auction as a going concern, which is similar to the survival rate of Chapter 11 cases. In going-concern sales, the buyer typically rehires lower-level employees. Top management fares less well: Eckbo and Thorburn (2003) find that while the buyer rehires the old management to run the restructured company in about one-half of the going-concern sales, the old management typically experiences a median wealth decline of -47% relative to managers of nonbankrupt firms. They argue that this expected personal bankruptcy cost, along with the loss of private benefits of control, counteract shareholder risk-shifting incentives when the firm is in severe financial distress (Jensen and Meckling, 1976). That is, if the CEO's objective includes being rehired by the buyer in the auction, she may implement a relatively conservative investment policy to preserve the possibility of a going-concern sale in the auction.

Does the auction mechanism induce an efficient reallocation of the resources of the bankrupt firm? First, Eckbo and Thorburn (2003) show that firms sold as going-concerns typically perform at par with industry rivals. Second, Eckbo and Thorburn (2007) fail to find auction fire-sale discounts in going-concern sales. That is, the auction produces auction premiums (and post-bankruptcy operating performance) in going-concern sales that are independent of fire-sale conditions such as industrywide financial distress, industry leverage, and whether or not the buyer is an industry insider or outsider.

Third, Eckbo and Thorburn (2007) find that prepackaged auctions (where the buyer has been identified prior to filing) tend to produce prices consistent with the hypothesis that the contracting parties are concerned with preempting piecemeal liquidation. Strömberg (2000) shows that salebacks to the previous owner-manager tend to increase during periods of high industry financial distress, which further helps preempt liquidation. Eckbo and Thorburn (2007) document that prices paid in salebacks are as high as prices in non-saleback going-concern transactions, which fails to support arguments that salebacks carry an inherent conflict of interest with junior creditors.

3.6.3. *Testing for auction overbidding*

Eckbo and Thorburn (2008b) develop and test the argument that creditor incentives may induce auction overbidding. Recall from Section 3.3 that toehold bidding raises the optimal bid above the bidder's own private valuation of the target, for example, as shown in Equation (11). In the sample of Swedish bankruptcies, the main creditor is always a single bank. Thus, the toehold analogy is that the bankruptcy event effectively creates an instant "creditor toehold" of $\alpha = 1$ when the creditor's debt is impaired at filing. The question is whether the existence of this creditor toehold leads to overbidding in the

⁹⁰ A majority of Chapter 11 filings are also by small private firms: Chang and Schoar (2007) report average sales of \$2 million and 22 employees in a large and representative sample of Chapter 11 filings between 1989 and 2003. Bris, Welch, and Zhu (2006) report that the median firm filing for Chapter 11 has assets of \$1 million.

auction. Given the importance of toehold bidding in the takeover literature, we outline the main test procedure and results below.

Swedish bank regulations prevent the bank from bidding directly in the auction. However, Eckbo and Thorburn (2008b) report that the bank often finances the winning bidder and uses this observation to motivate the following proposition: Bank financing allows the bank to induce bidder 1 to submit a bid b_c^* that involves overbidding and is jointly optimal for both parties.⁹¹ As in Section 3.3, overbidding forces a wealth transfer from bidder 2 to the bank-bidder coalition when bidder 2 wins the auction. This rent transfer raises auction revenue and the bank's expected debt recovery rate.

Suppose the bank forms a coalition with bidder 1. Continuing the notation from Section 3.3, the coalition's optimal bid is as follows:

$$b_c^* = \begin{cases} v_1 + h(b_c) & \text{if } v_1 \leq f - h(b_c) & (\text{unconstrained overbidding}) \\ f & \text{if } f - h(b_c) < v_1 < f & (\text{constrained overbidding}) \\ v_1 & \text{if } v_1 \geq f & (\text{no overbidding}) \end{cases} \quad (15)$$

where f is the face value of the bank's debt claim. Note that the unconstrained overbidding price is identical to the bid in Equation (11) but with $\alpha = 1$ and a termination fee $t = 0$. A value of $\alpha = 1$ follows because the bank, being the secured creditor with an impaired debt claim, is effectively the seller of the auctioned firm. Thus, the bank has a creditor toehold equal to one. As shown by Hotchkiss and Mooradian (2003) as well (in the context of Chapter 11 sales), a creditor toehold induces overbidding in exactly the same manner as a bidder toehold outside of bankruptcy.

What makes this overbidding theory testable is the constraining effect of the bank-debt face value f .⁹² To illustrate, let l denote the piecemeal liquidation value of the bankrupt firm, and suppose l is public knowledge at the beginning of the auction. Since l is the sum of the value of the firm's assets if sold individually, it constitutes a price floor in the auction of the firm as a going-concern. Let $r \equiv l/f \in [0, 1]$ denote the bank's debt recovery if the firm is liquidated piecemeal. r is a measure of the bank's debt impairment: low values of r indicate that the bank's debt is highly impaired. For low values of r , the bank-bidder coalition fully overbids (unconstrained overbidding). However, as the value of r increases, the amount of overbidding becomes constrained by f : the coalition optimally overbids *only* to the extent that overbidding does not benefit junior creditors. If the valuation of the bank's coalition partner is such that $v_1 > f$, the bank will receive full debt recovery even without overbidding, so the optimal coalition bid is simply $b_c^* = v_1$.

⁹¹ The bank may induce the bidder to bear the expected overpayment cost by granting a lower interest on the loan. Eckbo and Thorburn (2008b) show that there exists a positive transfer from the bank to bidder 1 which makes coalition formation incentive compatible for both parties.

⁹² This testable restriction does not exist for takeovers outside of bankruptcy. Extant empirical evidence on toehold-induced overbidding is therefore indirect. For example, theory implies that overbidding increases the probability of winning, which is supported by studies of corporate takeover bids with equity toeholds (Betton and Eckbo, 2000).

Eckbo and Thorburn (2008b) prove that the greater the liquidation recovery rate r , the lower is the incentive to overbid and, in turn, the lower is the expected premium paid by the winning bidder. They use a professional estimate of the piecemeal liquidation value l , published by the bankruptcy trustee at the beginning of the auction.⁹³ They find that when the firm is sold as a going-concern, final auction premiums are higher the lower is the liquidation recovery rate, as predicted by overbidding. Equally important, in subsamples where the theory implies zero overbidding incentive, the cross-sectional regressions reject overbidding. That is, final auction premiums are unaffected by the liquidation recovery rate when the auction leads to the target being liquidated piecemeal (in which case the going-concern premium is zero), or when the bank's collateral exceeds the face value ($l > f$) so the bank's debt is not impaired.

Overbidding results in allocative inefficiency whenever the bank-bidder coalition wins against a higher-valuation bidder. To examine this possibility, Eckbo and Thorburn (2008b) estimate the post-bankruptcy operating performance of firms sold as going-concerns conditional on the bank-bidder coalition having large overbidding incentives and winning the auction. While this is the most powerful subsample to look for ex-post allocative inefficiency, they show that the post-bankruptcy operating performance in this subsample is at par with or exceeds that of industry rivals. Overall, they conclude from this that the bank's coalition partner tends to be efficient in terms of restructuring and operating the bankrupt firm's asset.

3.7. Offer premium summary

Reflecting restrictions on the availability of actual offer prices, the bulk of the empirical studies on takeovers are content to use target cumulative abnormal stock returns around the takeover bid as a proxy for the actual offer premium. Obviously, target abnormal stock returns present noisy estimates of offer premiums because they incorporate the probability of bid failure and competition at the initial offer date, and they must be estimated over a long event window to capture the final premium. Thus, it is difficult to properly sort out how bidders determine offer premiums unless one employs offer price data directly.

Several papers study offer prices directly. Bradley (1980) provides the first systematic offer price analysis in the context of public tender offers. Walkling (1985) uses offer premiums to predict tender offer success. Eckbo and Langohr (1989) examine the effect of disclosure rules and method of payment (cash versus stock) on tender offer premiums. Betton and Eckbo (2000) examine bid jumps and offer premium determinants in tender offers. Officer (2003, 2004), Bates and Lemmon (2003), and Bargaron (2005) examine the premium effects of deal protection devices such as termination and share-tendering agreements. Betton, Eckbo, and Thorburn (2007) study the premium effects of toehold

⁹³ Bidders appear to rely on this estimate as well: when the auction does lead to piecemeal liquidation, the average price paid by the winning bidder is close to (on average 8% above) the trustee's estimate. In contrast, when the bankrupt firm is purchased as a going-concern, the average auction premium more than doubles the trustee's piecemeal liquidation value estimate.

bidding, while Betton, Eckbo, and Thorburn (2008b) are the first to estimate the effect of target runups on markups in initial and final offer prices. Chatterjee, John, and Yan (2008) study the effect of divergence of opinion on bid prices, while Levi, Li, and Zhang (2008) examine whether CEO and director gender affect takeover premiums.

Table 5 shows the cross-sectional determinants of both the initial and final offer premiums. The offer price data used for this table is from Betton, Eckbo, and Thorburn (2008b),

Table 5

Determinants of the offer premium in 4,889 control contests for U.S. public targets, 1980–2002.

The table shows OLS estimates of the initial and final offer premium, defined as $\ln(p_{initial}/p_{-42})$ and $\ln(p_{final}/p_{-42})$, respectively, where $p_{initial}$ is the initial offer price, p_{final} is the final offer price in the contest, and p_{-42} is the stock price on day -42 adjusted for splits and dividends. Amihud liquidity is the average value of $|R_i|/(p_i S_i)$ over days $i \in \{-250, -42\}$, where R_i is the % holding period return, p_i is the closing price and S_i is the number of shares traded. Industry is the four-digit SIC code in CRSP. The sample is 4,889 control bids 1980–2002 for U.S. targets with a stock price \geq \$1 and a market capitalization \geq \$10 million. p -values are in parenthesis. The data is from Betton, Eckbo, and Thorburn (2007).

	Initial offer premium		Final offer premium	
Mean	0.43		0.48	
Median	0.37		0.39	
St. dev.	0.46		0.47	
Intercept	0.296 (0.000)	0.256 (0.000)	0.296 (0.000)	0.254 (0.000)
A: Target characteristics				
Size: \ln of target market capitalization on day -42	-0.030 (0.000)	-0.027 (0.000)	-0.030 (0.000)	-0.027 (0.000)
Target book-to-market > industry median	0.025 (0.000)	0.029 (0.000)	0.024 (0.000)	0.029 (0.000)
Target runup: $\ln(p_{-1}/p_{-42})$	0.808 (0.000)	0.811 (0.000)	0.808 (0.000)	0.811 (0.000)
Amihud liquidity	8.55 (0.311)	13.29 (0.114)	8.71 (0.302)	13.46 (0.110)
Poison pill dummy	-0.016 (0.606)	0.000 (0.990)	-0.016 (0.604)	-0.001 (0.987)
B: Bidder characteristics				
Positive toehold (vs. zero toehold)	-0.023 (0.032)	-0.025 (0.024)	-0.023 (0.032)	-0.025 (0.024)
Acquirer public (vs. private)	0.015 (0.079)	0.023 (0.008)	0.015 (0.072)	0.023 (0.007)
Horizontal takeover (same industry)	-0.004 (0.608)	-0.004 (0.664)	-0.004 (0.618)	-0.004 (0.673)

(Continued)

Table 5 (Continued)

C: Deal characteristics				
Tender offer (vs. merger)	-0.061 (0.000)	-0.066 (0.000)	-0.061 (0.000)	-0.066 (0.000)
All cash consideration (vs. stock or mixed)	0.019 (0.017)	0.021 (0.012)	0.019 (0.017)	0.021 (0.012)
Hostile target response (vs. friendly or neutral)	0.020 (0.185)	0.020 (0.185)	0.019 (0.216)	0.019 (0.216)
Multiple bidders (vs. single-bidder contest)			0.009 (0.497)	0.008 (0.501)
Announced in 1980–1989 (vs. 1990–2002)	-0.016 (0.056)		-0.017 (0.050)	
Year fixed effects	no	yes	no	yes
Adjusted R^2	0.424	0.436	0.423	0.436
F-value	300.3 (0.000)	115.3 (0.000)	277.2 (0.000)	111.9 (0.000)

and covers a total of 4,889 targets. The premiums are defined as $\ln(p_{initial}/p_{-42})$ and $\ln(p_{final}/p_{-42})$, respectively, where $p_{initial}$ is the initial offer price, p_{final} is the final offer price in the contest, and p_{-42} is the stock price on day -42 adjusted for splits and dividends. The sample is restricted to targets in the period 1980–2002 with a stock price $\geq \$1$ and a market capitalization $\geq \$10$ million. As shown in the first two rows of the table, the mean (median) value of the initial offer premium is 43% (37%), which increases to 48% (39%) by the time of the final bid.

The explanatory variables, which are grouped into target characteristics, bidder characteristics, and deal characteristics, cover the types of decisions discussed throughout Section 3. We alternately use a time dummy for offers taking place in the early sample period (1980–1989) and year fixed effects. Notice also that the information in these variables is known at the time the offer premium was set. We include the variable hostile target response as a determinant of the initial offer premium because we believe this information is basically known at the outset. However, the variable multiple bidders obviously is not and is included as a determinant of the final offer premium only.

Not surprisingly (given the relative paucity of multiple-bid contests in the total sample of 4,889), the explanatory variables have similar coefficients and level of significance for both the initial and final offer premiums. In the order of the discussion of this section, the initial and final offer premiums are

1. significantly *higher* when the bidder is a public company and significantly *lower* if the initial bid is a tender offer (Section 2.3).

2. significantly *greater* when the method of payment is all cash (Section 3.2).
3. significantly *lower* when the bidder has a positive toehold (Section 3.3).
4. significantly *greater* the greater the target runup $\ln(p_{-1}/p_{-42})$ prior to the initial bid (Section 3.4).⁹⁴
5. *unaffected* by either the presence of a target poison pill or target hostility to the initial bid (Section 3.5).

Table 5 further shows that the initial and final offer premiums are decreasing in target total equity capitalization on day -42 , and they are greater if the target's book-to-market ratio exceeds the industry median B/M (i.e., if the target has few growth options relative to industry rivals). Offer premiums are unaffected by target stock liquidity, by the presence of multiple bidders, and by whether the bidder and target are horizontally related in product markets. Finally, offer premiums have increased from the 1980s.⁹⁵

Officer (2003) and Bates and Lemmon (2003) show that offer premiums are significantly greater when the SDC indicates the existence of a target termination agreement, while Bargeron (2005) finds lower premiums in the presence of a target board/management tender agreement. Moeller (2005) presents evidence indicating that powerful entrenched target CEOs reduce takeover premiums. Chatterjee, John, and Yan (2008) find that takeover premiums are larger the greater the disagreement between the earnings forecasts of financial analysts following the target. Levi, Li, and Zhang (2008) use RiskMetrics Group data on board structure and find that bid premiums are affected by the gender composition of the board. Specifically, bid premiums are lower when the bidder CEO is female, and the higher the target board's proportion of female directors (provided that the female directors are independent appointees).

Several of the variables used to explain the offer premium are themselves endogenous choice variables (payment method, toehold, hostility, termination agreements, bidder's public status). Some of the reported effects appear robust to endogeneity.⁹⁶ One variable that does *not* appear to be robust is "tender offer." The inclusion of other variables (such as toeholds and hostility) tends to affect conclusions as to whether offer premiums are higher, the same, or lower in tender offers than in merger bids. Additional specification analysis is needed to fully sort out the endogenous from truly exogenous forces in the data.

⁹⁴ The coefficient on the runup variable is 0.80. This means that a dollar increase in the target runup causes the bidder to raise the offer price by 80 cents on average. Betton, Eckbo, and Thorburn (2008b) also show that offer markups (either $\ln(p_{initial}/p_{-1})$ or $\ln(p_{final}/p_{-1})$) are significantly decreasing in the runup. Thus, there is partial substitution between runups and markups.

⁹⁵ Since most of the hostile bids occurred in the 1980s, this is consistent with the finding that offer premiums in hostile bids are no lower than those for nonhostile offers.

⁹⁶ Betton and Eckbo (2000), Officer (2003) and Betton, Eckbo, and Thorburn (2007) use systems of equations and various corrections for self-selection. See Li and Prabhala (2007) for a survey of self-selection models in corporate finance.

4. Takeover gains

In this section, we present estimates of abnormal stock returns to bidders and targets around takeover contests, as well as in the post-merger period. Given the large number of papers providing abnormal returns estimates in takeovers, we limit the review to more recent studies with large samples of 1,000 or more bidder firms, such as those listed in Table 6. Studies are included in the table only if announcement-induced abnormal returns to bidders are in fact reported. This excludes large-sample studies such as Schwert (1996) and Bates and Lemmon (2003), where the main focus is on targets or some other deal aspect and where bidder returns may be estimated and used for purposes of cross-sectional regressions—but average announcement returns are not reported. It also excludes almost all studies before SDC became available as a convenient online data source.⁹⁷

4.1. *Econometric caveats*

Abnormal stock returns measure only the unanticipated component of the total economic effect of the event. Given the difficulty in predicting target firms, partial anticipation of the bid announcement does not pose much of an econometric problem for studies of target takeover gains. Most researchers agree that one captures most, if not all, of the total target gains by comparing the offer price to the pre-offer target share price within two months of the first bid. As illustrated in this section, the bulk of the target pre-offer runup typically actually occurs within 10 days of the bid.

It is also widely understood that partial anticipation can severely complicate estimation of gains from bidding. Any partial anticipation must somehow be accounted for to avoid underestimating the value implications. In simple environments with only a single possible event, the announcement effect equals the valuation effect times one minus the probability that the merger event will occur. It is thus attenuated toward zero, creating a bias against rejection of the null of zero gains from bidding. Malatesta and Thompson (1985) directly model the information arrival process and conclude that bidder stock returns include a component due to partial anticipation of future acquisition activity. Eckbo, Maksimovic, and Williams (1990) model the probability of the takeover event and conclude that this probability affects estimates of bidder takeover gains. The conclusion from these studies is that partial anticipation of bidding activity is an important empirical issue when the researcher fails to reject the hypothesis of zero abnormal stock returns to bidders.

Another approach to dealing with partial anticipation is through various sampling techniques. For example, Schipper and Thompson (1983) sample firms that announce entire acquisition programs. Since this announcement capitalizes a whole series of future expected acquisitions (rather than responding to a single-acquisition announcement), power to detect true acquisition gains is enhanced. Their evidence is consistent with

⁹⁷ Two exceptions in Table 6 are Loderer and Martin (1990) and Betton and Eckbo (2000), who use large hand-collected samples.

Table 6

Large-sample ($N > 1,000$) estimates of announcement-induced average cumulative abnormal stock returns (ACAR) to U.S. bidders.

Study	Sample	Average announcement return: ACAR (day τ_1 , day τ_2)(* =significant at 10% level)
Loderer and Martin (1990)	$N = 1,135$ completed mergers, 274 completed tender offers, and 3,296 "other" acquisitions (not classifiable as merger or tender offer) by public acquirers, where the offer is announced in the <i>Wall Street Journal</i> , 1996–1984.	ACAR(−5, 0) is 1.7%* for 970 cases 1966–1968, 0.57%* for 3,401 cases 1960–1980, and −0.1% for 801 cases 1981–1984. Bidder announcement returns smaller for larger bidders and decreasing in the relative size of the target firm.
Betton and Eckbo (2000)	Initial and rival bidders in $N = 1,353$ tender offer contests for public targets, 1971–1990.	(1) Day 0 is the initial bid date: ACAR(−60, 0) is 1.3% for initial bidders and 2.2% for rival bidders. (2) Day 0 is the second bid date: ACAR(−60, 0) is 1.2% for initial bidders, and 6.1%* for rivals.
Fuller, Netter, and Stegemoller (2002)	$N = 3,135$ takeovers, 1990–2000, by 539 public acquirers with at least 5 successful control bids within three years. Minimum deal size is \$1 million.	ACAR(−2, 2) is 1.8%* for total sample of bidders, −1.0%* when target is public, 2.1%* when target is private, and 2.8%* when target is a subsidiary.
Akbulut and Matsusaka (2003)	$N = 3,466$ successful mergers between public firms, 1950–2002.	ACAR(−2, 1) is 1.2%* for "related" acquisitions (bidder and target have at least one 3-digit SIC code in common) and 1.1%* for unrelated acquisition.
Officer (2003, 2004)	$N = 2,511$ attempted mergers and tender offers between public firms, 1988–2000 (Officer, 2003).	ACAR(−3, 3) is −1.2%* for the total sample.
Moeller, Schlingemann, and Stulz (2004, 2005)	$N = 12,023$ acquisitions, 1980–2001. Minimum deal value is \$1 million and 1% of the acquirer's assets.	ACAR(−1, 1) is 1.1%* for total sample, 2.3%* for small acquirers, and 0.1% for large acquirers. Using dollar values, bidders lose a total of \$221 billion in market capitalization over day −1 to +1. This aggregate loss is driven by a small number of very large deals concentrated to the 1998–2001 period.
Bhagat, Dong, Hirshleifer, and Noah (2005)	$N = 1,018$ tender offers for public targets.	ACAR(−5, 5) is 0.2% with a median dollar return of −1.2 million.
Song and Walkling (2005)	$N = 3,389$ acquisitions, 1985–2001. Minimum deal value is \$10 million.	ACAR(−1, 0) for the first bidder after a 12-month dormant period in the industry is 0.7%*, and 0.04% for subsequent bidders. Consistent with an attenuation effect of partial anticipation of takeover activity.

(Continued)

Table 6 (Continued)

Study	Sample	Average announcement return: ACAR (day τ_1 , day τ_2)(* =significant at 10% level)
Bradley and Sundaram (2006)	$N = 12,476$ completed acquisitions by 4,116 public companies, 1990–2000.	ACAR(−2, 2) is 1.4% for the total sample, −0.7% for public targets, and 1.9% when the target is private. Bidding firms experience a large stock price runup over the two-years period preceding the bid. This runup is greater for stock bids than for cash bids.
Savor (2006)	$N = 1,484$ (159 failed and 1,335 successful) merger bids, 1990–2000. The bid is nonhostile and all-cash (359 successful cases) or all-equity (976 successful cases). Minimum deal size is 5% of bidder market value.	ACAR(−1, 1) is −3.5%* for all-stock bidders and 1.0%* for all-cash bidders. Similar results for the full sample of failed acquirers.
Dong, Hirshleifer, Richardson, and Teoh (2006)	$N = 3,137$ merger bids and tender offers between public firms, 1978–2000.	ACAR(−1, 1) ranges from −0.2% (when target is ranked as relatively “undervalued”) to −1.8 (when target is ranked as relatively “overvalued”)%
Moeller, Schlingemann, and Stulz (2007)	$N = 4,322$ all-cash and all-stock bids, 1980–2002. Minimum deal value is \$1 million and 1% of the acquirer’s assets.	ACAR(−1, 1) for the total sample is 0.8%. When target is public, ACAR(−1, 1) is −2.3% in all-stock deals and 0.7% in all-cash deals. When the target is private, ACAR(−1, 1) is 3.4% in all-stock deals.
Bargeron, Schlingemann, Stulz, and Zutter (2007)	$N = 1,292$ completed all-cash takeovers of US public targets by private and public bidders, 1990–2005.	Average target announcement CAR _(−1,1) is 32% for public bidders and 22% for private bidders.
Betton, Eckbo, and Thorburn (2007, 2008b)	$N = 10,806$ initial control bids for public targets: 7,076 merger bids from 1980–2002 and 3,730 tender offers from 1973–2002.	ACAR(−1, 1) is −1.2%* for total sample and −0.15%* if the bidder has a toehold. In Betton, Eckbo, and Thorburn (2008b), ACAR(−1, 1) is −1.9%* for merger offers, and an in significant 0.3% for tender offers.
Betton, Eckbo, and Thorburn (2008c)	$N = 15,987$ initial control bids by public bidders for public or private targets, 1980–2005: 13,985 merger bids and 1,468 tender offers.	ACAR(−1, 1) is 0.69% with a significantly negative z-statistic of −3.9 for initial bidders in mergers, and 0.76 (insignificant) for initial bidders in tender offers. Large public bidders acquiring public targets and paying with allcash produces ACAR(−1, 1) of −2.2%*. Small public bidders acquiring private targets in allstock offers produces ACAR(−1, 1) of 6.5%*. Details are in Tables 7, 8 and 9 in this survey.

(Continued)

Table 6 (Continued)

Study	Sample	Average announcement return: ACAR (day τ_1 , day τ_2)(* =significant at 10% level)
Hackbarth and Morellec (2008)	$N = 1,086$ completed takeovers between public firms, 1985–2002. Minimum transaction value of \$50 mill., and regulated and financial firms are excluded.	ACAR(−1, 1) is $-0.5\%^*$. Bidder risk changes around the acquisition events are found to be consistent with a neoclassical investment model.

the hypothesis that future expected acquisitions have positive net present value as a group. Song and Walking (2000, 2005) select takeover announcements that follow a dormant period—with no previous takeovers in the industry of the bidder for a minimum of 12 months. Presumably, these announcements come as a relative surprise to the market, adding power to reject the null of zero bidder abnormal returns. Perhaps as a direct result, the authors report significantly positive bidder announcement returns.

Takeover announcements may also reveal new information about the quality of the bidder's management team—regardless of the value of the proposed acquisition per se. This further confounds the interpretation of bidder announcement returns as gains from merger activity. One approach is to formally model the signaling problem and test for its existence using cross-sectional regressions with bidder announcement returns as dependent variable (Eckbo, Giammarino, and Heinkel, 1990). Fuller, Netter, and Stegemoller (2002) approach this issue by selecting a sample of frequent acquirers (firms that acquire five or more targets within a three-year period). This sampling strategy helps control for certain bidder characteristics in the cross section.

Finally, because bidder managers time takeovers based on private information, consistent estimation of parameters in cross-sectional models with bidder returns as the dependent variable requires a correction for self-selection (Eckbo, Maksimovic, and Williams, 1990). While such cross-sectional regressions are commonly presented in the literature, this (or other equivalent) correction is rarely implemented. However, the recent review of Li and Prabhala (2007) is likely to increase general awareness of the importance of providing unbiased estimates in these cross-sectional models.⁹⁸

4.2. Runup- and announcement-period returns

We estimate the average daily abnormal stock return for firm j over event window k as the event parameter AR_{jk} in the value-weighted market model

$$r_{jt} = \alpha_j + \beta_j r_{mt} + \sum_{k=1}^K AR_{jk} d_{kt} + \epsilon_{jt}, \quad t = \text{day}\{-293, \dots, \text{end}\} \quad (16)$$

⁹⁸ Note that self-selection poses an econometric issue in cross-sectional regressions with the target abnormal return as dependent variable only to the extent that the target self-selects the timing of the acquisition.

where r_{jt} is the return (in logarithmic form) to firm j over day t , r_{mt} is the value-weighted market return, and d_{kt} is a dummy variable that takes a value of one if day t is in the k th event window and zero otherwise.⁹⁹ This conditional event parameter estimation yields identical abnormal return estimates as the more standard residual analysis technique, but is more efficient in terms of using the available return data. Moreover, the regression easily incorporates variable-length event windows across takeovers, and it produces estimates of standard errors of the abnormal returns directly.¹⁰⁰

Day 0 is the day of the initial control bid, and the ending date is the earlier of the day of the control last bid in the contest plus 126 trading days and the effective date + 126. If the target delisting date is between the date of the last control bid and the effective date, then the contest end is set to the target delisting date. The runup and announcement abnormal returns are estimated using three event windows ($K = 3$). The three event windows are $[-41, -2]$ (the runup period), $[-1, 1]$ (the announcement period), and $[2, end]$. The estimation uses Ordinary Least Squares (OLS) with White's heteroscedastic-consistent covariance matrix and requires a minimum of 100 days of nonmissing returns during the estimation period.

The cumulative abnormal return (CAR) to firm j over event period k is

$$CAR_{jk} = \omega_k AR_{jk} \quad (17)$$

where ω_k is the number of trading days in the event window. In a sample of N firms, the average cumulative abnormal return (ACAR) is

$$ACAR_k = (1/N) \sum_j CAR_{jk} \quad (18)$$

The z -values are determined as

$$z = (1/\sqrt{N}) \sum_j AR_{jk} / \sigma_{AR_{jk}} \quad (19)$$

and $\sigma_{AR_{jk}}$ is the estimated standard error of AR_{jk} . Under the null of $ACAR = 0$, $z \sim N(0, 1)$ for large N . The combined bidder and target abnormal returns are determined by weighting the bidder and target abnormal returns by the market capitalization on day -42 .

The twin Tables 7 and 8 detail the average abnormal return estimates (CAR) for the runup period $(-42, -2)$, the announcement period $(-1, 1)$, classified by market capitalization (Panel B), the public status of the bidder and target firms (Panel C), merger

⁹⁹ The return analysis is limited to ordinary shares. Missing returns are dealt with as follows: A succession of less than six missing returns are backfilled by allocating the cumulative return equally over the missing days. For example, if there are three missing days and then a return of 10%, each missing day and the subsequent nonmissing day would be allocated a return of 2.5%.

¹⁰⁰ For reviews of event study econometrics, and the conditional event parameter approach used here, see Thompson (1985, 1995), MacKinlay (1997), and Kothari and Warner (2007).

Table 7

Cumulative abnormal stock returns (CAR) to targets and bidders (individually and combined) relative to the initial bid date. Sample of control contests for U.S. targets, 1980–2005.

See the text for the details of the abnormal return estimation. The average market capitalization on day -42 for the target (V_T) and bidder (V_B), and for the ratio V_T/V_B , are reported in brackets (in \$1,000). Day 0 is the day of the initial control bid. The combined bidder and target abnormal returns are determined by weighting the bidder and target abnormal returns by the market capitalization on day -42 .

	Target CAR			Initial Bidder CAR			Combined CAR		
	N (Average V_T)	Runup ($-41,-2$)	Ann'ct ($-1,1$)	N (Average V_B)	Runup ($-41,-2$)	Ann'ct ($-1,1$)	N (Av. V_T/V_B)	Runup ($-41,-2$)	Ann'ct ($-1,1$)
A: Entire sample									
Mean	\$9,298	0.0680	0.1461	15,987	0.0049	0.0073	4,803	0.0072	0.0106
Median	(\$641,951)	0.0516	0.1234	(3,752,262)	-0.0024	-0.0005	(0.4445)	0.0070	0.006
Z		25.2701	102.2990		-2.1463	-2.5297		4.2496	14.605
% positive		0.6231	0.8271		0.4924	0.4939		0.5259	0.5640
B: Subsamples based on market capitalization on day -42									
Lowest quartile									
Mean	2,324	0.1019	0.1472	3,995	0.0492	0.0404	1,200	0.0009	-0.000
Median	(11,207)	0.0708	0.1200	(28,762)	0.0154	0.0087	(0.0195)	-0.0005	-0.001
Z		11.9283	46.8157		5.5730	21.7874		0.5042	0.1303
% positive		0.6248	0.7900		0.5357	0.5827		0.4958	0.4858
Highest quartile									
Mean	2,323	0.0365	0.1327	10,480	-0.0122	-0.0049	1,201	0.0155	0.0279
Median	(2,372,966)	0.0385	0.1156	(5,698,863)	-0.0073	-0.0035	(1.3891)	0.0149	0.019
Z		11.2752	51.6770		-6.0704	-17.5109		4.1736	15.032
% positive		0.6117	0.8429		0.4757	0.4599		0.5612	0.6295

(Continued)

Table 7 (Continued)

	Target CAR			Initial Bidder CAR			Combined CAR		
	N	Runup (-41,-2)	Ann'ct (-1,1)	N	Runup (-41,-2)	Ann'ct (-1,1)	N	Runup (-41,-2)	Ann'ct (-1,1)
C: Subsamples based on the public status of the bidder and target firms									
Public target									
Mean	9,298	0.0680	0.1461	6,301	0.0065	-0.0087	4,803	0.0072	0.0106
Median		0.0516	0.1234		0.0012	-0.0066		0.0070	0.0067
Z		25.2701	102.2990		0.5387	-19.0462		4.2496	14.6057
% positive		0.6231	0.8271		0.5034	0.4269		0.5259	0.5640
Private target									
Mean				9,686	0.0040	0.0176			
Median					-0.0051	0.0029			
Z					-3.1918	12.1118			
% positive					0.4852	0.5375			

Table 8
Cumulative abnormal announcement returns in control contests (continued from Table 15.7).

	Target CAR			Initial Bidder CAR			Combined CAR		
	N	Runup (-41,-2)	Ann'ct (-1,1)	N	Runup (-41,-2)	Ann'ct (-1,1)	N	Runup (-41,-2)	Ann'ct (-1,1)
D: Subsamples based on form of initial bid									
Merger									
Mean	6,836	0.0619	0.1338	13,995	0.0050	0.0069	3,939	0.0071	0.0060
Median		0.0481	0.1134		-0.0024	-0.0008		0.0070	0.0037
Z		20.7051	88.2153		-2.2479	-3.8858		3.5536	7.7429
% positive		0.6181	0.8212		0.4921	0.4920		0.5268	0.5380
Tender offer									
Mean	2,320	0.0868	0.1881	1,468	0.0060	0.0076	837	0.0090	0.0335
Median		0.0693	0.1707		0.0006	0.0011		0.0073	0.0232
Z		14.9492	52.7321		0.5420	0.9110		2.6312	18.4987
% positive		0.6427	0.8573		0.5014	0.5123		0.5245	0.6941
E: Subsamples based on method of payment of initial offer									
All-Cash									
Mean	2,846	0.0765	0.2023	1,857	-0.0039	0.0081	996	0.0011	0.0285
Median		0.0523	0.1797		-0.0027	0.0025		0.0039	0.0170
Z		15.0345	65.3668		-1.1140	7.7136		1.4279	18.6150
% positive		0.6283	0.8949		0.4890	0.5315		0.5120	0.6837

(Continued)

Table 8 (Continued)

	Target CAR			Initial Bidder CAR			Combined CAR		
	N	Runup (-41,-2)	Ann'ct (-1,1)	N	Runup (-41,-2)	Ann'ct (-1,1)	N	Runup (-41,-2)	Ann'ct (-1,1)
E: Subsamples based on method of payment of initial offer									
All-Stock									
Mean	2,163	0.0680	0.1396	5,189	0.0096	0.0025	1,909	0.0092	-0.0030
Median		0.0533	0.1215		-0.0003	-0.0044		0.0083	-0.0016
Z		12.6045	46.7639		0.8922	-10.0304		3.0591	-2.5634
% positive		0.6301	0.8174		0.4993	0.4531		0.5343	0.4819
F: Subsamples based on time period of initial offer									
1991-1995									
Mean	1,601	0.0608	0.1344	3,654	0.0102	0.0169	941	0.0012	0.0131
Median		0.0485	0.1141		-0.0027	0.0017		0.0019	0.0079
Z		9.0822	43.0355		-0.9762	6.6646		0.4272	6.0191
% positive		0.6121	0.8189		0.4910	0.5216		0.5090	0.5770
1996-2000									
Mean	3,008	0.0818	0.1564	5,464	0.0039	0.0074	1,816	0.0099	0.0072
Median		0.0674	0.1372		-0.0017	-0.0008		0.0108	0.0052
Z		16.6761	56.6973		-0.3038	-1.4063		3.6605	5.9602
% positive		0.6483	0.8328		0.4941	0.4929		0.5391	0.5435

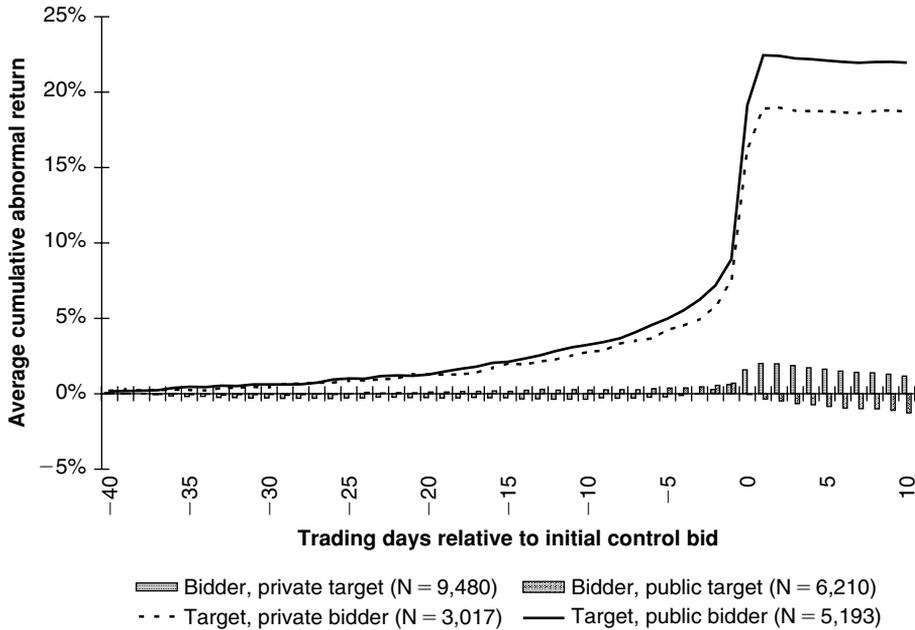


Fig. 10. Percent average cumulative abnormal stock returns to targets and initial bidders from day -40 through day 10 relative to the initial control bid. U.S. targets 1980-2005.

v. tender offer (Panel D), the payment method (Panel E), and, finally, the time period (Panel F). CAR is shown for the target, the initial bidder, and the value-weighted sum of the bidder and target CARs. For illustrative purposes, Figure 10 plots the daily cumulative abnormal returns from day -40 through day 10 relative to the initial offer announcement, classified by the public status of the bidder and target.¹⁰¹ The cumulative abnormal returns to targets are somewhat greater when the bidder is public than when the bidder is private. Moreover, bidder returns are somewhat greater when the target is private than when the target is public.

Several overall conclusions emerge from the results in Tables 7 and 8 that are broadly consistent with the conclusions from the extant literature, including those listed in Table 6:

(1) *Target CARs*

- (a) The average target CAR is positive and significant in all samples, over both the runup and the announcement period.

¹⁰¹ The cumulative abnormal returns shown in the graph are estimated by including a dummy variable for each of the days in the (-42, +10) interval and adding the estimated dummy coefficients.

- (b) The runup typically constitutes about one-third of the total runup plus announcement CAR. The largest target CAR occurs in all-cash offers (Panel E), where the sum of the runup and the announcement CAR is 28%.

(2) *Combined CARs (value-weighted)*

- (a) The average combined CAR is positive and significant over the runup period for 9 of the 10 sample categories, and insignificant for the lowest size-quartile bidders (Panel B). The average combined runup-period CAR for the total sample of 4,803 cases is 0.7% with a z -value of 4.3.
- (b) The average combined CAR is positive and significant for the announcement period for 8 of the 10 samples, insignificant in one (Panel E, for bidders in the lowest size quartile), and significantly negative in one (Panel E, when the payment method is all-stock). The average combined announcement-period CAR for the total sample of 4,803 cases is 1.06% with a z -value of 14.6.
- (c) For the total sample (Panel A), the sum of the combined CAR for the runup and announcement periods is a significant 1.79%.

(3) *Bidder CARs*

- (a) Announcement-period CAR is 0.73% for the total sample, but with a negative and significant z -statistic of -2.53 .¹⁰² The median CAR is -0.05% , and the percentage of bidders with negative CAR is 49%.
- (b) The average announcement-period bidder CAR is significantly positive for the lowest bidder size-quartile (Panel B), when the target is private (Panel C), in all-cash bids (Panel E), and in the period 1991–1995 (Panel F). It is significantly negative for bidders in the highest size-quartile (Panel F), when the target is public (Panel C), when the initial bid is a merger (Panel D), and when the payment method is all-stock (Panel E).
- (c) The runup period bidder CAR is positive but largely insignificant, typically in the range 0.05% to 0.10%. Bidders in the lowest size quartile have a significantly positive average runup of 4.9%, and the average runup is a significant -1.2% for bidders in the highest quartile (Panel B). In these two subsamples, the runup is greater than the announcement return (and of the same sign).

This confirms several of the conclusions of the studies listed in Table 6, in particular Fuller, Netter, and Stegemoller (2002), Moeller, Schlingemann, and Stulz (2004, 2005), Bradley and Sundaram (2006), Savor (2006), Moeller, Schlingemann, and Stulz (2007), Barger, Schlingemann, Stulz, and Zutter (2007), and Betton, Eckbo, and Thorburn (2007, 2008b,c). Table 9 further highlights the impact of key offer characteristics on bidder announcement returns. The combination of large bidder (here in the upper-size quartile), payment in all-stock, and the target being a public company represents

¹⁰² The average CAR and its z -statistic may differ in sign.

Table 9

Summary of initial bidder three-day announcement-period abnormal returns, 1980–2005.

Initial bidder cumulative abnormal returns for the window $-1, 1$ relative to the initial control bid. Large bidders are bidders in the upper quartile of market capitalization on day -42 (in constant 2000 dollars) and small bidders are bidders in the lower quartile of market capitalization on day -42 . The cutoff values for the upper and lower quartiles are \$134 million and \$2.2 billion respectively. The method of payment is determined from the SDC 100% cash or 100% stock consideration field. The public status of the target is determined from SDC. ** represents significance at the 1% level (2 sided test).

Sample	Public targets		Private targets	
	N	CAR(-1, 1)	N	CAR(-1, 1)
A: Large bidders				
All-stock	769	-0.0221**	445	0.0010
All-cash	439	-0.0030**	88	0.0026**
B: Small bidders				
All-stock	495	-0.0006	872	0.0646**
All-cash	190	0.0306**	184	0.0176**

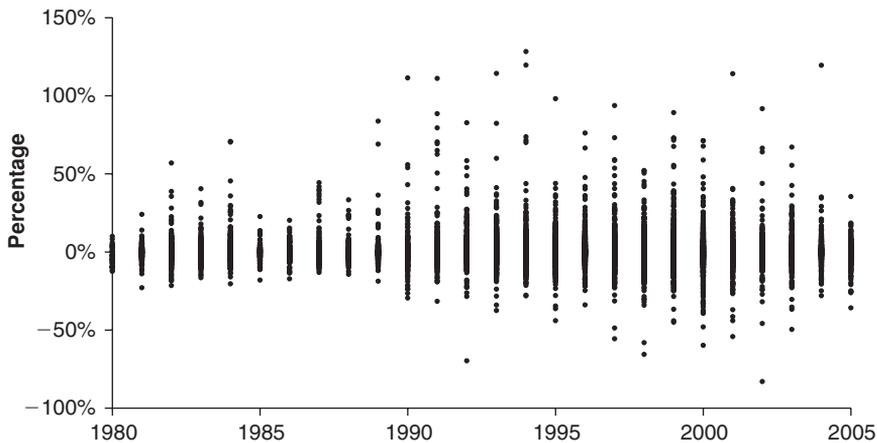
a worst-case scenario with average bidder announcement-period CAR of -2.21% . The best-case scenario is the combination of a small bidder (lower size-quartile), private target, and, again, *all-stock* as payment. This produces an average bidder announcement-period CAR of 6.46% . Thus, a major driver of negative bidder returns is not, as previously thought, the all-stock payment. Rather, the two key drivers appear to be the target's status as public or private and the bidder size. As shown next, bidder size was particularly large in 1999 and 2000, which suggests that the bidder size effect may also represent a unique time-period effect.

4.3. Dollar returns

Figure 11 presents an annual scatter plot of the three-day announcement period bidder abnormal returns $CAR(-1, 1)$ (Panel A) and the raw bidder dollar change from closing of day -2 to closing of day 1. As first noticed by Moeller, Schlingemann, and Stulz (2004, 2005), the distributions of the $CAR(-1, 1)$ and the dollar change are dramatically different. Betton, Eckbo, and Thorburn (2008c) extend the sample period to 2005 and discover that the period 1998–2000 is unusual not only relative to the pre-1998 period, but also relative to the post-2000 years. Figure 12 further illuminates the role and effect of bidder size. Panel A plots bidder market values (in constant 2000 dollars) as of day -2 . Clearly, bidders in the 1998–2000 period were unusually large.

Betton, Eckbo, and Thorburn (2008c) examine the distribution of dollar differences in Figure 11B. They identify 125 firms in the lower 1% and 129 firms in the upper 1%. In *both* groups, the dominant sector was manufacturing and the dominant firm was Cisco.

Panel A: Cumulative abnormal return (-1,1)



Panel B: Dollar change (-2,1)

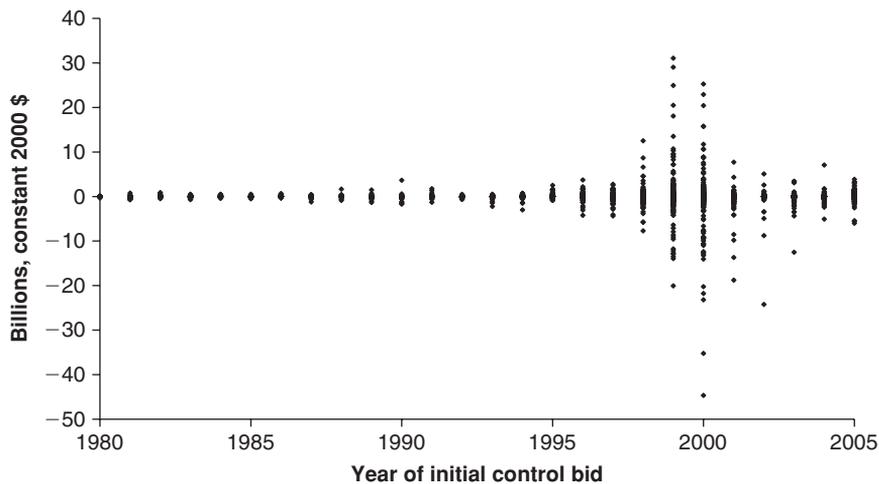
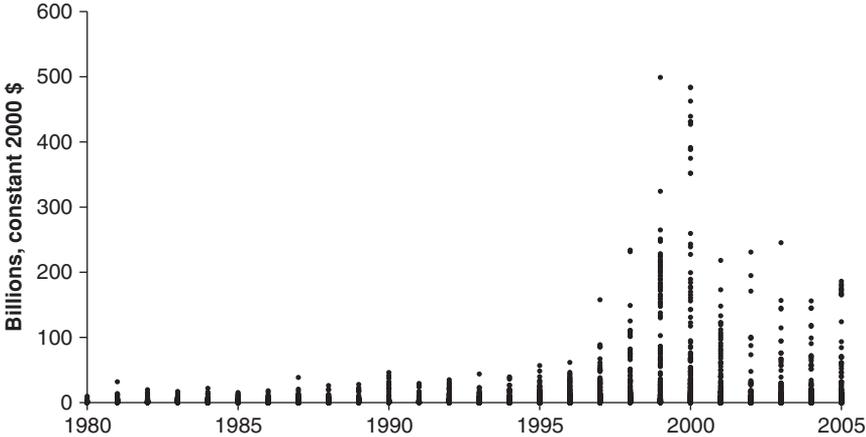


Fig. 11. Announcement-period abnormal returns and dollar-changes for 12,898 successful initial bidders, 1980–2005. Panel A is a scatter plot of the announcement period abnormal stock returns, $CAR(-1, 1)$. Panel B is a scatter plot of the bidders’ announcement-period dollar changes. Dollar changes are calculated as the change in market capitalization from day -2 to day 1 (relative to initial control bid) and converted to constant 2000 dollars using the CPI.

Panel C: Market value day -2



Panel D: Aggregate dollar abnormal returns

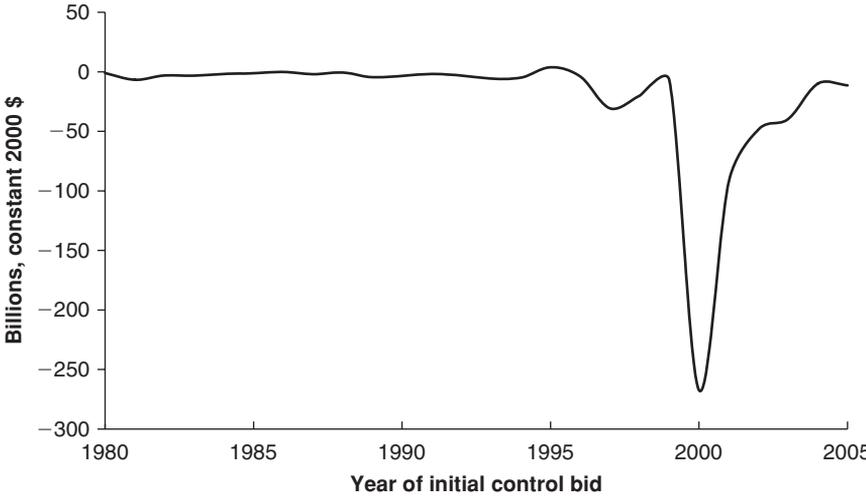


Fig. 12. The market values and announcement-period aggregate dollar abnormal return to 12,898 successful initial bidders, 1980–2005. Panel C is a scatter plot of the market value in constant 2000 dollars of successful initial bidders on day -2 relative to the initial control bid announcement. Panel D is a plot of the aggregate dollar abnormal returns earned by successful initial bidders over the window (-2,1) Aggregate dollar abnormal returns are calculated by multiplying the bidder market capitalization on day -2 by the cumulative abnormal return and then summing over the year.

Cisco appears with 62 deals in the total sample, with an average (constant dollar) market capitalization of \$180 billion. Other frequent acquirers are Union Planters with 40 deals (market cap \$2.5 billion) and BancOne with 40 deals (market cap \$8.1 billion).¹⁰³ Of these 62 deals made by Cisco, 26 appear in the group with the highest 1% CAR(-1, 1), with 10 bids in 99 and 6 bids in 2000.¹⁰⁴ Furthermore, Cisco appears 17 times in the lower 1% group (distributed evenly over the three-year period 1999–2001).¹⁰⁵

Panel D in Figure 12 plots the aggregate dollar CAR(-1, 1) for each sample year (combining Panel A of Figure 11 and Panel C, Figure 12). The large negative spike in the years 1999 and 2000 is what Moeller, Schlingemann, and Stulz (2005) characterize as a “wealth destruction on a massive scale.” It is massive indeed; yet, it is important not to forget that it is caused by a few very large firms that decided to bid in this particular period and that, on average, made value-decreasing acquisitions. Note that Panel D of Figure 12 does not eliminate overlapping abnormal returns to frequent acquirers (which may be one reason why the spike is greater here than in Moeller, Schlingemann, and Stulz (2005)). Also, removing Cisco from the sample changes the minimum of the spike to -\$198 billion from -\$267 billion. The ultimately unanswered question is whether the spike is a bidder size effect or a year fixed effect (or a combination of the two). At this point, there appears to be no explanation for why the large firms decided to enter the market for corporate control in 1998–2001, and then only to leave again.

Finally, Figure 13 shows the frequency distribution for the dollar announcement abnormal return for the total sample of successful initial bidders, classified by the time period and the method of payment (all-stock or all-cash). Panel A covers the total sample, while Panel B is restricted to the 1995–2005 period. There is very little difference between the two panels (in both panels, all-stock offers are slightly skewed relative to all-cash bids). Thus, the distribution in Panel B is not noticeably affected by the extreme cases from the 1998–2000 period. Until we reach a better understanding of the unique 1998–2000 period, estimates of the expected gains from bidding are best obtained from overall distributions such as those in Figure 13.

4.4. Estimating expected bidder gains

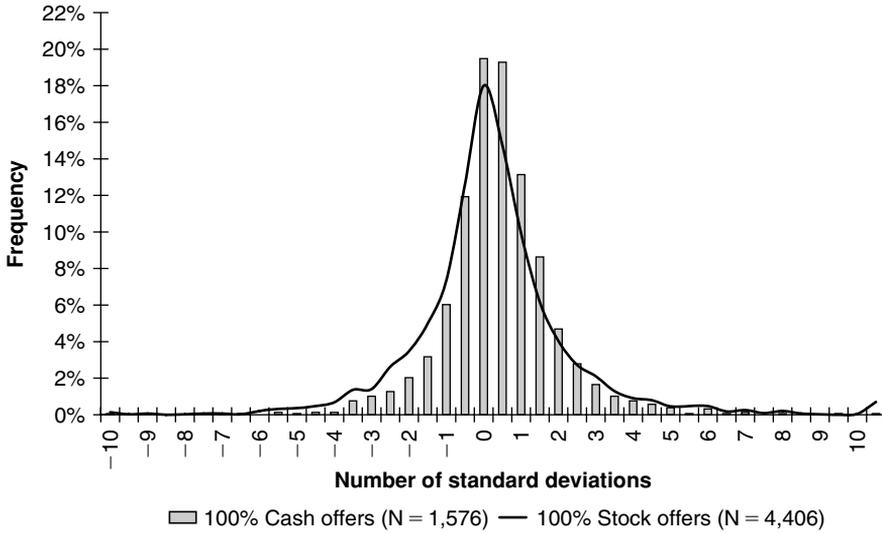
Referring back to Figure 2, let CAR_s and CAR_f denote average bidder gains conditional on the offer succeeding or failing, respectively. Moreover, let $\pi(x_j)$ denote the market's estimate of the probability that an offer by bidder j will succeed conditional on the offer characteristics x_j . As discussed in Section 3, important offer characteristics include the offer premium, toehold, payment method, and hostility. The bid announcement causes

¹⁰³ The largest bidders are CitiGroup (market cap \$245 billion and two deals), Microsoft (market cap \$190 billion and seven deals).

¹⁰⁴ The next most common bidders in the upper 1% group are Johnson & Johnson with six cases and Tyco with five cases.

¹⁰⁵ The next most common bidder in the lower 1% group is Lucent with six bids.

Panel A: Successful initial bidders 1980–2005



Panel B: Successful initial bidders 1995–2005

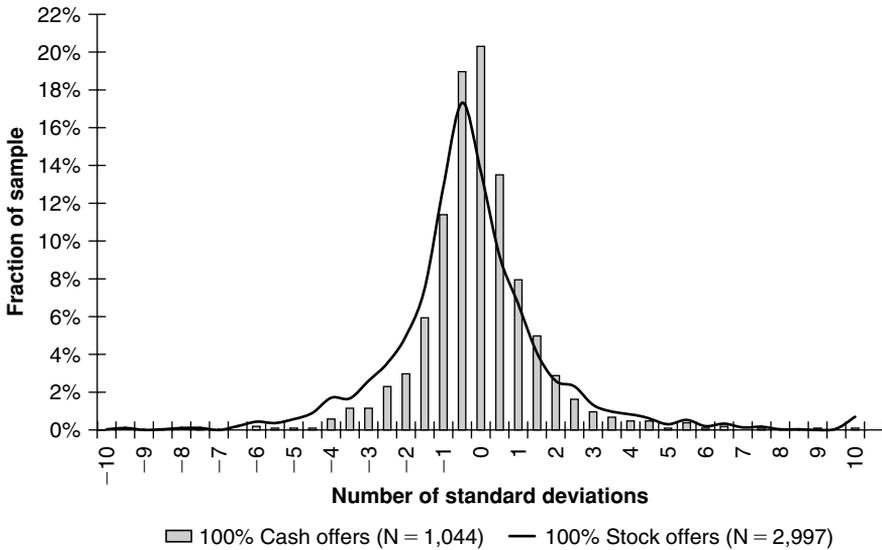


Fig. 13. Standardized dollar abnormal returns to successful initial bidders by method of payment, 1980–2005 (Panel A) and 1995–2005 (Panel B). Dollar abnormal returns are calculated as the change in market capitalization (in constant 2000 dollars) from day -2 to day 1 relative to initial control bid. Dollar abnormal returns are then standardized by the historical average and standard deviation of non-overlapping 3 day dollar market value changes measured over the period -293 to -42 relative to the initial control bid. Sample windows are $(-45, -42)$, $(-48, -45)$, etc.

rational investors to impound the *expected* bidder takeover gain into the bidder's share price, generating the following announcement return:

$$\text{CAR}(-1, 1) = \text{CAR}_s\pi(x) + \text{CAR}_f(1 - \pi(x)) \quad (20)$$

The empirical objective is to estimate the bidder gain CAR_s from successful takeovers. The common procedure is to form the average cumulative return in the subsample of ex-post successful bids. This average is either the average $\text{CAR}(-1, 1)$ for successful bids or the average abnormal bidder return cumulated all the way through the end of the contest (at which point $\pi = 1$). Note that, since these ex-post averages necessarily restrict the sample to successful bids, they ignore information in the abnormal returns to ultimately unsuccessful bids. Also, cumulation to the end of the contest (typically, six months for mergers) adds noise relative to that of the three-day estimate $\text{CAR}(-1, 1)$.

Betton and Eckbo (2000) develop an alternative estimation procedure that exploits the information in *all* initial bids (also the ultimately unsuccessful ones) in order to extract an estimate of CAR_s . The idea is to view Equation (20) as a cross-sectional regression where $\text{CAR}_j(-1, 1)$ is the dependent variable, $\pi(x_j)$ is the regressor, and CAR_s and CAR_f are estimated directly as regression parameters. Using a sample of 1,353 initial tender offers (both successful and unsuccessful), Betton and Eckbo (2000) find that the parameter CAR_s for bidders is statistically insignificantly different from zero. Thus, the expected net bidder return from initiating tender offers is nonnegative. Moreover, they estimate CAR_f to be significantly positive, which they suggest in part reflects the expected gain to the unsuccessful bidder from selling its toehold in the target to the ultimately winning (rival) bidder.¹⁰⁶

This alternative estimation procedure also allows one to test the effect on bidder expected returns of changing one or more of the offer parameters in the vector x . That is, when estimated, the right-hand-side of Equation (20) forms the predicted (conditional) value $E[\text{CAR}(-1, 1) | x]$. As modeled in Equation (20), changes in x affect bidder expected gains by changing $\pi(x)$. Tests of the bidder valuation impact of changing the offer parameters x amount to testing whether the partial derivative of $E[\text{CAR}(-1, 1) | x]$ with respect to x is significantly different from zero. For example, both Betton and Eckbo (2000) and Betton, Eckbo, and Thorburn (2007) report that this partial derivative with respect to the bidder's toehold is positive and significant.

4.5. Post-takeover (long-run) abnormal returns

Several studies report evidence of post-merger underperformance, particularly when using the matched-firm buy-and-hold technique (implemented below). For example, Rau and Vermaelen (1998) find that merged firms with low book-to-market ratio tend

¹⁰⁶ In Betton and Eckbo (2000), 48% of all initial bidders have a positive toehold. Their sample period is 1971–1990, with the largest toehold frequency prior to the mid-1980s (consistent with Figure 8).

to underperform, while Loughran and Vijh (1997) report underperformance when the merger is paid in stock (while all-cash mergers overperform). Moeller, Schlingemann, and Stulz (2004) report insignificant long-run (36-month) post-merger performance. Harford (2005) finds some evidence suggestive of relatively poor post-merger performance for the largest bidders. Moeller, Schlingemann, and Stulz (2005) find significantly negative long-run buy-and-hold returns to portfolios of “large loss deal” bidders. Rosen (2006) reports evidence that mergers that take place during periods of high general merger activity tend to have high pre-merger share prices followed by low post-merger performance.

There are at least three possible explanations for the post-merger underperformance. First, under behavioral arguments, the market slowly corrects its overvaluation of the merged firms’ shares (Shleifer and Vishny, 2003; Baker, Ruback, and Wurgler, 2007). Second, a neoclassical argument is that the merger is a response to a negative industry shock and that the merged firm performs better than it would have without the merger—which may still be worse than the pre-merger performance (Harford, 2005). Third, the apparent underperformance is an artifact of the econometric methodology itself. The rest of this section sheds light on the third hypothesis.

We begin the long-run abnormal return analysis with the matched firm technique, and then we show results when returns are risk-adjusted using factor regressions applied to portfolios of merged firms.¹⁰⁷ Our sample drops to 15,298 mergers after imposing the following additional restrictions: (1) The sample period is 1980–2003 to allow a minimum of three years of post-merger stock returns. (2) The merged firm is found on CRSP and is listed on NYSE/AMEX/Nasdaq for at least one year following the year of the effective date of the merger. (3) The merged firm must have Compustat information on equity book-to-market ratio (B/M) to allow selection of a matched firm based on size and B/M.¹⁰⁸

4.5.1. Buy-and-hold returns

The typical buy-and-hold experiment involves buying the merged firm’s stock in the month following the merger completion month (effective merger date) and holding the stock for a period of three to five years or until delisting, whichever comes first. In a sample of N issues, the average return over a holding period of T months is computed

¹⁰⁷ We thank Øyvind Norli for his generous programming assistance. The econometric methodology implemented below is identical to the one used by Eckbo, Masulis and Norli (2007) when estimating the long-run performance following security offerings.

¹⁰⁸ Book value is defined as “the Compustat book value of stockholders equity, plus balance sheet deferred taxes and investment tax credits (if available), minus the book value of preferred stock. Depending on availability, we use the redemption, liquidation, or par value (in that order) to estimate the value of preferred stock” (Fama and French, 1993, p. 8). If available on Compustat, the book value of equity is also measured at the end of the year prior to the year of the acquisition. If this book value is not available, we use the first available book value on Compustat starting with the acquisition year and ending with the year following the acquisition year.

as the average cumulative (T-period) return, also referred to as $\overline{\text{BHR}}$ (for buy-and-hold return):

$$\overline{\text{BHR}} \equiv \sum_{i=1}^N \omega_i \left[\prod_{t=\tau_i}^{T_i} (1 + R_{it}) - 1 \right] \quad (21)$$

where R_{it} denotes the return to stock i over month t and ω_i is stock i 's weight in forming the average holding-period return ($\omega_i = 1/N$ when equal-weighting). The effective holding period for stock i is T_i , where T_i in the analysis below is either five years or the time until delisting or the occurrence of a new merger, whichever comes first).^{109, 110} The matched-firm technique equates the *expected* return to merged firms with the *realized* return to a nonmerging firm, usually matched on firm characteristics such as industry, size, and book-to-market ratio. The abnormal or unexpected return BHAR is then

$$\text{BHAR}_{\text{Issuer}} \equiv \text{BHR}_{\text{Issuer}} - \text{BHR}_{\text{Matched firm}} \quad (22)$$

Table 10 shows average five-year percent buy-and-hold returns for our sample and for firms matched on size and B/M. The matched firms are selected from all CRSP-listed companies at the end of the year prior to the year of the merger completion and companies that are not in our sample of mergers for a period of five years prior to the offer date. Moreover, the matching procedure is as follows: We first select the subset of firms that have equity market values within 30% of the equity market value of the

¹⁰⁹ Kothari and Warner (1997), Barber and Lyon (1997) and Lyon, Barber, and Tsai (1999) provide simulation-based analysis of the statistical properties of test statistics based on long-run return metrics such as BHR. Kothari and Warner (2007) survey the main statistical conclusions from this analysis.

¹¹⁰ An alternative to $\overline{\text{BHR}}$ is to estimate the average monthly return to a strategy of investing in the stocks of merged firms and hold these for up to T periods. The T -period return would then be formed as the *cumulative average* (portfolio) return, or

$$\overline{\text{CMR}} \equiv \prod_{t=\tau}^T \left[1 + \frac{1}{\omega_t} \sum_{i=1}^{N_t} R_{it} \right] - 1$$

As noted by Kothari and Warner (2007), depending on the return generating process, the statistical properties of $\overline{\text{BHR}}$ and $\overline{\text{CMR}}$ can be very different. Notice also that while $\overline{\text{CMR}}$ represents the return on a feasible investment strategy, $\overline{\text{BHR}}$ does not. You obtain $\overline{\text{CMR}}$ by investing one dollar in the first security issue at the beginning of the sample period, and then successively rebalancing this initial investment to include subsequent issues as they appear (and N increases), all with a T -period holding period. In contrast, $\overline{\text{BHR}}$ is formed in event time—and thus presumes prior knowledge of the magnitude of N . Thus, estimates of $\overline{\text{CMR}}$ are better suited than estimates of $\overline{\text{BHR}}$ to address the question of whether investors have an incentive to take advantage of a potential market mispricing of merged firms' securities. Most of the empirical studies using the matched firm technique report results based on $\overline{\text{BHR}}$, which we follow here. In the subsequent section, we discuss portfolio benchmark returns based on asset pricing models, which use the return concept $\overline{\text{CMR}}$ on a monthly basis, that is, without the T -period cumulation.

Table 10

Percent average five-year buy-and-hold stock returns ($\overline{\text{BHR}}$) for merged firms, non-merging matched firms, and the difference between merged and matched firms, 1980–2006.

Buy-and-hold percent returns are defined as:

$$\overline{\text{BHR}} \equiv \sum_{i=1}^N \omega_i \left[\prod_{t=\tau_i}^{T_i} (1 + R_{it}) - 1 \right] \times 100.$$

The sampling of merged firms starts in February 1980 and ends in December 2003, while the return holding period is allowed to continue to December 2006. The total sample of merged firms with information on matched firms is 15,298. The non-merging matched firms are firms that did not merge in the previous five-year period and have similar total equity size and book-to-market ratio. When equal-weighting, $\omega_i \equiv 1/N$, and when value-weighting, $\omega_i = MV_i/MV$, where MV_i is the firm's common stock market value at the start of the holding period and $MV = \sum_i MV_i$. The abnormal buy-and-hold returns shown in the column marked "Diff" represent the difference between the $\overline{\text{BHR}}$ in the "Merged" and "Match" columns. "N" is the total number of issues. The p -values for equal-weighted abnormal returns are p -values of the t -statistic using a two-sided test of no difference in average five-year buy-and-hold returns for issuer and matching firms. The p -values for the value-weighted abnormal returns are computed using $U \equiv \omega'x/(\sigma\sqrt{\omega'\omega})$, where ω is a vector of value weights and x is the corresponding vector of differences in buy-and-hold returns for issuer and match. Assuming that x is distributed normal $N(\mu, \sigma^2)$ and that σ^2 can be consistently estimated using $\sum_i \omega_i(x_i - \bar{x})^2$, where $\bar{x} = \sum_i \omega_i x_i$, U is distributed $N(0, 1)$.

Merger sample period	N	Equal-weighted $\overline{\text{BHR}}$				Value-weighted $\overline{\text{BHR}}$			
		Merged	Matched	Diff	$p(t)$	Merged	Matched	Diff	$p(t)$
1980–2003	15,298	62.6%	84.6	–21.9	0.000	32.6	49.6	–17.1	0.000
1980–1989	3,815	83.6	95.1	–11.5	0.003	102.0	113.9	–12.0	0.120
1990–2003	11,483	55.7	81.1	–25.4	0.000	26.7	44.2	–17.5	0.000

merged firm. This subset is then ranked according to book-to-market ratios. The size and book-to-market matched firm is the firm with the book-to-market ratio, measured at the end of the year prior to the merger year, that is closest to the merged firm's ratio. Matched firms are included for the full five-year holding period or until they are delisted, whichever occurs sooner. If a match delists, a new match is drawn from the *original* list of candidates described earlier.

Table 10 shows that, when using either the total sample period 1980–2003 or the sub-period 1990–2003, merged firms on average underperform their matched firms whether $\overline{\text{BHR}}$ is formed using equal weights or value weights. For the total sample period, the difference between the equal-weighted $\overline{\text{BHR}}$ for merged and matched firms is –21.9% and –17.1% with value-weighting, both with p -values of 0.00. About 20% of the sample mergers take place in the 1980s, and here the underperformance is evident only for equal-weighted $\overline{\text{BHR}}$. For the subperiod 1990–2003 the underperformance estimates are again highly significant and slightly greater than for the total period –25.4% using the equal-weighted estimate of $\overline{\text{BHR}}$.

4.5.2. Portfolio performance estimation

An alternative to the buy-and-hold matched firm technique is to form portfolios of event firms rolling forward in calendar time and to estimate portfolio performance. Monthly portfolio (excess) returns are regressed on a set of risk factors presumed to generate expected returns. The regression intercept—or alpha—is the measure of average monthly abnormal return. We estimate alphas in a model with the following five risk factors:

$$r_{pt} = \alpha_p + \beta_1 \text{RM} + \beta_2 \text{SMB}_t + \beta_3 \text{HML}_t + \beta_4 \text{UMD} + \beta_5 \text{LMH} + e_t \quad (23)$$

where r_{pt} is the excess return to an equal-weighted portfolio of issuers, RM is the excess return on the CRSP value-weighted market index. SMB and HML are the Fama and French (1993) size and book-to-market factors. UMD is a momentum factor inspired by Carhart (1997) and constructed as the return difference between the one-third highest and the one-third lowest CRSP performers over the past 12 months. LMH is the Eckbo and Norli (2005) turnover factor, defined as a portfolio long in low-turnover stocks and short in high-turnover stocks.

We report estimates for three different portfolios: (1) the merging firms, (2) the nonmerging matched firms, and (3) the zero-investment portfolio that is long in merged firms and short in matched firms. The zero-investment portfolio has the advantage that it controls for any omitted risk factor with identical factor betas across issuer and matched firm, effectively combining the matched-firm and asset pricing techniques. For example, suppose the true set of risk factors is given by the vector F and that only a subset F_1 of this vector is included in the regression model, with the complement vector F_2 omitted. Let B denote merged firm and M matched firm. The merger-match zero-investment portfolio regression is then

$$r_B - r_M = (\alpha_B - \alpha_M) + (\beta_{1B} - \beta_{1M})F_1 + \epsilon \quad (24)$$

where $\epsilon = (\beta_{2B} - \beta_{2M})F_2 + u$, where u is a white noise error term. The definition of a “good” match is that β_B is close to β_M . Given a good match, the zero-investment portfolio will have both a small alpha and values of beta close to zero. Alternatively, if the matching technique fails to control for important risk factors, then the zero-investment portfolio will contain significant factor loadings.

Table 11 reports the alphas and factor loadings (betas) for our three portfolios and the five-factor model. Portfolio formation starts in 1980 and ends in 2003. The table shows estimates for both equal weighting and value weighting of the firms in the portfolios. Given the large portfolios, the R^2 are high, approximately 0.94. Notice also that the zero-investment portfolios receive R^2 of close to 0.20, with several significant factor loadings, indicating that the usual size and B/M matching procedure typically yields firms that have different expected returns than the event firms. This in turn means that the “abnormal” return reported earlier in Table 11 in part reflects differences in *expected* returns for merged and matched firms.

The key result in Table 11 is that the alphas for the portfolio of merged firms are small and statistically insignificant for both equal- and value-weighted portfolios. Thus, we

Table 11

Alphas and factor loadings for five-year rolling portfolios of merged firms, non-merging matched firms, and long-short merged-matched firms, 1980–2006.

The merged-matched portfolio is a zero-investment portfolio that is long in the merged firms and short in the non-merging matched firms. The portfolios are either equal-weighted (“EW”) or value-weighted (“VW”). The non-merging matched firms are firms that did not merge in the previous five-year period and have similar total equity size and book-to-market ratio. The portfolios are formed starting in February 1980: a firm is added to the portfolio in the month following the month of the effective merger date and held for the minimum of five years and until delisting. The merger sampling stops in 12/2003, yielding a total of 15,298 successful mergers with data on size and book-to-market matched firms. The abnormal return estimation ends in December 2006. Abnormal returns are estimated using the following asset pricing model:

$$r_{pt} = \alpha_p + \beta_1 \text{RM} + \beta_2 \text{SMB}_t + \beta_3 \text{HML}_t + \beta_4 \text{UMD} + \beta_5 \text{LMH} + e_t$$

where r_{pt} is the portfolio excess return, RM is the excess return on the CRSP value weighted market index, SMB and HML are the Fama and French (1993) size and book-to-market factors, UMD is a momentum factor constructed as the returns difference between the one-third highest and the one-third lowest CRSP performers over the past 12 months, and LMH is the Eckbo and Norli (2005) turnover factor (a portfolio long in low-turnover stocks and short in high-turnover stocks). The coefficients are estimated using OLS. Standard errors are computed using the heteroskedasticity consistent estimator of White (1980). The numbers in parentheses are p -values. R^2 is the adjusted R-squared.

Portfolio	α_p	RM	SMB	HML	UMD	LMH	R^2
EW-merger	0.08 (0.434)	1.05 (0.000)	0.62 (0.000)	0.26 (0.000)	-0.28 (0.000)	-0.13 (0.070)	0.943
EW-match	0.23 (0.003)	0.97 (0.000)	0.52 (0.000)	0.24 (0.000)	-0.19 (0.000)	-0.14 (0.019)	0.949
EW-zero	-0.15 (0.050)	0.09 (0.000)	0.11 (0.000)	0.02 (0.333)	-0.09 (0.000)	0.01 (0.785)	0.239
VW-merger	0.02 (0.838)	1.07 (0.000)	-0.08 (0.029)	-0.10 (0.016)	-0.05 (0.028)	-0.01 (0.828)	0.935
VW-match	0.11 (0.076)	1.00 (0.000)	-0.14 (0.000)	-0.06 (0.016)	-0.02 (0.266)	0.07 (0.100)	0.949
VW-zero	-0.09 (0.288)	0.06 (0.017)	0.06 (0.027)	-0.03 (0.386)	-0.03 (0.181)	-0.09 (0.071)	0.170

cannot reject the hypothesis of zero abnormal post-merger performance. Four of the five factor-mimicking portfolios have significant factor loadings, with the turnover-based factor producing a factor loading that is significant at the 10% level for equal-weighted portfolio returns.

Table 11 also shows that the empirical factor model misprices the equal-weighted portfolio of matched firms. The alpha of this portfolio is 0.23 with a p -value of 0.003. As a result, the portfolio of merged firms underperforms the matched portfolio (the alpha for the zero-investment portfolio is -0.15 with a p -value of 0.05). When equal-weighting returns, the factor model’s mispricing of the matched-firm portfolio is less significant, and now the alpha of the zero-investment portfolio is insignificantly different from zero.

In sum, when using the rolling portfolio technique, there is no evidence of abnormal stock returns following mergers. Moreover, our evidence that matched firms have significantly different factor loadings than merged firms undermines the notion that the underperformance reported in Table 10 represents truly negative abnormal stock returns.

5. Bondholders, executives, and arbitrageurs

5.1. Takeovers and bondholder wealth

Corporate mergers affect the wealth of the target and the acquiring firms' senior claimholders for the same reasons that they affect stockholders. Merger-induced synergies add security to outstanding bonds and therefore increase bond values, while value-reducing mergers reduce bond value. In addition, bondholders benefit from any co-insurance effect from combining the less than perfectly correlated cash flows of the bidder and target firms.¹¹¹ The coinsurance effect means that a merger that generates no synergies, and where the bidder firm neither overpays for the target nor manages to sell overpriced bidder stock to the target, nevertheless causes a wealth transfer from stockholders to bondholders (Galai and Masulis, 1976). The magnitude of this wealth transfer depends on the sensitivity of the bond payments to changes in firm value (bond risk), with greater potential valuation impact on ex-ante riskier bonds.¹¹² The coinsurance effect also reduces the risk of firm-specific human capital. This argument has led to a concern that entrenched managers seek empire building through conglomerate merger activity primarily in order to hedge the risk of their firm-specific human capital.

A difficulty facing bond studies is the lack of access to high-frequency data on bond values, particularly prior to the 1980s. One of the primary data sources is the Lehman Brothers Fixed Income Database. Most bonds do not have published transaction prices, and many of the reported prices are matrix prices. Matrix prices are reported when the bond does not trade or a dealer quote is unavailable. The matrix consists of prices of similar bonds that did trade, based on characteristics such as bond rating and maturity. Obviously, the effect of a merger does not show up in matrix prices (for other bonds), reducing power to reject the null of no price impact of the merger.

Kim and McConnell (1977) examine 2,286 mergers but find price data for 44 bonds of 39 firms only. In their sample of 2,870 mergers, Asquith and Kim (1982) find prices for 62 bonds, while the sample in Eger (1983) includes 33 acquirer bonds and 6 target bonds. The Dennis and McConnell (1986) bond sample contains 67 bonds of 39 acquirers and 27 bonds for 21 targets. Maquieira, Megginson, and Nail (1998) identify a large sample of 504 acquirer bonds and 124 target bonds of firms involved in 260 stock-for-stock mergers

¹¹¹ Levy and Sarnat (1970), Lewellen (1971), Higgins and Schall (1975).

¹¹² There is also a maturity effect: When the bonds of the bidder and target firms have different maturities, the shorter maturity bonds effectively gain seniority after the merger. This seniority effect is valuable because of the larger merged firm's asset base.

(the bulk of which took place prior to 1980). More recently, Billett, King, and Mauer (2004) examine 940 mergers and acquisitions from the period 1979–1997, identifying 818 bonds of 265 target firms and 3,083 bonds of 831 acquiring firms. Moreover, Penas and Unal (2004) use a sample of 282 bonds in 66 mergers between commercial banks during the period 1991–1997.¹¹³

The early studies found mixed evidence for the wealth effects of mergers on bidder bonds: excess bond returns (typically computed as the difference between monthly total return and the return on a bond index matched on rating and remaining maturity) are significantly positive in Eger (1983) and Maqueira, Megginson, and Nail (1998); insignificant in Kim and McConnell (1977) and Asquith and Kim (1982); and negative (marginally significant) in Dennis and McConnell (1986). Billett, King, and Mauer (2004) find zero or negative bidder bond excess returns, while Penas and Unal (2004) document significantly positive bidder bond returns for their sample of commercial bank mergers.

Early studies of target bond returns report insignificant excess returns to *target* bonds. This finding is surprising, as one would expect target bondholders to benefit from the typically large asset-base increase that comes with a merger with a bidder that is often several times larger than the target. However, with improved data, both Billett, King, and Mauer (2004) and Penas and Unal (2004) report significantly positive excess returns to target bonds. This finding may also reflect the increased use of event risk covenants in bonds issued in the 1990s.¹¹⁴ Penas and Unal (2004) conclude that the bond market views bank mergers as default-risk-reducing events. Billett, King, and Mauer (2004) conclude that there is no evidence of wealth transfers in the data, or that positive synergies expected from the corporate combinations tend to overshadow any wealth transfer that do exist.

5.2. Takeovers and executive compensation

Does the structure of CEO compensation packages affect the quality of takeover decisions? Or, as Lehn and Zhao (2006) put it: “Are Bad Bidders Fired?” The literature on optimal compensation presumes that a strong pay-performance sensitivity helps promote better acquisition decisions.¹¹⁵ There is evidence that target firms tend to underperform prior to becoming targets.¹¹⁶ Moreover, Mitchell and Lehn (1990), Martin

¹¹³ Warga and Welch (1993) also use this Lehman Brothers Fixed Income Database to study the bond wealth effects of leveraged buyouts, while Eberhart and Siddique (2002) use these bond data in their study of long-run bond returns following securities offerings. See Eckbo and Thorburn (2008a) and Eckbo, Masulis, and Norli (2007) for reviews.

¹¹⁴ A typical event risk covenant for mergers requires the company to repurchase the outstanding bonds at the full principal amount plus accrued interest, effectively insuring the bond against potentially value-decreasing control events (Lehn and Poulsen, 1992; Nash, Netter, and Poulsen, 2003).

¹¹⁵ See, for example, Murphy (1999) and Aggarwal (2008) for comprehensive reviews of the literature on executive compensation and pay-performance sensitivity.

¹¹⁶ Asquith (1983), Malatesta (1983). There is also evidence of poor operating performance prior to divisional sales. See Eckbo and Thorburn (2008a) for a review.

and McConnell (1991), Agrawal and Walkling (1994), and Kini, Kracaw, and Mian (1995, 2004) document that targets of hostile bids tend to show a prior history of value-decreasing acquisitions and that CEO turnover increases after hostile bids. Offenberg (2008) find evidence that CEOs of larger firms are more likely to be replaced following a series of poor acquisitions than CEOs of smaller firms. This is consistent with a disciplinary role played by the market for corporate control.

With the spread of the poison pill defense and the subsequent decline of hostile takeovers after the 1980s, the market for corporate control may have become a court of last resort—with internal governance structures being the primary mechanism for disciplining poor managers.¹¹⁷ Huson, Parrino, and Starks (2001) find that changes in the intensity of the takeover market over the period 1976–1994 are *not* associated with changes in the sensitivity of CEO turnover to firm performance. Their evidence suggests that changes in external and internal governance mechanisms have not significantly changed the likelihood that the CEO of a poorly performing firm will be replaced. They also suggest that the effectiveness of internal monitoring mechanisms is not dependent on the intensity of the takeover market. With data from 1979 through 1998, Kini, Kracaw, and Mian (2004) conclude that the corporate takeover market intercedes when internal control mechanisms are relatively weak or ineffective.

Lehn and Zhao (2006) show that managers who undertake value-reducing acquisitions in the period 1990–1998 face a significantly higher probability of being replaced than managers who make value-enhancing acquisitions, either by internal governance, takeovers, or bankruptcy. They also show that CEOs who cancel an acquisition after observing a reduction in their company's stock price face significantly lower replacement risk than their counterparts who proceed with value-reducing acquisitions. Among firms not subjected to takeover or bankruptcy, they find no association between a firm's governance characteristics and the probability that the CEOs who make value-reducing acquisitions are replaced.

Lehn and Zhao (2006) conclude that “corporate governance and the external market for corporate control generally work well in disciplining managers who pursue acquisitions to the detriment of their stockholders.” Moreover, they interpret their evidence of a lack of association between the CEO replacement probability and specific governance characteristics following bad takeovers as an indication that governance structures are on average optimally chosen. While this is one possible interpretation, an alternative view (which they recognize) is that governance structure is irrelevant as to the firing decision for the sample firms. Given the endogeneity of the governance structure (where the CEO herself plays a role), additional research is necessary to discriminate between these two positions.¹¹⁸

Lehn and Zhao (2006) also present evidence of relevance for the “market-driven acquisition” hypothesis of Shleifer and Vishny (2003) discussed above. This hypothesis implies that acquisitions that are followed by poor long-run bidder stock returns may

¹¹⁷ Mikkelsen and Partch (1997), Holmstrom and Kaplan (2001).

¹¹⁸ Himmelberg, Hubbard, and Palia (1999), Bhagat and Jefferis (2002), Hermalin and Weisbach (2003).

nevertheless be in the interest of bidder stockholders, provided the alternative of no merger would have been even worse. For example, it is tempting (with hindsight) to characterize AOL/Time Warner merger as a successful attempt by AOL's CEO Stephen Case to use overvalued stock as currency to acquire Time Warner's "hard" assets:

From our perspective, the central feature of this acquisition is not technological synergies, but rather the attempt by the management of the overvalued AOL to buy the hard assets of Time Warner to avoid even worse returns in the long run. In this acquisition, as in other deals involving high-technology acquirers with overvalued stock prices, long-run acquirer returns appear to be poor. However, according to our model, these returns are not as negative as they would have been had the acquisitions not taken place. When future writers condemn the merger spree of the late 1990s as manifesting misguided policies on the part of acquirers, they should focus on the alternative of not making these acquisitions. (Shleifer and Vishny, 2003, p. 295)

The market-driven acquisition hypothesis implies that the bidder prefers cash as payment method when bidder stock is sufficiently undervalued. Cash acquisitions must generate value through synergies (as opposed to selling overvalued stock) for the bidder management to act in their shareholders' interest. Thus, while poor bidder performance following all-stock mergers is consistent with bidder value-maximizing behavior, poor performance following all-cash mergers is not.

Lehn and Zhao (2006) find a significant inverse relation between long-run returns after acquisitions and the probability that CEOs are replaced. More importantly, CEOs of acquiring firms with negative bidder returns are equally likely to be replaced, regardless of whether they used stock or cash as the method of payment in the acquisition. This finding challenges the prediction of Shleifer and Vishny (2003) and instead suggests that stock acquisitions (as well as cash acquisitions) associated with negative long-run bidder returns are destructive of value.

Several recent papers provide evidence on CEO compensation changes (other than turnover) following acquisition activity. Bliss and Rosen (2001) study bank mergers over the period 1985–1995, a period characterized by overcapacity and frequent mergers. Mergers are found to have a net positive effect on bidder firm CEO compensation, mainly via the effect of size on compensation. Compensation increases even if the merger causes the acquiring bank's stock price to decline (which is typical upon merger announcement). However, CEOs with more stock-based compensation are less likely to make an acquisition, suggesting that bank managers are motivated by their compensation contracts.

Datta, Iskandar-Datt, and Raman (2001) study 1,719 acquisitions over the period 1993–1998 and separate the acquirers into whether the equity-based compensation of their respective CEOs is above (high) or below (low) the median. While the market reaction to the merger announcements is insignificantly different from zero on average, it is significantly positive for bidder CEOs with high equity-based compensation and significantly negative when the equity-based compensation is low. Moreover, the compensation structure impacts the target selection: high equity-based managers tend to seek out targets with relatively high market-to-book ratio (growth targets), whereas CEOs in the low-incentive compensation group tend to acquire targets with low growth prospects. Thus, it appears that managers with high equity-based compensation are willing to take

on riskier and more valuable acquisition projects than managers with low equity-based compensation.

Grinstein and Hribar (2004) examine M&A bonuses (typically all-cash) paid to CEOs of bidder firm after 327 large merger deals over the period 1993–1999. Bonuses are larger for larger deals. Other than size, CEO power is the single most powerful variable explaining the cross-sectional variation in M&A bonuses. Much as in Bebchuk and Fried (2003), CEO power is measured as the CEO's ability to influence directors (and thereby the compensation decision). A CEO gains influence as a chairman of the board, as a member of the nominating committee, as the proportion of insiders on the board increases, and as board size increases. The size and power variables explain much more of the variation in bonuses than variables capturing CEO skill, effort, and performance. Moreover, the deal announcement-induced abnormal stock return is significantly lower (more negative) in the sample of CEOs with high power than those with low power. Moeller (2005) also concludes that targets with powerful CEOs receive lower takeover premiums. However, Bauguess, Moeller, Schlingemann, and Zutter (2007) present evidence that inside (managerial) ownership has a positive relation with target returns, whereas active-outside (nonmanaging director) ownership has a negative relation with target returns. They suggest that the latter effect reflects outsiders' willingness to share gains with the bidder.

Harford and Li (2007) also study how CEO pay and pay-performance sensitivity are affected by acquisitions. With a sample of 1,508 mergers completed over the period 1993–2000, they show that bidding firm CEOs receive substantial rewards in the form of new stock and options grants following acquisitions. While a poorly performing acquisition reduces the value of the CEO's portfolio of stocks and options obtained prior to the acquisition, the new post-acquisition grants more than compensate for this personal value reduction. As a result, "CEO's pay and wealth are completely insensitive to poor post-acquisition performance, but CEO's wealth remains sensitive to good post-acquisition performance" (p. 919). Interestingly, they show that bidding firms with stronger boards retain the sensitivity of their CEO's compensation to poor post-acquisition performance.

Harford and Li (2007) also document that compensation changes around major capital expenditures are much smaller and more sensitive to performance than those following acquisitions. That is, similar to conclusions made by Andrade and Stafford (2004), external and internal expansion decisions are treated fundamentally differently by the board. This difference may be rooted in the greater degree of uncertainty and information asymmetry surrounding acquisitions, which may allow the CEO to demand (and receive) some degree of protection for the downside risk to her personal wealth.

Walkling and Long (1984), Cotter and Zenner (1994), Wulf (2004) and Hartzell, Ofek, and Yermack (2004) all present evidence on acquisition-induced compensation of *target* firm CEOs. Hartzell, Ofek, and Yermack (2004) analyze a sample of 311 negotiated mergers between 1995 and 1997. A key question is what package of capital gains, cash, and subsequent employment do target CEOs accept in exchange for relinquishing control? Another important issue is whether target CEOs sacrifice premiums paid to their

own outside shareholders in return for a favorable golden handshake.¹¹⁹ Consistent with earlier studies, they conclude that “acquirers overtly pay certain CEOs to surrender managerial control over the firm’s assets, or equivalently, that some CEOs “purchase” executive jobs in the buyer by foregoing cash payments that they might otherwise have obtained” (p. 39). Also, they present some evidence of an inverse association between selling shareholder premia and unusual bonuses received by the target CEO as a reward to “step aside.” However, since their study uses a sample of completed mergers only, it does not provide information on the sort of packages that other target CEOs turn down in attempted mergers that were not completed. Thus, as the authors recognize, the study does not conclusively indicate that the large CEO packages come at the expense of target shareholders.

Finally, there is some evidence that board structure and director compensation affect the outcome of takeovers. Byrd and Hickman (1992) and Cotter, Shivdasani, and Zenner (1997) find that boards dominated by outsider directors increase value for their shareholders during an acquisition attempt. Harford (2003) documents the effect of a takeover bid on target directors, both financially and in terms of its effect on the number of future board seats held by those directors. He finds that directors are rarely retained following a completed offer and that target directors as a group hold fewer directorships after a takeover, suggesting that the target board seat is difficult to replace. Moreover, he shows that for outside directors, the direct financial impact of a completed merger is largely negative. In sum, failing as a monitor imposes a personal cost on outside directors.

5.3. Merger arbitrage

5.3.1. Arbitrage positions

After the announcement of a takeover bid, the target stock price adjusts upward but typically still trades at a discount from the offer price. The difference between the offer price and the post-announcement market price is called the arbitrage spread. Merger arbitrage (or risk arbitrage) is a specialized investment strategy that tries to profit from this spread. Specifically, it is a bet on the likelihood that the proposed transaction closes. If the bid (or a rival bid) is successful and the target is acquired, the arbitrageur captures the price differential. If the takeover fails and the target remains independent, however, the target stock tends to fall back to pre-bid levels and the arbitrage position has to be closed at a loss. Since the position carries the transaction risk, it is not an arbitrage in the true (riskless) sense of the word. It is, however, designed to be neutral to subsequent market movements and to price fluctuations between the bidder and the target if the deal succeeds.

For a cash bid, a merger arbitrage position simply involves a long position in the target stock. When the acquisition is consummated, the target stock is exchanged for cash. With a positive arbitrage spread, the cash received at closing will exceed the initial investment in the target stock, hence generating a profit. In contrast, if the takeover fails

¹¹⁹ Yermack (2006) presents evidence on severance packages more generally, in a sample of *Fortune 500* companies.

and the target stock price falls, the speculative position has to be sold at a loss equal to the price decline in the target stock.

The arbitrage position in a stock-for-stock transaction is more complex, since target shareholders are offered acquirer stock as payment. Here, the arbitrage position consists of a long target stock and a short acquirer stock in the same proportion as the exchange ratio. For example, with an offer of two acquirer shares for each target share, the arbitrage position is long one target share and short two acquirer shares. If the bid is subsequently revised, the arbitrage position must be adjusted to reflect the new exchange ratio. When the transaction closes, the arbitrageur receives in return for the target share the promised number of acquirer shares, which are used to cover the short position. The profit from a successful arbitrage position in a stock deal is the difference between the price of the short acquirer stock and the price of the target at the point in time when the position is established. If the bid fails, the arbitrageur will likely incur a loss from selling its target share holdings. The effect of closing out the short position in the acquirer is more uncertain: if the bidder stock falls, there may be an offsetting gain; and if the bidder stock appreciates, there may be additional losses.

Jindra and Walkling (2004) examine arbitrage spreads for 362 cash tender offers of publicly traded U.S. targets between 1981 and 1995. They document large cross-sectional variations in the initial arbitrage spread, with one-quarter of the targets exhibiting a negative spread (i.e., a trading price exceeding the offer price) and an average spread of 2% (median 2%). Arbitrage spreads are greater for lengthier contests and smaller for hostile targets, and they suggest that spreads reflect market anticipation of the duration and price resolution of the offer.

5.3.2. *Arbitrage gains*

The magnitude of arbitrage returns depends on several factors, including the size of the arbitrage spread, the probability that the deal closes, the length of time that the arbitrageur must hold the position, and the target stock price development, if the deal fails. Several empirical studies document that merger arbitrage strategies tend to generate substantial excess returns. The largest abnormal returns have been documented for cash tender offers. For a sample of 295 cash tender offers from 1962 to 1980, Bhagat, Brickley and Loewenstein (1987) document an average target excess return of 2% from two days after the tender offer announcement to the day prior to the expiration of the offer (on average 29 days). Dukes, Frohlich, and Ma (1992) analyze 761 cash tender offers identified from 14D-1 filings in 1971–1985. They find average daily raw returns of 0.5%, or holding-period returns of 25%, for the average arbitrage-position holding period of 52 days. Jindra and Walkling (2004) report an abnormal monthly return of 2% for investments in the target stock from the day after the initial bid until bid resolution. Although continuous reinvestment at similar returns is unlikely, these studies indicate annualized excess returns ranging from 25% to over 100%.

Studies involving a mix of cash and stock, as well as tender and merger offers, also document positive, though smaller returns to merger arbitrage. Larcker and Lys (1987)

examine a sample of 111 13-D filings in 1977–1983 that state arbitrage or participation in a takeover proposal as the purpose of the investment and are associated with an acquisition offer. They show that an arbitrage position held from the announcement date to the resolution of the offer (median of 31 days) generates a cumulative excess return of on average 5% (median 3%). Karolyi and Shannon (1999) study 37 takeover bids for Canadian publicly traded targets in 1997. They find an average abnormal return to a merger arbitrage strategy of 5% over a 57-day average investment period. Baker and Savasoglu (2002) report monthly abnormal returns of almost 1% from a merger arbitrage strategy for a portfolio of 1,901 U.S. takeover offers between 1981 and 1996.

The studies reviewed above collectively suggest that merger arbitrage strategies systematically generate excess risk-adjusted returns. The literature proposes various explanations for the existence of these returns. One is that risk arbitrageurs may be compensated for carrying the risk of deal failure. Jensen (1986) points to three important roles played by merger arbitrageurs for which they should be compensated: (1) they help value alternative offers; (2) they provide risk-bearing services for investors who do not want the uncertainty associated with the outcome of the takeover offer; and (3) they help resolve the free-rider problems of small, diffuse shareholders who cannot organize to negotiate directly with competing bidders for the target. Moreover, transactions costs and other practical constraints may limit the possibilities of successfully implementing an arbitrage strategy.

Larcker and Lys (1987) argue that the excess returns constitute compensation to arbitrageurs for assembling costly information related to the outcome of the bid. They show that the ex-post fraction of successful bids is significantly higher than the success probability implied by the arbitrage spread, suggesting that arbitrageurs have gathered private information about the deal outcome. In contrast, Cornelli and Li (2002) argue that the private information may be endogenous to the creation of the arbitrage position itself. The probability of offer success is positively related to the increased participation of arbitrageurs, since they are more likely to tender their target shares. The arbitrageur's investment in the target will therefore create an informational advantage, which can explain the profits earned by arbitrageurs. The model in Cornelli and Li (2002) predicts that the more liquid the stock, the easier it is to hide trades and the larger the arbitrage profits.¹²⁰

Hsieh and Walking (2005) examine the importance of merger arbitrageurs for the market for corporate control using a sample of 680 all-cash and all-stock takeover offers during the period 1992–1999. They find that arbitrage holdings increase in offers that are likely to be successful, and suggest that this is evidence of the participation of passive arbitrageurs, whose accumulation of target stock does not affect the outcome of the deal. Hsieh and Walking further find that these changes in arbitrage holdings are positively correlated to the probability of bid success, bid premia, and arbitrage returns. They interpret this as evidence of the involvement of active arbitrageurs, who influence the outcome and the terms of the deal.

¹²⁰ Gomes (2001) makes a similar argument where the entry of merger arbitrageurs creates large blocks of target shares that can hold out to a freezeout and hence forces the bidder to offer a higher preemptive bid.

5.3.3. *Limits to arbitrage*

The significance of transactions costs in limiting profits from merger arbitrage is investigated by Mitchell and Pulvino (2001). For a sample of 4,750 mergers from 1963 to 1998, they document annual excess returns to merger arbitrage of 10% when ignoring transactions costs. When accounting for transactions costs, such as brokerage commissions and the price impact of trading, the annual excess returns are reduced to 4%. Thus, transactions costs appear to limit but not entirely eliminate the excess profits generated by merger arbitrage strategies. Mitchell and Pulvino (2001) further show that merger arbitrage returns are correlated with market returns in a nonlinear way. Specifically, the returns are positively correlated in down markets but uncorrelated in flat and appreciating markets. They suggest that the excess returns are compensation to arbitrageurs for providing liquidity, especially during severe market downturns.

Arbitrage activity may be limited in practice because these investments are risky and require capital (Shleifer and Vishny, 1997). It is obvious that merger arbitrage in cash offers require capital, since the investor takes a long position in the target stock. Because the lender of a stock typically demands the short-sale proceeds as collateral, merger arbitrage positions require capital in stock-for-stock transactions too. Baker and Savasoglu (2002) propose that the capacity of arbitrageurs to carry risk is limited by the transaction risk and the size of their arbitrage position. They report that merger arbitrage returns increase with target size and a measure for the ex-ante deal completion risk. Moreover, there is some evidence that subsequent arbitrage profits are negatively related to changes in the supply of arbitrage capital.

Although merger arbitrage tends to be a profitable strategy, these trading strategies periodically generate large losses, primarily caused by unexpected deal failure (Baker and Savasoglu, 2002). Such liquidity events could affect the available supply of risk capital and hence the presence of arbitrageurs in subsequent deals. Officer (2007) examines the direct effect of two liquidity events—large arbitrage losses and the announcement of large deals-on arbitrage spreads. For a sample of 4,593 all-cash and all-stock offers in 1985–2004, he finds that risk returns are negatively related to big arbitrage losses, but this is attributable to the deal itself and has no contagion to other deals or spreads on pending deals. Overall, Officer (2007) finds little evidence indicating that large losses would cause withdrawal of arbitrage funds to the extent that it affects pricing in other merger and acquisition transactions.

Trading volumes typically increase in connection with the announcement of a takeover offer. Estimates of the target ownership by merger arbitrageurs following a takeover announcement ranges from 15% (Hsieh and Walking, 2005) to 35% (Officer, 2007). Yet, Geczy, Musto and Reed (2002) suggest that merger arbitrage strategies may be limited by short-selling constraints. They show that it is relatively expensive to borrow acquirer stock compared to other company stocks, in particular when the acquirer is small.

Mitchell, Pulvino, and Stafford (2004) study the effects of merger arbitrage for 2,130 mergers announced between 1994 and 2000. They document a substantial arbitrage activity after the announcement of a takeover offer. In the announcement month, the acquiring firm's short interest increases with a median of 40% in fixed-exchange-ratio

stock mergers (i.e., where the exchange ratio is determined in the merger agreement). Interestingly, there is no corresponding change in the short interest for mergers where the arbitrage position does not involve a concurrent shorting of the acquirer stock, such as cash mergers or floating-exchange-ratio mergers (where the acquirer offers stock equivalent to a specific dollar value). The level of short interest falls dramatically when the merger closes. Also, the announcement effect of stock mergers is related to the change in short interest that occurs in the month of the announcement, suggesting a relationship between the arbitrage spread and the level of arbitrage activity.

To single out the effect of arbitrage trading activity, Mitchell, Pulvino, and Stafford (2004) further examine a subsample of 64 floating-exchange-ratio mergers. During the pricing period, which typically lasts 10 days and ends 5 days prior to merger closing, the corresponding number of acquirer stock is determined. In this type of stock mergers, the short selling of acquirer stock typically takes place during the pricing period. Since most of the deal uncertainty has already been resolved at this point, the effect of the short-selling pressure is no longer confounded with the revelation of new information about the merger. Importantly, the short interest increases significantly and there is a negative abnormal drift in the acquirer stock price of 3% during the pricing period for the floating-exchange-ratio mergers. Mitchell, Pulvino, and Stafford (2004) conclude that the short-selling by merger arbitrageur causes downward price pressure that accounts for almost half of the negative announcement return for acquirers in stock-financed mergers.

Overall, mergers and acquisitions of publicly traded firms attract substantial merger arbitrage activity. Such merger arbitrage strategies, betting on the closing of the transaction, seem to systematically generate positive excess returns. These returns reflect limits to arbitrage from transaction costs as well as compensation for carrying transaction risk.

6. Takeovers, competition and antitrust

In Section 4, we concluded that the typical merger produces significantly positive combined announcement-induced abnormal stock returns to bidders and targets. A standard interpretation is that the wealth effect is the present value of future expected increases in the merging firms' operating margins (the spread between future revenues and costs). In this section, we review studies that attempt to tease out whether the wealth effect predominantly originates in cost reductions (efficiency effects) or in revenue increases (market power effects).

6.1. Efficiency v. market power: predictions

Eckbo (1983) and Stillman (1983) develop a test approach based on stock prices rather than product price data to infer the anticompetitive significance of horizontal mergers.¹²¹ On the one hand, the (combined) abnormal stock returns to the bidder, and the target

¹²¹ Examples of merger studies examining product price and output data are Barton and Sherman (1984) on microfilm; Borenstein (1990), Werden, Joskow, and Johnson (1991), Kim and Singal (1993) and Singal (1996)

cannot be used to discriminate between efficiency and market power hypotheses: these returns represent the *net* effect of expected cost reductions and revenue increases. On the other hand, merger-induced changes in expected future product and factor prices translate into abnormal stock returns to industry rivals (as well as upstream suppliers and downstream customers) of the merging firms. In particular, a collusive, anticompetitive merger raises the product price and thus benefits the nonmerging rivals as well. This means that evidence of a negative industry wealth effect of a merger announcement is inconsistent with the merger having collusive, anticompetitive effects on its industry.

A positive industry wealth effect is necessary but not sufficient to conclude in favor of the collusion hypothesis. The reason is that the industry wealth effect of an efficient merger may be either positive or negative. On the one hand, scale-increasing efficient mergers tend to have a negative impact on the industry's equilibrium product price, which harms rival firms and by itself causes a negative industry wealth effect.¹²² On the other hand, news of the merger may reveal positive information about the value of the resources controlled by the rival firms. That is, the merger may reveal increased demand for resources owned by other firms, causing a positive revaluation of these rivals. For example, the increased demand may lead to expectations of future merger activity, resulting in a positive "in-play" effect on rival firms from the announcement of the initial merger. In sum, the efficiency hypothesis does not restrict the abnormal returns to industry rivals.

As summarized in Table 12, which is reproduced here from Eckbo and Wier (1985), these predictions can be refined further by distinguishing between public announcements that either increase or decrease the probability of a merger in the industry. The table adds predatory pricing as a variant of the market power hypothesis. The predation theory holds that the merger provides an incentive for the bidder firm to increase output and drive product prices down until rivals exit—at which point output is cut back to the monopoly level. Thus, both predation and productive efficiency arguments predict a lowering of the product price (albeit in the short run under the predation argument), which harms rivals.

An event decreasing the probability of the merger is the announcement of a decision by U.S. antitrust authorities (Department of Justice or Federal Trade Commission) to challenge the proposed merger with violation of antitrust laws (Section 7 of the 1914 Clayton Act).¹²³ As is seen in Table 12, the only pattern of abnormal stock returns to rival firms at once inconsistent with the market power hypothesis and consistent

on airlines; Akhavein, Berger, and Humphrey (1997), Prager and Hannan (1998) and Focarelli and Panetta (2003) on banking; and Dafny (2005) on hospital mergers.

¹²² Rivals may minimize the negative product price impact by racing to adopt similar technological innovations as the merging firms—prompting industry merger waves.

¹²³ Section 7 of the Clayton Act replaced Section 2 of the 1890 Sherman Act as the principal federal antitrust law regulating corporate mergers and acquisitions. A *potential* threat to competition constitutes an offense under this law, and it is not necessary to prove a horizontal relationship between the combining firms. Furthermore, anticipated or demonstrated economic efficiencies are not a defense against the illegality of a merger that may lessen competition.

Table 12

Predicted abnormal returns to merging firms and their industry rivals under market power and productive efficiency hypotheses, classified by whether the event increases or decreases the probability of merger in the industry.

Examples of positive information effects on rival firms are the case where the merger announcement reveals possibilities for efficiency gains also available to non-merging rivals and the case where the merger signals an increase in demand for resources generally owned throughout the industry of the merging firms.

Theory predicting the source of the merger gains	Abnormal returns to merging firms	Abnormal returns to industry rivals
A. Events increasing the probability of merger (e.g. initial merger proposal announcement)		
Market Power:		
(1) Collusion	<i>Positive</i> (monopoly rents)	<i>Positive</i> (monopoly rents)
(2) Predatory pricing	<i>Positive</i> (monopoly rents)	<i>Negative</i> (costs of price war)
Productive Efficiency:		
(3) Productivity increase	<i>Positive</i> (cost savings)	<i>Negative</i> (competitive disadvantage)
(4) Information	<i>Positive</i> (undervalued resources)	<i>Zero or Positive</i> (undervalued resources and/or opportunities for productivity increases)
B. Events decreasing the probability of merger (e.g. antitrust complaint blocks the merger)		
Market Power:		
(1) Collusion	<i>Negative</i> (loss of monopoly rents)	<i>Negative</i> (loss of monopoly rents)
(2) Predatory pricing	<i>Negative</i> (loss of monopoly rents)	<i>Positive</i> (avoiding price war)
Productive Efficiency:		
(3) Productivity increase	<i>Negative</i> (loss of cost savings)	<i>Positive</i> (avoiding competitive disadvantage)
(4) Information	<i>Zero</i> (information already out)	<i>Zero</i> (information already out)

with the efficiency hypothesis is one where the rivals experience nonnegative returns in response to *both* probability-increasing and probability-decreasing events. Moreover, the collusion hypothesis is rejected unless one observes positive rival returns to the initial merger proposal followed by negative returns to news of the antitrust action. The predation theory is rejected unless a price pattern opposite to the pattern under the collusion theory is observed.

This shows that information on the abnormal return to rival firms in principle has the power to test market power hypotheses. This is true even if a given merger has a

combination of productive efficiency and market power effects (so the rival firm performance reflects the net effect of the two). Tests of the predictions in Table 12 do, however, presume that collusion and predation are mutually exclusive market power effects (since you would otherwise be netting out positive and negative rival effects at both announcements). It is common in the theoretical literature, as well as in the practice of antitrust policy, to treat these two market power theories as separate.

Further refinements of the predictions in Table 12 are possible. Schumann (1993) suggests that market power theories may have different implications for rivals with small versus large market shares. Fee and Thomas (2004) and Shahrur (2005) follow the suggestion of Eckbo (1983) to examine the wealth effects of mergers also for customers and suppliers. The two papers develop similar predictions, reproduced here as Table 13 from Table 1 in Shahrur (2005). The major focus in these two studies is on the buyer power hypothesis (last column)—that is, the possibility that the merger increases the monopsony power of the combined firm over its input suppliers. In this case, the merger benefits the merging firms and (possibly) its industry rivals at the expense of upstream suppliers. Consumers benefit as well, provided some of the increased monopsony rents are passed on downstream from the merging firms' industry. Evidence on customer performance also helps resolve a possible ambiguity from looking at rival firm performance alone. For example, while evidence of a positive rival firm performance in response to the merger proposal announcement does not discriminate between collusion and efficiency, collusion is rejected if customers also benefit.

Tests of predictions such as those in Tables 12 and 13 are likely to pick up an in-play effect in the abnormal returns to rival firms in response to merger announcements. The in-play effect, which motivates the positive information effect predicted by hypothesis (4) of Table 12, occurs when the merger event increases the probability that the rivals may become targets. An in-play effect follows naturally from the fact that rival firms use similar production technologies and own some of the same (and possibly scarce) productive resources. A takeover may signal increased resource scarcity, causing a positive revaluation of every firm holding those resources. The findings of most of the studies discussed below are consistent with such a positive industry information effect.¹²⁴

Banerjee and Eckard (1998) and Fridolfson and Stennek (2005) suggest that since a successful merger bid eliminates rival firms as potential merger partners for the target, there could be a negative out-of-play effect for these rivals. Such a negative effect might attenuate a positive effect due to market power. In their sample of largely conglomerate takeovers (where there arguably are no market power effects), Betton and Eckbo (2000) document *positive* rival firm performance when the rival learns that it has lost the target. While the idea of an out-of-play effect is interesting and consistent with formal competitive takeover models such as Akdogu (2007b) and Molnar (2008), we are unaware of evidence favoring a significant out-of-play effect on rival firms.

¹²⁴ Exceptions are Eckbo (1992), Akdogu (2007a), and Becher, Mulherin, and Walkling (2008), who find a negative industry wealth effect of multi-industry horizontal merger announcements in Canada, and in single-industry studies of the U.S. telecommunications and utility firms, respectively.

Table 13
 Predicted abnormal returns to merging firms, rivals, customers, and suppliers.
 Source: Shahru (2005)

	Productive efficiency	Collusion	Buyer power
Merging firms:	<i>Positive</i> More-efficient production will result in higher infra-marginal rents to the merging firms	<i>Positive</i> Higher likelihood of collusion will result in increased monopoly rents to the merging firms (Eckbo, 1983)	<i>Positive^a</i> Lower input prices due to intensified competition among suppliers (Snyder, 1996)
Rivals:	<i>Unrestricted</i> <u>Positive</u> : information regarding industry-wide restructuring. <u>Negative</u> : more-intense competition in the industry due to a new, more-efficient combined firm (Eckbo, 1983)	<i>Positive</i> Higher likelihood of collusion will result in increased monopoly rents to rival firms (Eckbo, 1983)	<i>Positive^a</i> Lower input prices due to more intense competition among suppliers (Snyder, 1996)
Customers:	<i>Unrestricted^b</i> <u>Positive</u> : scale-increasing mergers. <u>Negative</u> : scale-decreasing mergers	<i>Negative</i> Restricted output in the takeover industry results in lower demand for suppliers' output	<i>Unrestricted^c</i> <u>Positive</u> : benefit from lower input costs for merging firms. <u>Negative</u> : supplier underinvestment
Suppliers:	<i>Unrestricted^b</i> <u>Positive</u> : scale-increasing mergers. <u>Negative</u> : scale-decreasing mergers and/or more-efficient combined firm	<i>Negative</i> Restricted output in the takeover industry results in lower demand for suppliers' output	<i>Negative^a</i> The increased buyer power of the merging firms will intensify competition among suppliers (Snyder, 1996)

^aEfficient mergers can be of the scale-increasing or the scale-decreasing types (see, e.g. Eckbo, 1992; Andrade and Stafford, 2004). If the merger is expansionary in nature, it should benefit customers. Suppliers can benefit from a scale-increasing merger as long as the positive effect of expansion is not outweighed by the adverse effect of the increased efficiency of the combined firm. Finally, an efficient merger of the scale-decreasing type can hurt customers and suppliers.

^bSnyder (1996) shows that by creating a larger buyer, a horizontal merger can result in more intense competition among suppliers, which will benefit the merging firms and their rivals at the expense of suppliers.

^cCustomers may benefit from the increased buyer power if some of the gains resulting from lower input prices are passed on to them because of competition in the takeover industry. Customers can also suffer if the increased buyer power induces suppliers to underinvest.

6.2. Effects of merger on rival firms

Table 14 lists a number of empirical studies providing estimates of the industry wealth effects of horizontal mergers, beginning with Eckbo (1983) and Stillman (1983). Eckbo

Table 14
Stock market studies examining industry wealth effects of horizontal mergers

Study	Merger Sample	Selection of Industry Rival, Customers and Suppliers	Key Findings
Stillman (1983)	11 U.S. horizontal mergers challenged by DOJ or FTC with violating Section 7 of the Clayton Act, 1964–72	Rival firms identified in antitrust litigation reports and antitrust enforcement agency fact memoranda	Zero average abnormal returns to rivals. Results inconsistent with market power effects of the sample mergers
Eckbo (1983)	191 U.S. horizontal and 68 vertical mergers between mining or manufacturing firms operating nationally, 1963–78. 65 horizontal and 11 vertical mergers were challenged by DOJ or FTC under Section 7	Rival firms selected from the major target industry using a <i>five</i> -digit SIC-based product classification procedure created by the author. For challenged mergers, the relevant industry is identified using court documents	Rival firms earn zero or positive abnormal returns in response to both the initial merger proposal announcement and the subsequent antitrust complaint. Results inconsistent with the market power (collusion) effects of the horizontal mergers
Eckbo and Wier (1985)	82 U.S. challenged horizontal mergers, 1963–81, including 65 from Eckbo (1983). 17 cases occurred after the passage of the 1978 Hart-Scott-Rodino Antitrust Improvements Act	Two sets of rivals: one based on five-digit SIC codes as in Eckbo (1983), and another identified in antitrust litigation reports	Rival firm performance inconsistent with market power either before or after 1978. This conclusion holds for both sets of rivals
Eckbo (1985)	266 U.S. merger proposals (196 horizontal, 98 challenged), including those in Eckbo (1983) and Eckbo and Wier (1985), 1963–81	Rivals selected using the 5-digit SIC code procedure of Eckbo (1983)	Industry wealth effect <i>negatively</i> related to merger-induced increase in industry concentration. Inconsistent with predictions of the Market Concentration Doctrine
Eckbo (1992)	471 merger proposals (312 horizontal), 266 between U.S. firms and 205 between Canadian firms, 1963–82. 80 of the U.S. horizontal mergers were challenged under Section 7, none of the Canadian mergers were challenged	Rivals for both U.S. and Canadian mergers identified using the 5-digit SIC code procedure of Eckbo (1983)	No evidence of market power despite no antitrust deterrence of anticompetitive mergers in Canada until 1985. Industry wealth effect <i>negatively</i> related to merger-induced increase in industry concentration.
Schumann (1993)	37 acquisitions challenged by the FTC, 1981–87	Rival firms identified using antitrust litigation reports	Positive rival firm performance at merger proposal and zero or positive at antitrust complaint. At the complaint, rival returns lower the greater the merger-induced change in concentration

(Continued)

Table 14 (Continued)

Study	Merger Sample	Selection of Industry Rivals, Customers and Suppliers	Key Findings
Fee and Thomas (2004)	554 proposed (four-digit SIC) U.S. horizontal mergers between publicly traded firms from SDC, 39 challenged under Section 7, 391 deals completed, 1981–1997	Identifies single- and multi-segment rivals in same 4-digit horizontal industry using Compustat industry segment information. The segment information also helps identify customers and suppliers	Evidence inconsistent with increased monopolistic collusion, but consistent with improved efficiency and buying power of merged firm
Shahrur (2005)	463 successful (four-digit SIC) U.S. horizontal mergers and tender offers from SDC, 1987–99	Identifies single-segment rivals, and customer and supplier firms, using Compustat industry segment information	Evidence inconsistent with increased monopolistic collusion, but consistent with improved efficiency and buying power of merged firm
Aktas, deBodt, and Roll (2006)	290 proposed horizontal mergers in the European Union, of which 55 were subjected to “in depth investigation” for potential antitrust violation. Bidder is a non-EU firm in 104 cases	Rival firms identified in same country and industrial sector as target using Hoover’s Online Database, European Commission Web Site, and Datastream	Negative rival abnormal performance around merger proposal announcements. Suggests the sample mergers enhance industry competitiveness
Bhattahcaryya and Nain (2006)	615 successful (four-digit SIC) U.S. horizontal mergers, 1989–2000, from SDC	Use Bureau of Economic Analysis benchmark Input-Output tables to identify the fraction of the supplier industry’s output sold to the merging industry	Conclude with increased buying power based on post-merger decline in supplier product prices
Akdogu (2007a)	N = 275, of which 115 (four-digit SIC) U.S. horizontal takeover bids in the telecommunications industry, 1996–2005	Rivals firms identified using SDC and CRSP, using SIC code 4813	Evidence of negative industry wealth effect of the acquisition bids. Conclude that acquirers are on average expected to gain competitive advantage from the takeovers.
Becher, Mulherin, and Walkling (2008)	384 successful mergers between electric utilities, 1980–2004	Rival firms are all public utilities with assets > \$500 mill.	Evidence inconsistent with market power but consistent with efficiency (synergy) effects of the horizontal mergers

(Continued)

Table 14 (Continued)

Study	Merger Sample	Selection of Industry Rivals, Customers and Suppliers	Key Findings
Shenoy (2008)	453 successful vertical mergers, 1981–2004	Use Bureau of Economic Analysis benchmark Input-Output tables to identify the main customer industries and rivals. Customer portfolios based on single-segment firms	Evidence fail to support market power but consistent with vertical mergers having efficiency effects

(1983) examines intra-industry wealth effects of 191 horizontal mergers in the United States between 1963 and 1978, 65 of which were challenged by either the Department of Justice or the Federal Trade Commission with violating Section 7 of the Clayton Act. A sample of 68 vertical mergers, of which 11 were challenged, is also examined. For each merger, a set of horizontal competitors of the merging firms that were listed on the NYSE or the American Stock Exchange (ASE) at the time of the merger proposal announcement is identified.

The rivals are defined based on overlapping five-digit Standard Industrial Classification (SIC) codes. For the challenged mergers, the relevant product market is the one identified in court records as being the market “threatened” by the “anticompetitive” merger. For unchallenged mergers, the relevant product market is the target’s major product line, as defined in Standard & Poor’s Registry of Corporations. As shown by Eckbo and Wier (1985), the empirical results based on the five-digit SIC rivals are robust: They duplicate the tests using rivals identified by the Department of Justice (DOJ) or the Federal Trade Commission (FTC) as being relevant competitors, and they draw the same inferences. To test the hypotheses in Table 12, the paper reports estimates of the abnormal stock returns to the merging firms and their horizontal rivals relative to (i) the merger proposal announcement and (ii) the subsequent announcement that the DOJ or the FTC has filed a Section 7 complaint against the horizontal merger.

Eckbo (1983) reports that the observed sequence of abnormal returns across the proposal and antitrust complaint announcements does not follow the pattern predicted by the collusion hypothesis. Rivals of the 65 horizontal challenged mergers earn small but significantly positive abnormal returns around the merger proposal announcement, followed by zero or positive abnormal returns in response to the antitrust complaint announcement.¹²⁵ The antitrust complaint causes a negative average abnormal return of -10% to the *merging* firms. This means that the antitrust complaint comes as a surprise

¹²⁵ The industry wealth effect of the merger is estimated by first forming an equal-weighted portfolio of the rivals of a given target and then estimating the portfolio abnormal return. Let $AR(t_1, t_2)$ denote the average of these portfolio estimates, where the period of cumulation is $t_2 - t_1 + 1$ days around the event-announcement day (day 0). Eckbo (1983) reports $AR(-1,1) = 0.10\%$ and $AR(-10,5) = 1.17\%$ relative to the merger proposal (significant at the 5% level), and an insignificant $AR(-1,1) = 0.17\%$ relative to the antitrust complaint

to the market, which in turn means that the complaint announcement has the requisite power to test the market power hypothesis using rival firm returns.

This pattern of abnormal return to rival firms is inconsistent with the predictions as summarized in Table 12 of the collusion hypothesis, but it is jointly consistent with the efficiency and information arguments. Stillman (1983) performs a similar set of tests on 11 horizontal, challenged mergers for the period 1964–1972 and finds zero average abnormal rival stock returns relative to both merger announcements and antitrust complaints. Thus, both Eckbo and Stillman conclude against the market power hypothesis. Eckbo (1983) also reports that the average intra-industry wealth effect of unchallenged horizontal mergers is indistinguishable from the average intra-industry wealth effect of unchallenged vertical mergers. Since vertical mergers are unlikely to have collusive effects, this further supports the view that the horizontal unchallenged mergers in the sample were not expected to be anticompetitive.

Schumann (1993) also examines the effect of horizontal merger proposals and antitrust complaints on rival firms. His sample consists of 37 cases from 1981–1987 that were challenged by the FTC, a period with less antitrust intervention than in the sample periods of the earlier studies. Rival firms are identified using antitrust litigation reports, much as in Eckbo and Wier (1985). The results for the total sample, which indicates significantly positive rival returns at the proposal announcement and zero at the time of the antitrust complaint, are “remarkably similar to those reported in Eckbo (1983) and Eckbo and Wier (1985)” (Schumann, 1993, p. 681). For a subsample of 97 rivals with available data on market shares, Schumann also reports that rivals in the smallest market-share quartile have the largest abnormal returns and that these are significantly positive at both the proposal and complaint events. Following the predictions in Table 12, these findings contradict the collusion (market power) hypothesis.

Several studies also document significantly negative abnormal returns to rival firm portfolios in response to the announcement of horizontal mergers. Eckbo (1992) finds a negative industry wealth effect of horizontal merger announcements in Canada. Aktas, deBodt, and Roll (2006) study horizontal mergers in the European Union, several of which were subjected to a preliminary antitrust review. They report significantly negative rival abnormal returns. Akdogu (2007a) finds negative rival abnormal returns in response to horizontal takeover bids in the U.S. telecommunications industry. Becher, Mulherin, and Walkling (2008) document a significantly negative industry wealth effect in a large sample of horizontal mergers between U.S. electric utilities. All of these studies reject the market power hypothesis and conclude that the typical sample merger would likely enhance efficiency.

6.3. *Effects of merger on suppliers and customers*

Fee and Thomas (2004) and Shahrur (2005) estimate the effect of horizontal mergers on rivals and, in particular, on upstream suppliers and downstream customers, over the

announcement. Eckbo (1983) also reports that complaints by the FTC cause a significantly *positive* industry wealth effect of $AR(0) = 0.74\%$.

period 1981–1999. These two studies provide new tests of market power theories based directly on the wealth effects for suppliers and customers. Moreover, by revisiting abnormal returns to rivals during a time period with relatively lax U.S. antitrust enforcement in the merger area, they provide a perspective on the generality of the findings of earlier studies on industry wealth effects.

Starting with the evidence on rival firms, both studies report a statistically significant, positive industry wealth effect in response to the merger proposal announcement. Abnormal returns to portfolios of single-segment rival firms average 0.54% in Fee and Thomas (2004) and 0.39% in Shahrur (2005). These results are close to the early results in Eckbo (1983), and to those in Song and Walkling (2000). The evidence confirms that the composition of the rival firm portfolios in this literature yields sufficient power to register industry wealth effects of horizontal mergers.¹²⁶ Moreover, Eckbo (1983) as well as Fee and Thomas (2004) report significantly positive rival firm abnormal returns in response to news of antitrust action against the proposed merger.¹²⁷ Thus, consistent with the earlier literature, Fee and Thomas (2004) reject the collusion hypothesis for the horizontal-merger gains.

Fee and Thomas (2004) and Shahrur (2005) identify customer and supplier information using Compustat's industry segment files. These files record information mandated by Federal Accounting Standards Board (FASB) rule No. 14 during their sample period. Under this rule, firms are required to report financial information for any industry segment comprising more than 10% of consolidated yearly sales, assets, or profits.¹²⁸ This reporting requirement also discloses the identity of any customer representing more than 10% of the total sales, as well as the company segment that was primarily responsible for those sales. Both studies also use sales data to identify suppliers and customers that are particularly dependent on the industry of the merged firm.

Under the monopoly (collusion) hypothesis, the merging firms and their rivals gain at the expense of customers. Fee and Thomas (2004) and Shahrur (2005) reject this hypothesis because they find no systematic evidence of customer losses, even for customers that are particularly reliant on the merging firm's industry. There is also evidence that the mergers with the largest gains to the merging firms also produce gains to customers. As Fee and Thomas (2004) conclude, "Taken together, the customer and rival results are strongly inconsistent with the monopolistic collusion hypothesis" (p. 457). Shahrur (2005) states that "Our overall evidence suggests that the lenient antitrust policy in recent years does not appear to have resulted in predominantly anticompetitive takeovers" (p. 95). These results support the conclusion in Eckbo (1992) that, when it comes to the need to use antitrust policy to strongly deter potentially anticompetitive mergers, "Judging from the evidence, there simply isn't much to deter" (p. 1028).

¹²⁶ See Eckbo (1983, 1989, 1992), McAfee and Williams (1988), and Schumann (1993) for discussions of power issues in the selection of rivals.

¹²⁷ Shahrur (2005) does not study antitrust events.

¹²⁸ After 1998, SFAS No. 131 governs required segment disclosures.

Fee and Thomas (2004) and Shahrur (2005) find some evidence of losses to upstream suppliers of the merging firms and conclude that horizontal merger tends to increase buying power. Increased buying power follows if the merger increases monopsony power or if it forces upstream suppliers to be more efficient. Fee and Thomas (2004) argue that if the source of buying power is upstream efficiency, then the losses to suppliers will be asymmetric—with losses only to those suppliers that are not retained post-merger. That is, those suppliers that lose a bidding competition post-merger would suffer. Fee and Thomas do in fact find that the wealth effect for suppliers depends significantly on the supplier's ability to retain its product-market relationship with the merged entity. Only the suppliers that are terminated experience negative abnormal returns around the merger announcement and significant negative cash flow changes post-merger. Suppliers that are retained experience increases in market share and do not show evidence of abnormal stock returns or changes in operating performance. The authors therefore conclude that the effect of the merger on suppliers reflects efficiency-increasing buying power. Shahrur (2005) reaches a similar conclusion: “Along with the evidence in Fee and Thomas (2004), our results suggest that industry consolidations can help increase the efficiency of upstream industries” (p. 96).

Bhattahcaryya and Nain (2006) and Shenoy (2008) also focus on vertical buying power. Bhattahcaryya and Nain (2006) sample 615 successful horizontal mergers and fail to find a significant announcement effect on the horizontal rivals. However, they find evidence of a reduction in the product price paid to upstream suppliers, which is consistent with increased buying power. Moreover, they find some evidence indicating that the upstream suppliers, perhaps feeling the squeeze from the increased buying power, restructure to counter the effect of the downstream horizontal merger. The authors suggest that the net effect of all this may have been to leave the market value of the horizontal rivals of the merging firms unchanged. Finally, Shenoy (2008) studies the industry wealth effects of 453 successful *vertical* mergers and concludes that these on average have efficiency effects. This evidence is also consistent with the effects of vertical mergers first reported by Eckbo (1983).

6.4. *Some implications for antitrust policy*

6.4.1. *The market concentration doctrine*

The U.S. government selects Section 7, Clayton Act, cases against horizontal mergers largely on the basis of market share and industry concentration.¹²⁹ The government agencies' reliance on structural standards for selection of merger cases is rooted in one

¹²⁹ The Justice Department's Merger Guidelines of 1968 state market shares that were likely to trigger an antitrust complaint. The critical aggregate market shares varied according to the four-firm market concentration ratios. For example, a merger between two firms each having 4% of the sales in a market with a four-firm concentration ratio of 75% or more was likely to be challenged. The department's 1982 Merger Guidelines use the Herfindahl Index of concentration and are somewhat less restrictive than the old guidelines, but their focus is also on market structure.

of the oldest propositions in industrial economics: the market concentration doctrine. This doctrine holds that the level of industry concentration is a *reliable* index of the industry's market power. The empirical implication is that a relatively high level of industry concentration, which in the presence of entry barriers is believed to facilitate intra-industry collusion or dominant-firm pricing, should be associated with relatively large industrywide monopoly rents.

A horizontal merger produces a measurable change in the industry's level of concentration and a change in the risk-adjusted present value of industry rents that is directly associated with the concentration change. Under the market concentration doctrine, this change in industry rents is positively correlated with the change in concentration. This value-based test in the *changes* of the two variables (industry rents and concentration) allows more specific inferences than can be drawn from a correlation between the levels of (accounting) profits and concentration.

Eckbo (1985, 1992) provides empirical tests of the market concentration doctrine by estimating cross-sectional regressions of the following form:

$$AR_i = \alpha_0 + \alpha_1 CR_i + \alpha_2 dCR_i + \beta' Z_i + e_i \quad (25)$$

where CR_i is a measure of the pre-merger level of concentration in the industry where the horizontal merger is taking place, dCR_i is the change in concentration caused by the merger, Z_i is a set of firm- and industry-specific control variables, and AR_i is the abnormal return to an equal-weighted portfolio of the rivals of the merging firms around the merger proposal announcement. Under the market concentration doctrine, and assuming the sample includes some anticompetitive mergers, one should find that $\alpha_2 > 0$. This is because the AR of rivals of an anticompetitive merger represents increased monopoly rents, and the market concentration doctrine holds that the increase in monopoly rents will be larger the larger the increase in concentration caused by the merger. Furthermore, under the stronger proposition embedded in antimerger policy, which holds that a merger is more likely to have anticompetitive effects the larger the pre-merger *level* of concentration, one should also find evidence of $\alpha_1 > 0$.

While the form of Equation (25) is similar in spirit to the regression models typically estimated in the "structure-conduct-performance" (industrial organization) literature, there are some notable qualitative differences: For example, while the dependent variable AR measures directly the market value of the increase in industry profits expected to follow from the (merger-induced) increase in industry concentration, the tradition has been to regress an accounting measure of the level of industry profits on the level of concentration. The traditional approach has been criticized on the grounds that accounting profits are a poor proxy for economic profits and that any cross-sectional variation in the level of industry profits can simply reflect differences in risk. This criticism does not apply here, since AR is measured using market values and represents a risk-adjusted change in the level of industry rents. Equally important is the fact that since Equation (25) is specified in the form of changes in the central variables, α_2 can be meaningfully interpreted without specifying a complete structural model relating the level of industry profits to concentration.

Eckbo (1985, 1992) uses the four-firm concentration ratio (CR_4) of the major four-digit SIC industry of the target firm to represent CR , while the change in the industry's Herfindahl Index (dH) measures dCR .¹³⁰ While data on CR_4 is generally available, the market shares of the bidder and target firms, which yield dH , were collected from case-related court records and publications. In the sample of challenged mergers in Eckbo (1985), the average level of CR_4 is 58% (ranging from 6 to 94%), while the average value of dH is 3.3% (ranging from 0.02 to 24.2%).

Both studies report a statistically significant negative coefficient on dH . In Eckbo (1985), increasing dH by 1% implies a reduction of 0.42% in the abnormal returns to the average portfolio of rival firms. Similar results emerge when one uses the abnormal returns to the *merging* firms as dependent variable. The author notes that since the regressions of the type in Equation (25) are based on challenged mergers, the results are biased in favor of the market concentration doctrine. Despite this potential bias, there is no evidence supporting the doctrine.¹³¹

6.4.2. Did the 1978 antitrust improvements act improve antitrust?

The 1976 Hart-Scott-Rodino (HSR) Antitrust Improvements Act significantly increased the legal powers of the law enforcement agencies to obtain private information needed for judging a merger's anticompetitive impact before filing a complaint. The HSR Act addressed two perceived handicaps borne by the agencies charged with enforcing Section 7 of the Clayton Act. First, under the 1962 Antitrust Civil Process Act, the DOJ could not require third parties, such as competitors and trade associations, to provide information about corporate acquisitions until after a Section 7 complaint had been filed. This frequently caused the DOJ to drop an investigation altogether for lack of information or to file a "skeleton" complaint based on scanty data. HSR established the right of the DOJ to issue Civil Investigative Demands to the merging firms and to other parties not directly involved in the merger prior to filing a complaint. Second, until the HSR Act, the government could not require postponement of proposed acquisitions pending investigation. HSR required firms planning mergers to prenotify the FTC and the DOJ of the transaction, providing the agencies with time and information to prepare a case before merger consummation.

According to the FTC,¹³² the notification requirements and delay assure that "virtually all significant mergers or acquisitions occurring in the United States will be reviewed by the antitrust agencies prior to the consummation of the transaction." Moreover, the

¹³⁰ $CR_4 \equiv \sum_{i=1}^4 s_i$, and $H \equiv \sum_{i=1}^n s_i^2$, where s_i is the market share of firm i (in CR_4 the sum is over the four firms with the largest market shares) and n is the total number of firms in the industry. The change in the Herfindahl Index caused by the merger between firms i and j in the same industry is therefore given by $dH = 2s_i s_j$.

¹³¹ "[T]he evidence systematically rejects the antitrust doctrine even for values of industry concentration and market shares which, over the past four decades, have been considered critical in determining the probability that a horizontal merger will have anticompetitive effects" (Eckbo, 1992 p. 1028).

¹³² 6 FTC Ann. Rep. to Cong. concerning HSR ACT 11 (1983).

information provided by the parties “usually is sufficient for the enforcement agencies to make a prompt determination of the existence of any antitrust problems raised by the transaction.” These assurances notwithstanding, Eckbo and Wier (1985) compare the anticompetitive significance of horizontal mergers challenged before and under HRS and find no significant difference in their effect on rival firms. Moreover, they conclude that the pattern of abnormal stock returns to the industry rivals is inconsistent with the mergers having collusive anticompetitive effects both before and under the HSR. Based on this, they argue that HSR is unlikely to have significantly increased the precision with which defendants are chosen by the antitrust agencies.

Why would the antitrust process, which many believe is designed to protect consumer interests, result in blocking efficient mergers? Bittlingmayer and Hazlett (2000) suggest bureaucratic self-interest, political extraction, and private benefits. In this context, it is important to keep in mind that, while preventing efficient mergers harms consumers, the *rivals* of the merging firms benefit as they avoid having to face competition from an increasingly efficient merged firm. The rivals can indeed form a politically strong interest group in situations where they perceive a significant threat to their existing industry equilibrium. This industry capture theory is highlighted by Posner (1969) who asserts that the FTC is significantly impaired in its task of promoting the public interest; Posner claims that its investigations are initiated “at the behest of corporations, trade associations, and trade unions whose motivation is at best to shift the costs of their private litigation to the taxpayer and at worst to harass competitors” (p. 88).

A case in point is Chrysler’s vocal opposition to the joint venture between GM and Toyota in 1983. At the time the venture was announced, Chrysler demanded publicly that the FTC take action to stop the venture because it would “harm competition” in the automobile industry. An alternative interpretation of Chrysler’s opposition is that it suspected the venture would make GM a tougher competitor, placing Chrysler at a competitive disadvantage. In fact, Eckbo (1990a) finds significant abnormal returns of -9% to Chrysler upon the announcement of the GM-Toyota joint venture. More recent cases in point include the airline industry, where Slovin, Sushka, and Hudson (1991) conclude that Civil Aeronautics Board interventions during 1965 to 1988 reduced competition and favored collusion among existing carriers. Bittlingmayer and Hazlett (2000) study the effect on the software and computer industry of 54 antitrust enforcement actions against Microsoft over the period 1991–1997, and strongly reject the thesis that these actions would enhance efficiency. Also, Aktas, deBodt, and Roll (2006), who study rival firm performance following antitrust interventions against mergers in the European Union, find evidence consistent with antitrust policy being used to protect EU firms from outside competition.

Since the anticompetitive significance of a horizontal merger does not represent a directly observable characteristic, policy makers are forced to rely on largely untested theories to justify their decisions. As noted by Stigler (1982), the economics profession has supplied “precious little” in the way of *tested* knowledge to support the market share and concentration criteria that (still) form the basis for U.S. antimerger policy. As long as those responsible for antimerger policy continue to insist on rigid structural standards

for evaluating the competitive effects of mergers, it is reasonable, given the evidence, that special interest groups, including those representing relatively inefficient producers and/or a rigid workforce, will continue to exploit antitrust policy toward merger.

7. Summary and conclusions

Table 15 summarizes key findings across the various topics we have surveyed. Here, we draw broad inferences from these findings and point to interesting but unresolved issues.

7.1. Takeover activity

While there are clear patterns of merger waves in the data, there is little agreement on the basic sources of the waves. Under neoclassical theories, basic sources include industry-specific technological and demand shocks, regulatory changes, and liquidity constraints. Under behavioral arguments, mergers are driven by attempts to sell overpriced assets and securities and herding behavior. There is evidence that regulatory changes and liquidity factors predict industry waves. There is also evidence of greater average market-to-book ratios during periods of merger waves, which may (but need not) indicate overvaluation. On the other hand, additional research is needed on the extent to which bidders select stock as payment in response to market-to-book ratios and on whether the presence of mixed cash-stock offers (which are typically as frequent as all-stock offers) are consistent with equilibria in which targets willingly accept overpriced bidder shares.

Perhaps the most straightforward way to advance our understanding of aggregate merger activity is to model the takeover process from basic, microeconomic principles. One does not get something from nothing—so this requires imposing various restrictive (but hopefully testable) assumptions on production technologies and market structures. The theoretical literature on the optionality of corporate investments is a promising avenue, as are models of industry competition in which industry shocks force rival firms to restructure. Empirical research tailored to such modeling efforts is only starting to emerge.

Important stylized facts from the aggregate takeover activity in the 1980–2005 period include (1) the stability of horizontal combinations at 30%–40% of the total takeover population, (2) negotiations (as opposed to open auction) as the preferred route to acquiring control (3) the sharp drop-off in hostile takeovers after 1988, (4) the large increase in volume and deal values involving public bidders toward the end of the 1990s, (5) the predominance of all-cash and mixed cash-stock offers in tender offers, (6) the rise of mixed stock-cash offers to become the most frequently used payment method in mergers by 2001, and (7) the dramatic fall in toehold bidding since the mid-1980s.

Additional research is needed to sort out the competing theories for the sharp drop in hostile takeovers and what this drop means for the market for corporate control to function effectively as the court of last resort. While takeover activity depends on market liquidity factors (and thus fell during the credit crunch of the late 1980s), it is also important to

Table 15
Summary of empirical results on corporate takeovers, classified by research topic

Topic

A. Takeover Activity:

- (1) Merger waves (clustering of takeovers) tend to occur in periods of market booms. They occurred in the late 1800s and early 1900s (“the monopolization wave”), the late 1960s (“the conglomerate wave”), the mid 1980s (“the refocusing wave”), and the late 1990s (“the strategic/global wave”).
 - (2) There is substantial evidence of industry-clustering of mergers. Regulatory changes and macroeconomic liquidity variables are better predictors of industry merger waves than are market-to-book ratios.
 - (3) In the period 1996–2000, when market valuations were particularly high, the sum of all-cash and mixed cash-stock bids was equal to the number of all-stock bids. Also, in this period, the proportion all-stock offers was the same as during the previous five-year periods.
 - (4) Despite strong merger patterns, predicting target firms with any accuracy has proven difficult.
 - (5) Target firms increasingly initiate the takeover process by soliciting bid indications from a set of potential negotiating partners. The bidder that is selected is recorded as the first bidder in SEC registration documents and therefore by data bases such as SDC (Thomson Financial).
 - (6) When organizing all SDC control bids into contest for U.S. targets, there were a total of 35,727 control contests. Of these, the initial bidder proposed a merger in 28,994 cases and made a public tender offer in another 4,500 cases (the balance being 2,224 controlling-block trades).
 - (7) In constant 2000 dollars, the merger deal was valued at \$436 million on average (median (\$35 mill.), while the deal value of the average tender offer was \$480 (median \$79 mill.).
 - (8) SDC provides information on the payment method for about half of the cases. Of these, 26% were all-cash deals, 37% were all-stock deals, and 37% were mixed cash-stock deals. All-cash and mixed offers have similar deal sizes, slightly above all-stock deals.
 - (9) A total of 590 initial bids are classified as “hostile” and another 435 deals are “unsolicited”. Hostile bids have substantially higher than average deal values.
 - (10) In approximately thirty percent of all deals, the initial bidder and target operate in the same four-digit SIC industry (horizontal takeover). The two most active takeover sectors are Manufacturing, and Finance/Insurance/Real Estate.
 - (11) Two-thirds of the 35,727 initial bidders are public companies, while 37% of the targets are public. In 44% of the initial bids, a public bidder is pursuing a private target (the largest single group of takeovers), with an average deal value of \$114 mill. (median \$23 mill.). The total number of deals involving either a public bidder or target rose sharply in the 1990s.
 - (12) Of the 35,727 initial bidders, 11% were foreign companies (primarily Canada and the UK). Deals involving foreign bidders are relatively large.
 - (13) The time from the initial offer to the effective takeover date averages 108 trading days (median 96) when the initial bid is a tender offer, and 71 days (median 49) for merger bids. In cases where there are more than one control bid for the target, the time from the first to the second bid averages 40 trading days (median 19).
 - (14) The likelihood that the initial bidder wins the target is higher when the bidder has a toehold, when the payment method is all-cash, when the bid form is tender offer, and when the bidder is a public company. The probability of winning is lower for targets with poison pills, and when the target reaction is negative. All bids fail (no bidder wins) in 22% of the cases, with a greater failure probability for private bidders.
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(Continued)

Table 15 (Continued)

 Topic

B. The Payment Method:

- (15) Bidders initiating takeover bids for U.S. targets over the period 1980–2005 offered all-cash as payment in 26% of the cases, all-stock in 37%, and a mix of stock of cash in 37%.
- (16) The majority of tender offers are all-cash or a mix of cash and stock, while the majority of merger bids are in the form of all-stock (with the exception of the 1980–85 period where most merger bids offered a mixed cash-stock payment).
- (17) In the two subperiods 1990–1995 and 1996–2000, the percentage all-stock offers in initial merger bids were approximately 55% in *both* period. This means that (1) nearly half of the initial merger bids in the 1990s use some cash as payment, and (2) the percentage all-stock merger bids remained unaffected by the significant runup in overall market valuations in the 1996–2000 period.
- (18) The payment method choice is in part determined by tax considerations, the degree of information asymmetry between the bidder and the target, the degree of market mispricing of bidder stock, and by corporate control considerations. Stock offers are more likely the greater the bidder's asset size and market-to-book ratio. Stock offers are less likely the greater the bidder management's shareholdings and the greater the dispersion in analyst forecast of bidder earnings.
- (19) Offer premiums are greater in all-cash offers than in all-stock offers. The probability that the initial bidder wins the target is lower for all-stock offers than for cash offers.
- (20) When the target is public, bidder announcement returns are on average negative in all-stock offers and greater in all-cash and mixed cash-stock offers than in all-stock offers. Moreover, bidder announcement-induced stock returns are increasing in the cash-portion of the (mixed) offer.
- (21) When the target is a private company, stock offers generate positive bidder announcement returns that are as high—if not higher—than for all-cash bids.

C. Toehold Bidding:

- (22) The frequency of toehold bidding in friendly mergers and tender offers has fallen dramatically since the 1980s. Over the 1990–2002 period, 7% of bidders initiating a takeover had toeholds, and only 2% had toeholds acquired in the market shortly prior to launching the bid.
 - (23) Toehold bidding remains common in hostile bids (50% frequency).
 - (24) Toeholds are large when they exist: on average 20%.
 - (25) Toehold bidders tend to pay lower offer premiums and win the target more often than zero-toehold bidders.
 - (26) The presence of a bidder toehold attenuates the drop in the target share price when all bids fail.
 - (27) Since bidder toehold benefits mirror target toehold costs (lower offer price, greater probability of target management being replaced) toehold bidding may be viewed as aggressive by the target. Thus, approaching the target with a toehold may cause some otherwise friendly targets to refuse negotiations. Consistent with this, the data indicates a significantly negative association between the likelihood of the initial bidder approaching with a toehold and the expected value of resistance costs (including the opportunity loss of a termination agreement).
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(Continued)

Table 15 (Continued)

 Topic

C. Bid Jumps and Markup Pricing:

- (28) The average offer premium in successful single-bid takeover contests is somewhat higher than the average initial offer premium in multi-bid contests. This is consistent with the greater premium preempting competition in ex-post successful single-bid cases.
- (29) Bid revisions are substantial, with an average bid jump from the first to the second bid in the contest of 10% (a 31% change in the offer premium).
- (30) A dollar increase in the pre-offer target share price runup causes the initial bidder to mark up the total offer premium by \$0.80.
- (31) Markup pricing notwithstanding, bidder takeover gains are increasing in the target runup. Thus, takeovers with greater target runups are more profitable for *both* bidder and target firms, which may also explain why bidders agree to (partial) markup pricing.
- (32) Toehold acquisitions during the runup period bidder increases the target runup. When the toehold is acquired by the initial bidder, however, the markup is reduced. No such markup reduction is observed when the toehold is acquired by another investor.

D. Takeover Defenses:

- (33) The presence of a majority of independent directors on the board of the target is viewed by the court as a strong indication of satisfaction of the fiduciary duty of loyalty.
- (34) Delaware case law sanctions the right to “just say no” to an unsolicited takeover bid. That is, the board may determine in good faith that the continuing independence of the corporation is in the long-term best interest of the corporation and its stockholders.
- (35) If the board’s defensive response is not “draconian” (i.e., it is neither coercive nor preclusive) but “within the range of reasonableness” given the perceived threat, the board is protected by the business judgement rule. A defense that is deemed preclusive because it frustrates, impedes or disenfranchises a shareholder vote is unlikely to be upheld.
- (36) The twin defense of staggered board election and a poison pill (“shareholder rights plan”) is “draconian” in the eyes of many economists but not the court. However, “dead hand” pills (where only directors not up for election may vote to rescind the pill) have been struck down.
- (37) The fraction of “hostile” (sum of unsolicited bids and bids where target is explicitly hostile) drops sharply after 1989, from more than 20% in the 1980s to less than 3% by the end of the 1990s.
- (38) Offer premiums are no lower for targets with poison pills.
- (39) There is a small but significantly negative market reaction to the adoption of strong antitakeover amendments such as poison pills and staggered board. The market reacts positively to antigreenmail amendments provided these occur when a takeover is rumored.

E. Targets in Bankruptcy:

- (40) There is a trend towards market-based mechanisms for resolving Chapter 11 cases, including sale of the firm to a bidder. Target firms that are sold spend less time in Chapter 11, which lowers bankruptcy costs. Acquirers tend to be in the same industry, and premiums paid are on average lower than in takeovers of non-bankrupt firm in the same industry.
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(Continued)

Table 15 (Continued)

Topic

- (41) Premiums paid for targets sold in mandatory, open, first-price, all-cash bankruptcy auctions in Sweden suggest the possibility that the auction mechanism may work well for the typical Chapter 11 case as well (which is of a similar size as the Swedish sample firm).
- (42) The average mandatory auction receives three bids and lasts two months; three-quarters of the auctioned firms are sold as going concern; the prices paid in these going-concern sales do not exhibit fire-sale discounts; and competition among bidders appear to force insiders to pay premiums comparable to those paid by outsiders.
- (43) The bankrupt firm's major creditor (bank) often finances a bidder in the auction, which pushes the auction towards overbidding. Post-bankruptcy operating performance is found to be at par with non-bankrupt industry rivals, regardless of overbidding incentives, suggesting that the auction leads to a relatively efficient restructuring of the target firm.

F. Offer Premiums:

- (44) Large-sample evidence on offer premiums are only starting to emerge. This evidence indicates that both the initial and final offer premiums are
- greater after the 1980s;
 - greater for public bidders;
 - greater in all-cash offers;
 - lower for toehold bidders;
 - increasing in the target runup (markup pricing);
 - decreasing in target total equity capitalization and greater if the target's book-to-market ratio exceeds the industry median market-to-book ratio;
 - greater in the presence of substantial dispersion in analysts' earnings forecasts;
 - lower when the bidder CEO is female, and the higher the target board's proportion of female directors (provided that the female directors are independent appointees).
 - unaffected by either the presence of a target poison pill or target hostility to the initial bid;

G: Takeover Gains:

- (45) The average target cumulative average abnormal stock return (CAR) is positive and significant, both over the runup period and the announcement period. The runup constitutes about one-third of the total runup plus announcement CAR. The largest target CAR occurs in all-cash offers.
- (46) The average, value-weighted combined CAR to bidders and targets is positive and significant over both the runup period and the announcement period. For the overall sample used here, the sum of the combined CAR for the runup- and announcement periods is a significant 1.79%.
- (47) Bidder announcement period CARs average close to zero for the overall sample, with 49% of the bidders having negative CAR. The combination large bidder (here in the upper size quartile), payment in all-stock, and the target being a public company represents a "worst-case scenario" with average bidder announcement-period CAR of a significant -2.21% . The "best-case scenario" for the bidder is the combination of a small bidder (lower size-quartile), private target and *all-stock* as payment. This produces a significant average bidder announcement-period CAR of 6.46%.
- (48) The major driver of negative bidder returns is not, as previously thought, the all-stock payment. Rather, the two key drivers are the target's status a public or private, and bidder size.
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(Continued)

Table 15 (Continued)

Topic
(49) Bidder size was particularly large in 1999 and 2000. These years were unusual relative to years before <i>and</i> years after. Cisco, with a (constant 2000 dollar) market capitalization of \$180 billion was the dominant bidder in <i>both</i> the upper 1% and lower 1% tails of the distribution of bidder abnormal announcement returns. Removing Cisco from the sample reduces the aggregate bidder dollar wealth loss in 1999–2000 period by almost \$100 billion.
(50) Studies of long-run abnormal stock returns use either the matched-firm technique or Jensen's alpha (regression constant in an asset pricing model) to measure expected return to the merged firms in the sample. With 15,298 successful takeovers completed during the period 1980–2003, we show that long-run returns are significantly negative based on the matched-firm technique and insignificantly different from zero based Jensen's alpha.
(51) The standard matched-firm procedure identifies firms that have significantly different factor loadings than the event firms—which undermines their role as “matches”.
(52) A zero-investment portfolio strategy which is long in the merged firms and short in the matched firms fail to produce long-run abnormal stock returns which are significantly different from zero, even for the sample of all-stock mergers.
H. Bondholders, Management, and Arbitrageurs:
(53) Studies of excess returns to bondholders of bidder and target firms find zero or negative gains to bidder bondholders and positive gains to target bondholders. There is no evidence of a wealth transfer from stockholders to bondholders due to a coinsurance effect of mergers. As of the 1990s, target bondholders are often fully protected via event risk covenants.
(54) Some target firms, particularly those receiving hostile bids, underperform prior to becoming targets. Moreover, CEO turnover increases after hostile bids. These findings indicate a disciplinary role played by the market for corporate control. There is, however, indications that this external control mechanism represents a “court of last resort”.
(55) There is evidence that managers undertaking value-reducing acquisitions face a greater probability of being replaced than do managers undertaking value-increasing acquisitions. That is, bad bidders risk being fired.
(56) There is evidence that CEO compensation (other than turnover) changes following acquisition activity. The market reaction to merger announcements tends to be positive and greater for CEOs with above-average equity-based compensation, suggesting that compensation affects the quality of managerial investment decisions.
(57) CEOs with high equity-based compensation tend to seek out targets with relatively high market-to-book ratios (growth firms). This is consistent with high equity compensation inducing risk-taking behavior.
(58) Empirical measures of CEO “power” helps explain the cross-sectional variation in M&A bonuses. Deal announcement induced abnormal stock returns tend to be lower for CEOs with greater “power”, suggesting that power may be misused.
(59) While a poorly performing acquisition reduces the value of the CEO's portfolio of stocks and options, there is evidence that the value of post-acquisition grants more than compensates for this value reduction. This indicates that CEOs face combination of low downside risk and high upside potential from making good acquisition decisions.

(Continued)

Table 15 (Continued)

Topic

- (60) There is evidence that some target firm CEOs may be sacrificing takeover premium in return for a “golden handshake” from the bidder (to step aside and relinquish control).
- (61) There is evidence that boards dominated by outside directors tend to increase value for their shareholders during an acquisition attempt. Target directors are rarely retained after a completed takeover, and their number of board seats and income levels tend to drop. This indicates that failing as a monitor imposes a personal cost on directors.
- (62) There is substantial evidence of increased trading activity in the bidder and target shares following merger announcements. In all-cash offers, merger (risk) arbitrageurs purchase target shares without shorting the bidder shares. In all-stock deals, arbitrageurs short the bidder stock using the exchange rate. If the exchange ratio is floating, the short sales are postponed until the final pricing has been set and the floating ratio has been fixed.
- (63) There are substantial (risk-adjusted) returns to merger arbitrage strategies. Moreover, the short selling activity appears to put downward pressure on the acquirer stock price that may account for almost half of the negative announcement return for acquirers of stock-financed mergers.

I. Mergers, Competition and Antitrust:

- (64) Merger-induced changes in product and factor prices directly translate into abnormal stock returns to the merging firms’ industry rivals, upstream suppliers and downstream customers. Market power theories (collusion, predation, buying power) and productive neoclassical efficiency theories make empirically testable predictions for these abnormal stock returns. Such tests complement and extend traditional product price analysis seen in industrial economics.
 - (65) The power of tests based on stock returns depend on the accurate identification of related firms (rivals, customers, suppliers). Since much of the available evidence indicates significant contagion effects of horizontal merger announcements on these related firms, the tests appear to have sufficient power. Related firms are identified using four-digit SIC codes, Compustat industry segment information, and the Bureau of Economic Analysis Input Output tables.
 - (66) The tests utilize two sets of samples: Mergers that have been challenged with violation of antitrust laws (or, in the European Union, reviewed for such violation), and non-challenged mergers. For challenged mergers, the tests exploit *two* events with (typically) opposing implications for the industry wealth effects, thus increasing power to reject.
 - (67) The empirical studies typically conclude against horizontal market power effects of horizontal mergers, whether or not these were challenged. That is, the observed wealth effects on horizontal rivals and downstream (corporate) customers do not support increased market power. Some studies find traces of monopsony (buying power) effects vis-a-vis upstream suppliers.
 - (68) A horizontal merger *causes* a measurable increase in industry concentration (equal to twice the product of the market shares of the bidder and target when using the Herfindahl measure of concentration). The classical market concentration doctrine holds that increases in concentration reliably increases the industry’s market power and thus industry monopoly rents. Since the abnormal returns to industry rivals directly measures changes in industry rents, regressing the merger-induced rival abnormal returns on the change in industry concentration provides a powerful test of the market concentration doctrine. Empirical tests reject the doctrine.
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establish how draconian antitakeover devices such as the staggered board and poison pill defense contributed to the fall.

The choice between merger and tender offer is interesting but has received little attention. There is some evidence that this decision is impacted by industry competition. This is hardly surprising as the likelihood of attracting rival competition in an auction setting depends on industry structure as well as asset characteristics. This is a fertile area for future research, both empirical and theoretical, and it ultimately links back to our understanding of takeover waves. Moreover, there are some indications that the target (and not the bidder) is increasingly initiating takeovers and thus determines the acquisition form. The economics of the selection process behind target-initiated deals is an exciting area for future research.

7.2. *Bidding strategies and offer premiums*

Bidders initiating takeover bids for U.S. targets over the period 1980–2005 offered all-cash as payment in 26% of the cases, all-stock in 37%, and a mix of stock of cash in 37%. The majority of tender offers are all-cash or a mix of cash and stock. While the majority of merger bids are in the form of all-stock (with the exception of the 1980–1985 period where most merger bids offered a mixed cash-stock payment). As pointed out earlier, all-cash and mixed cash-stock offers are predominant in tender offers. Moreover, mixed stock-cash offers rose to become the most frequently used payment method in mergers by 2001. In the two subperiods 1990–1995 and 1996–2000, the percentage of all-stock offers in initial merger bids was approximately 55% in *both* period. This means that (1) nearly half of the initial merger bids in the 1990s use some cash as payment, and (2) the fraction of merger bids where the payment is all-stock remained unaffected by the significant runup in overall market valuations in the 1996–2000 period.

The choice of payment method is strategic for several reasons, including tax effects, its impact on the conditional expected value of the bid to asymmetrically informed bidders and targets, and corporate control considerations. The evidence indicates that stock offers are more likely the greater the bidder's asset size and market-to-book ratio. Stock offers are less likely the greater the bidder management's shareholdings and the greater the dispersion in analyst forecast of bidder earnings. Moreover, offer premiums are greater in all-cash offers than in all-stock offers, and the probability that the initial bidder wins the target is lower for all-stock offers than for cash offers.

The pervasive negative market reaction to all-stock merger bids by public bidders is typically compared to the average negative market reaction to seasoned equity offers. The comparison is appealing since the timing of the equity issue is determined endogenously by the issuer in both events, and thus involves some degree of adverse selection. On the other hand, in terms of the *issue method*, stock swaps in mergers are closer to private placements than they are to an underwritten seasoned equity offering—and there is substantial evidence that the market reaction to private placement is positive on average (Eckbo, Masulis, and Norli, 2007). Moreover, the market reaction to merger stock swaps is positive when the target is private. Also, formal tests of signaling theories for the

payment method choice have received mixed success. Additional research is needed to establish the empirical relevance of asymmetric information arguments for the strategic payment choice.

The dramatic fall in toehold bidding coincides with the rise of structural takeover defenses beginning in the 1980s. In theory, toehold bidding conveys the substantial strategic advantage of rival bidders, particularly in a common-value setting. Since many of these advantages come at the expense of the *target*, some targets may be reluctant to negotiate if the bidder has a toehold. If so, acquiring a toehold prior to attempting friendly merger negotiations may backfire: if the target refuses, the bidder foregoes not only things like a termination agreement but also the opportunity to examine the target books—which is crucial for pricing the merger.

Another way to put this is that a toehold must be large to be worth it—larger than 10% by some (conservative) estimates. This argument may go a long way in explaining the dual observation that toeholds are large (on average 20%) when they exist and that they occur mostly in hostile bids. An interesting and hitherto unexplored empirical issue is whether toeholds are important in other jurisdictions, in particular those with highly concentrated shareownership and a set of takeover regulations and corporate governance practices that differ from those in the U.S.

The average offer premium in successful single-bid takeover contests is somewhat higher than the average initial offer premium in multi-bid contests. While this is consistent with the greater premium preempting competition in ex-post successful single-bid cases, systematic empirical tests of preemption are almost nonexistent. Bid revisions are substantial when the initial bid attracts competition and/or is revised by the initial bidder. The average bidjump from the first to the second bid in the contest is 10 percentage points, a 31% change in the offer premium.

Another interesting jump is the markup of the offer price above the target stock price on the day before the offer is announced. There is substantial evidence that a dollar increase in the pre-offer target share price runup causes the initial bidder to mark up the total offer premium by almost a dollar (\$0.80). Interestingly, *bidder* takeover gains are also found to be increasing in the target runup, which raises issues concerning the true nature of the markup pricing phenomenon itself. It appears that takeovers with greater pre-bid target runups are more profitable for *both* bidder and target firms, which may explain why bidders agree to the (partial) markup.

A useful approach to investigating the markup pricing phenomenon further is to document in much greater detail the bidder's pricing process during merger negotiations. An analogy here may be the structure of the pricing process in seasoned equity offerings and in initial public offerings. Which parties are involved? What role do fairness reports play for the pricing process? If bidders, in fact, react by revising the offer price in response to the target runup, how is the runup analyzed? Is the reverse causality at play, that is, is the offer price set high ex ante in profitable takeovers, which when rumored drives the runup in the target price ex-post?

Delaware case law sanctions the right to “just say no” to an unsolicited takeover bid. Moreover, if the board's defensive response is not draconian (i.e., it is neither coercive

nor preclusive), the board is protected by the business judgment rule. The twin defense of staggered board election and a poison pill (shareholder rights plan) is draconian in the eyes of many economists but not the court. However, “dead-hand” pills (where only incumbent directors may vote to rescind the pill) have been struck down.

There is a small but significantly negative market reaction to the adoption of strong antitakeover amendments such as poison pills and staggered board. The market reacts positively to antigreenmail amendments provided these occur when a takeover is rumored. Offer premiums appear to be as high (if not higher) for targets with poison pills than targets with no pill in place. Since pills can be adopted any time, and in particular in response to a bid (“morning after pill”), the power of tests that compare offer premiums in pill-targets with no-pill-targets is questionable and should be examined further. Understanding the true economic effects of defenses such as staggered boards and poison pills is important, not the least for the ongoing public policy debate over antitakeover measures.

There is a trend toward market-based mechanisms for resolving Chapter 11 cases, including sale of the firm to a bidder. Target firms that are sold spend less time in Chapter 11, which lowers bankruptcy costs. Acquirers tend to be in the same industry, and premiums paid are on average lower than in takeovers of nonbankrupt firms in the same industry. Premiums paid for targets sold in mandatory, open, first-price, all-cash bankruptcy auctions in Sweden suggest the possibility that the auction mechanism may also work well for the typical Chapter 11 case (which is of a similar size as the Swedish sample firms). Importantly, the Swedish auction prices do not exhibit fire-sale discounts, contradicting a central presumption behind the creation of Chapter 11 back in 1978. The growing use of auction-related mechanisms in the United States is likely to have lowered bankruptcy costs. By how much remains an important question for future research.

Large-sample evidence on offer premiums are only starting to emerge. This evidence indicates that both the initial and final offer premiums were greater after the 1980s; greater for public bidders; greater in all-cash offers; lower for toehold bidders; increasing in the target runup (markup pricing); decreasing in target total equity capitalization and greater if the target’s book-to-market ratio exceeds the industry median market-to-book ratio; greater in the presence of substantial dispersion in analysts’ earnings forecasts; lower when the bidder CEO is female, and the higher the target board’s proportion of female directors (provided that the female directors are independent appointees); and unaffected by either the presence of a target poison pill or target hostility to the initial bid.

Several variables used by researchers to explain the offer premium are themselves endogenous choice variables (payment method, toehold, hostility, termination agreements, bidder’s public status). Some of the effects stated earlier appear robust to corrections for endogeneity (including systems of equations and Heckman procedures). One variable that does *not* appear to be robust, however, is tender offer. The inclusion of other variables (such as toeholds and hostility) appears to affect conclusions as to whether offer premiums are higher, the same, or lower in tender offers than in merger bids. Additional work is needed to sort this issue out—and may also affect the conclusion so far that poison pills have a neutral effect on offer premiums.

7.3. Takeover gains

Becoming a target is a significant surprise event; thus target total gains are measured relatively precisely by the offer premium (typically, relative to the target market price two months prior to the first offer announcement) or, alternatively, by target cumulative abnormal returns over the same period. Consistent with the evidence on offer premiums (above), the average target cumulative average abnormal stock return (CAR) is positive and significant, over both the runup and the announcement period. The target runup constitutes about one-third of the total runup plus announcement CAR. The largest target CAR occurs in all-cash offers.

The average, value-weighted combined CAR to bidders and targets is positive and significant over both the runup period and the announcement period. For the overall sample used here, the sum of the combined CAR for the runup and announcement periods is a significant 1.79%. Bidder announcement-period CARs average close to zero for the overall sample, with 49% of the bidders having negative CAR. The combination large bidder (here in the upper size quartile), payment in all-stock, and the target being a public company represents a worst-case scenario, with average bidder announcement-period CAR of a significant -2.21% . The best-case scenario for the bidder is the combination of a small bidder (lower size-quartile), private target, and *all-stock* as payment. This produces a significant average bidder announcement-period CAR of 6.46%.

The major driver of negative bidder returns is not, as previously thought, the all-stock payment. Rather, the two key drivers are the target's status as public or private and bidder size. Bidder size was particularly large in 1999 and 2000. These years were unusual relative to years before *and* years after. Cisco, with a market capitalization of \$180 billion (constant 2000 dollars) was the dominant bidder in *both* the upper 1% and lower 1% tails of the distribution of bidder abnormal announcement returns. Removing Cisco from the sample reduces the aggregate bidder dollar wealth loss in the 1999–2000 period by almost \$100 billion. An important but unanswered question is whether the negative spike is truly a bidder size effect or a year effect (or a combination of two). At this point, there appears to be no explanation for why the large firms decided to enter the market for corporate control in 1998–2001, only then to leave again.

Studies of long-run abnormal stock returns use either the matched-firm technique or Jensen's alpha (regression constant in an asset pricing model) to measure expected return to the merged firms in the sample. With 15,298 successful takeovers completed during 1980–2003, we show that long-run returns are significantly negative based on the matched-firm technique but insignificantly different from zero-based Jensen's alpha. Of the two methods, only the latter can actually be replicated using a portfolio investment strategy. We also show that the standard matched-firm procedure identifies firms that have significantly different factor loadings than the event firms—which undermines their role as “matches.” A zero-investment portfolio strategy that is long in the merged firms and short in the matched firms fails to produce long-run abnormal stock returns that are significantly different from zero, even for the sample of all-stock mergers. Overall, the long-run performance evidence presented here does not support the hypothesis that merged firms underperform.

7.4. Bondholders, executives and arbitrage

Studies of bondholder returns have suffered from limited access to data on bond market values. However, bond data are improving. Recent studies of excess returns to bondholders of bidder and target firms find zero or negative gains to bidder bondholders and positive gains to target bondholders. There is no evidence of a wealth transfer from stockholders to bondholders due to a coinsurance effect of mergers. As of the 1990s, target bondholders are often fully protected via event risk covenants. Bondholder wealth effects of a variety of corporate control decisions seem a fertile area for future research.

There is evidence that managers undertaking value-reducing acquisitions face a greater probability of being replaced than do managers undertaking value-increasing acquisitions. That is, bad bidders risk being fired. Some target firms, particularly those receiving hostile bids, underperform prior to becoming targets. However, CEO turnover increases after hostile bids, indicating a disciplinary role played by the market for corporate control. There is also evidence that CEO compensation (other than turnover) changes following acquisition activity. The market reaction to merger announcements tends to be positive and greater for CEOs with above-average equity-based compensation, suggesting that compensation affects the quality of managerial investment decisions.

CEOs with high equity-based compensation tend to seek out targets with relatively high market-to-book ratios (growth firms). This is consistent with high equity compensation inducing risk-taking behavior. Moreover, while a poorly performing acquisition reduces the value of the CEO's portfolio of stocks and options, there is evidence that the value of post-acquisition grants more than compensates for this value reduction. This indicates that CEOs face the combination of low downside risk and high upside potential from making good acquisition decisions.

There is also some evidence that target firm CEOs may be sacrificing takeover premium in return for a golden handshake from the bidder (to step aside and relinquish control). Empirical measures of CEO power helps explain the cross-sectional variation in M&A bonuses. Moreover, deal announcement-induced abnormal stock returns tend to be lower for CEOs with greater power, suggesting that power may be misused. This raises the question of what role boards play in monitoring takeover activity. There is evidence that boards dominated by outside directors tend to increase value for their shareholders during an acquisition attempt. Target directors are rarely retained after a completed takeover, and their number of board seats and income levels tend to drop. This suggests that failing as a monitor imposes a personal cost on directors, which helps align the interest of directors and shareholders.

Merger arbitrage (or risk arbitrage) is a specialized investment strategy that tries to profit from the spread between the offer price and the target stock market price conditional on the offer having been made. It is essentially a (risky) bet on the likelihood that the proposed transaction will go through. Arbitrage gains depend on several factors, including the size of the arbitrage spread, the probability that the deal closes, the length of time that the arbitrageur must hold the position, and the target stock price development if the deal fails. Average gains are significantly positive, with the largest abnormal returns

reported for cash tender offers. In addition to bearing deal failure risk, merger arbitrageurs provide a service in terms of providing deal-related information, liquidity, and helping resolve the free rider problems among small, diffuse target shareholders. Transaction costs, such as brokerage commissions and price impact of trading, limit arbitrage returns. There is evidence that short-selling by merger arbitrageur causes downward price pressure that accounts for almost half of the negative announcement return for acquirers in stock-financed mergers.

7.5. *Competition and antitrust*

Merger-induced changes in product and factor prices directly translate into abnormal stock returns to the merging firms' industry rivals, upstream suppliers, and downstream customers. Market power theories (collusion, predation, buying power) and productive neoclassical efficiency theories make empirically testable predictions for these abnormal stock returns. Such tests complement and extend the traditional product price analysis seen in industrial economics. The empirical studies typically conclude against the horizontal market power effects of horizontal mergers. That is, the observed wealth effects on horizontal rivals and downstream (corporate) customers do not support increased market power. Some studies find traces of monopsony (buying power) effects vis-à-vis upstream suppliers.

A horizontal merger causes a measurable increase in industry concentration (equal to twice the product of the market shares of the bidder and target when using the Herfindahl measure of concentration). The classical market concentration doctrine holds that an increase in concentration reliably increases the industry's market power and thus industry monopoly rents. Since the abnormal returns to industry rivals directly measure changes in industry rents, regressing the merger-induced rival abnormal returns on the change in industry concentration provides a powerful test of the market concentration doctrine. Empirical tests reject the doctrine.

The power of tests based on stock returns depends on the accurate identification of related firms (rivals, customers, suppliers). Since much of the available evidence indicates significant contagion effects of horizontal merger announcements on these related firms, the tests appear to have sufficient power. Related firms are identified using four-digit SIC codes, Compustat industry segment information, and the Bureau of Economic Analysis Input Output tables. The tests utilize two sets of samples: mergers that have been challenged with violation of antitrust laws (or, in the European Union, reviewed for such violation) and nonchallenged mergers. For challenged mergers, the tests exploit two events with (typically) opposing implications for the industry wealth effects, thus increasing power to reject.

In the future the interaction of industrial and financial economics, where econometric methods traditionally used in corporate finance are applied to interesting phenomena in industrial economics, is likely to increase in importance. While most of the attention thus far has centered on testing theories of monopoly, the econometric method applies

equally well to an examination of alternative efficiency theories of corporate investment. For example, an industry-based theory of merger waves may be couched in terms of the valuation effects for related firms and may be tested using the event study methodology. Similarly, behavioral arguments for things like clustering of merger activity and post-merger underperformance have hitherto untested implications for the event-induced valuation effect across industry rivals.

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CORPORATE RESTRUCTURING: BREAKUPS AND LBOs

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Abstract

This chapter surveys the empirical literature on corporate breakup transactions (divestitures, spinoffs, equity carveouts, tracking stocks), leveraged recapitalizations, and leveraged buyouts (LBOs). Many breakup transactions are a response to excessive conglomeration and reverse costly diversification discounts. The empirical evidence

shows that the typical restructuring creates substantial value for shareholders. The value-drivers include elimination of costly cross-subsidizations characterizing internal capital markets, reduction in financing costs for subsidiaries through asset securitization and increased divisional transparency, improved (and more focused) investment programs, reduction in agency costs of free cash flow, implementation of executive compensation schemes with greater pay-performance sensitivity, and increased monitoring by lenders and LBO sponsors. Buyouts after the turn of the century created value similar to LBOs of the 1980s. Recent developments include club deals (consortiums of LBO sponsors bidding together), fund-to-fund exits (LBO funds selling the portfolio firm to another LBO fund), a highly liquid (until mid-2007) leveraged loan market, and evidence of persistence in fund returns (perhaps because brand-sponsors borrow at better rates). Perhaps the greatest challenge to the restructuring literature is to achieve a modicum of integration of the analysis across transaction types. Another challenge is to produce precise estimates of the expected return from buyout investments in the presence of limited data on those portfolio companies that do not return to public status.

Keywords

restructuring, breakup, divestiture, spinoff, equity carveout, tracking stock, leveraged recapitalization, leveraged buyout, highly leveraged transaction

1. Introduction

Shocks to the corporate economic environment may give rise to severe organizational inefficiencies. For example, a vertically integrated firm may find that long-term contracts and/or spot market purchases of a key input have become more efficient. Or increased general capital market liquidity may have rendered internal capital markets a relatively costly divisional funding mechanism for conglomerates. High leverage may be optimal as financial innovations and expertise make it less expensive to manage financial distress. Financial innovations and general market liquidity may also render it optimal to securitize an entire division. The result is increased divisional managerial focus. In this chapter, we collectively refer to the transactions that implement these and other changes in asset composition, financial contracting, and ownership structure as “corporate restructurings”.

We focus the survey on garden-variety restructuring procedures used to securitize and sell off part of the firm. Takeovers—the perhaps ultimate form of corporate restructuring—are reviewed in Chapter 15 of this Handbook (Betton, Eckbo, and Thorburn, 2008). However, we include leveraged buyouts (LBOs) in which the entire firm is acquired by a financial buyer such as a buyout fund. We also deal with issues of financial distress only tangentially, as the evidence surrounding restructurings in bankruptcy are covered in Chapter 14 (Hotchkiss, John, Mooradian, and Thorburn, 2008).

It is useful to classify corporate restructurings into two broad groups: breakups and highly leveraged transactions. Breakup transactions focus primarily on the separation of company assets and therefore include divestitures, spinoffs, equity carveouts, and tracking stock. Highly leveraged transactions involve a significant increase of debt in the firm’s capital structure, either through a debt-financed special dividend in a leveraged recapitalization or in an LBO.¹

Corporate restructurings may be initiated by the firm’s top-level management, by divisional managers, or by outside sponsors like buyout funds. Occasionally, the restructuring is defensive, arising in response to a control threat from the market for corporate control. Regardless of who initiates the transaction, the parties are seeking to improve operating efficiency, increase cash flow, and, ultimately, enhance firm profitability. In breakup transactions, assets are transferred to higher-value users, while highly leveraged transactions involve optimizing capital structure, improving managerial incentives and achieving tax efficiency.

The survey is organized as follows. We begin in Section 2 with a brief discussion of the so-called diversification discount and potential costs of diversification, which motivate many breakup transactions. Sections 3 through Section 6 then detail the structure and consequences of various types of breakup transactions, including divestitures (Section 3), spin-offs (Section 4), equity carveouts (Section 5), and tracking stock (Section 6).

¹ We do not survey recapitalizations that do not involve extensive use of leverage. Examples include state privatizations (Megginson and Netter, 2001), conversions from mutual to stock companies (Masulis, 1987), and stock repurchases. Stock repurchases are reviewed in Chapter 10 of this Handbook (Kalay and Lemmon, 2008).

Next we turn to highly leveraged transactions, including leveraged recapitalizations and leveraged buyouts (LBOs). Section 9 concludes the survey.

2. Restructurings and the boundaries of the firm

2.1. Breakup transactions

The economic boundary of the firm may be defined as the point where within-firm transactions start to become more costly than arms-length (across market) transactions. There are numerous theories for why within-firm transactions may economically dominate market transactions, ranging from transactions costs (Coase, 1937) to agency costs and costs of imperfect contracting and moral hazard (Jensen and Meckling, 1976, Klein, Crawford and Alchian, 1978, Williamson, 1985, Grossman and Hart, 1985, Jensen, 1986, Hart and Moore, 1990). Alternatives outright ownership of resources include renting (long- or short-term contracts) and “spot” market transactions to ensure continued operations of the firm. These organizational alternatives have different implications for corporate taxes, firm-specific resource specialization and development of appropriable quasi-rents (which in turn lead to bargaining issues and potential for opportunistic behavior), investment decisions, risk-sharing and financing costs.

An asset such as an operating plant may have greater value as a division of a conglomerate than as a stand-alone “pure play” entity. The degree to which conglomerates generate value depends on the managerial skills and the nature of the resources required to operate efficiently within an industry. The value of using shared resources, such as managerial time and internal capital, differs across firms and industries as well as through time. As the boundaries of the firm change over time, some firms respond by undertaking expansions (mergers and acquisitions), breakups (divestitures, spinoffs) and recapitalizations (leveraged recaps and buyouts). Breakup transactions create value when synergies from conglomeration become negative, that is, when the costs of keeping the company’s assets together exceed the benefits from doing so.

As emphasized by Maksimovic and Phillips (2007) (Chapter 8 of this Handbook), the corporate finance literature on conglomeration took off with the discovery of the “conglomerate discount” by Lang and Stulz (1994) and Berger and Ofek (1995). The discount is measured as the difference between the market value of the diversified firm and the sum of the estimated values of the (nontraded) divisions. The latter are estimated using multiples from single-segment (pure play) competitors. Berger and Ofek (1995) report a diversification discount of 13 to 15% in the 1986–1991 period. Subsequent empirical work has extended and reinterpreted the early results. Maksimovic and Phillips (2007) conclude that diversified firms *predominantly* behave like value maximizers given their productivity and that internal capital markets tend to facilitate the efficient transfer of resources. However, they also point to ambiguities reflecting econometric issues of endogeneity and self-selection, as well as choice of data, at various steps of the overall test strategy.

The typical breakup transaction reviewed below is shown to generate substantial shareholder value. This evidence is consistent with both the empire-building hypothesis and the value-maximizing self-selection hypothesis for the average observed diversification discount. Whether managers of firms breaking up are value-maximizers or empire-builders, the breakup may be an optimal response to exogenous changes in the economic boundaries of the firm. Reversing costs of excessive conglomeration may be a by-product of downsizing. Diversified firms undertaking breakup transactions are, however, more likely to be facing significant diversification costs than a random sample of conglomerates. Consequently, firms busting up are prime candidates for examining the potential nature of diversification costs.

The literature provides several examples of diversification costs and how they may distort investment. Scharfstein and Stein (2000) describe conditions under which top management inefficiently allocates too much funds to divisions with poor investment opportunities (cross-subsidization). Rajan, Servaes and Zingales (2000) argue that investment choices may be distorted because top management cannot commit to future distribution of funds until a surplus has been realized. Goldman (2004) models the resource allocation inside a multidivision firm of a manager with stock-based compensation and shows that the investment incentives improve after a spinoff of a division.

Another potential cost of diversification is related to executive compensation: since the division is a private entity, it is difficult to tie divisional manager compensation directly to the underlying value of the operations under their control. Stock-based compensation policies may be critical to induce optimal investment decisions and to retain managerial talent in a competitive labor market. A separate listing of subsidiary stock resolves such compensation issues, lowering agency costs and increasing market value.²

Breakup transactions may also result because conglomeration accentuates costly information asymmetries between investors and corporate insiders. Nanda and Narayanan (1999) model a diversified firm's decision to divest a division that is undervalued by the market. Outside investors observe the aggregated (conglomerate) cash flow only, while management also observes the divisional cash flows. Without detailed divisional information, the market rationally assigns an average performance to each division. This pooling results in undervaluation of the well-performing division and overvaluation of the poorly performing division. In this situation, it may be optimal to divest the overvalued (underperforming) division in order to lower the cost of capital for the undervalued division.

A related information-based argument is that conglomerates operating in a wide range of industries are more difficult for analysts to value correctly. This is true both because analysts tend to specialize in certain industries and because divisions may be relatively opaque in terms of financial information. A breakup may lead to increased coverage by financial analysts and improved quality of the information available to investors. Liu (2005) further maintains that a breakup allows outsiders more generally to discover firm

² See Aron (1991) for a model of this effect in the context of spinoffs.

value at a lower cost. As a result, high-value firms may undertake breakups in order to separate themselves from low-value firms.

Are there too few breakups? Boot (1992) argues that self-interested managers are reluctant to sell assets because a divestiture may signal poor managerial quality. Lang, Poulsen, and Stulz (1995) also point out that managers who value control may be reluctant to sell assets in order to promote operating efficiency alone. In this situation, an active market for corporate control may be required to force more divestitures. Financial distress is another scenario which may force even non-value-maximizing managers of financially constrained firms to divest assets in order to raise capital (see also Hotchkiss, John, Mooradian and Thorburn, 2008, Chapter 14 of this Handbook).

The above arguments emphasize how breakups create value by reversing negative synergies. A divisional or asset sale may also be the result of the demand side: the assets may simply be worth more under the buyer's control. That is, the buyer may be a higher-quality manager, and the divisional resources may offer a greater potential for synergies when merged with the acquiring firm. Selling the asset at a premium may serve the interest of all parties involved. Finally, corporate breakups may be forced by direct legal actions under antitrust or bankruptcy court, or by regulatory changes changing the economic boundary of the firm.

2.2. *Highly leveraged transactions*

In a highly leveraged transaction, the focus of the restructuring is on the economic effects of the leverage increase. Whether undertaking a debt-financed dividend (leveraged recap), or a leveraged purchase of a division or the entire firm (LBO, where the firm goes private), it is the leverage increase rather than any concomitant asset restructuring that provides the main economic motivation for the transaction. As a result, LBOs tend to involve financial (as opposed to strategic) buyers, such as buyout funds.

The literature points to several possible sources of gains in leverage-increasing transactions. Under the classical trade-off theory of debt (see Frank and Goyal, 2008, Chapter 12 of this Handbook), firms move to a higher level of debt in order to capitalize on the corporate debt tax shield provided by the (U.S.) tax law. In addition to the potential for corporate tax benefits, the literature emphasizes beneficial managerial incentive and monitoring effects of higher leverage. Some highly leveraged firms may also gain a strategic advantage in product markets. On the other hand, high leverage is not for everyone: under conditions of financial distress, a debt overhang tends to prevent efficient investments (Myers, 1977).

In terms of managerial incentives, Ross (1977) presents a signaling model in which managers who face personal bankruptcy costs signal their private information about higher future expected cash flows by committing to a greater corporate debt level. In the vernacular of Jensen (1986), entrenched managers prefer to overinvest rather than pay out the firm's "free cash flow" as dividends (where free cash flow is defined as

corporate liquid funds in excess of what is required to fund all positive net present value projects). A leveraged recapitalization, where the firm increases its debt without retaining the proceeds (thus increasing leverage ratios), reduces Jensen's overinvestment problem by precommitting to disgorge future cash flows in the form of interest payment. Jensen (1986) further argues that the greater risk of financial distress associated with higher leverage also helps discipline managerial investment policies. Stulz (1990) formalizes this intuition and shows that high leverage is particularly valuable when investment opportunities are poor, even if the free cash flow is negative.

Increasing leverage also allows wealth constrained managers to hold a greater percentage of total equity after the transaction is completed. For example, in a leveraged recapitalization, the debt may be paid out as cash dividend to non-managerial stockholders and as a stock dividend (or a cash dividend that is immediately reinvested in the firm) to managers. In an LBO, the managers may roll over their equity investment, while other equity-holders are paid out, again increasing managers' fractional equity ownership. The incentive effect of such greater managerial equity ownership helps reduce manager-shareholder conflicts of interest. Garvey (1992) explores the conditions under which leverage and management equity ownership are complementary in reducing the overinvestment problem of free cash flow.³

Highly leveraged transactions may also lead to improved monitoring by banks, and by the LBO sponsor who has its own money at risk in the transaction. Jensen (1989) argues that active governance by buyout sponsors and high-powered managerial incentives, combined with the pressure from high leverage, provides an incentive structure that is superior to that of public firms with dispersed ownership and weak governance. He even suggests that the LBO organizational form may "eclipse" the traditional corporate form, a prediction that has yet to be proven (we present evidence on the frequency of LBO transactions in Section 8 below).

Moreover, highly leveraged transactions may cause wealth transfers across the firm's various constituencies. For example, bonds that lack protective covenants may become more junior in the capital structure, resulting in a bondholder loss (benefiting shareholders). It is also possible that incumbent managers participating in a leveraged buyout have inside information about the firm's future prospects, expropriating selling shareholders. Muller and Panunzi (2004) argue that the LBO sponsor may be in a position to expropriate minority shareholders by merging the firm with the raider's leveraged acquisition subsidiary. Perotti and Spier (1993) present a model in which the firm gains bargaining power in contracting renegotiations by temporarily increasing leverage. Specifically, after retiring equity through a junior debt issue, shareholders threaten to underinvest in valuable new projects unless employees concede to wage reductions. Finally, there is a growing literature linking leverage to the firm's strategic position in product markets. See the reviews of Maksimovic (1995) and Parsons and Titman (2008), Chapter 13 of this Handbook, for reviews of this literature.

³ See also Garvey (1995) for an analysis of managerial incentive effects of leverage.

We now turn to a detailed description of the empirical evidence on breakups and highly leveraged transactions. In the course of discussing the evidence, we return to several of the hypotheses outlined above.

3. Divestitures

A divestiture is the sale of a portion of the firm's assets to a third party—typically another company or a private equity fund—in a private transaction. The assets sold may be a division, segment, subsidiary, or product line. In return, the seller typically receives cash, but sometimes also securities or a combination of both. The proceeds from the sale are reinvested in the remaining business or distributed to the firm's claim holders. While eliminating some assets, the selling firm continues to exist in essentially the same form as before. Divestitures may trigger a substantial tax liability: the difference between the proceeds from the sale and the firm's tax basis in the assets is a capital gain or capital loss, which is taxed at the corporate tax rate.

3.1. Transaction volume

In 2006, U.S. corporations announced 3,375 divestitures with a total deal value of \$342 billion (*source: Mergerstat Review*). The line in Panel A of Figure 1 shows the annual number, and the bars show the total dollar volume of U.S. divestitures over the period 1980–2006. The number of transactions was relatively stable between 1980 and 1995. Since the mid-1990s, however, the divestiture activity has tripled and reached record high levels in 2005–2006.

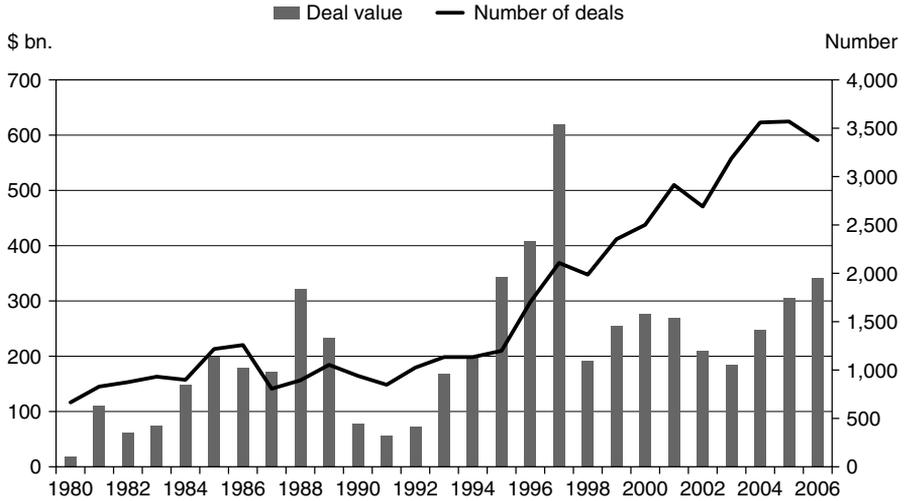
The most aggressive divester in 2006 was UTEK (26 divestitures), followed by General Electric (17), Clear Channel Communications (11), El Paso (10), and Federated Department Stores (10). Two of the sellers, General Electric and El Paso, were also among the most aggressive divesters in the previous year. In addition, General Electric was listed as the most aggressive U.S. acquirer in 2006 and 2005, with 30 and 28 acquisition announcements, respectively.

The total divestiture activity tracks closely the merger and acquisition (M&A) activity in the economy. Panel B of Figure 1 shows the annual number of U.S. divestitures as a percentage of all U.S. takeovers from 1970 and forward. While the number of divestitures increased sharply in the second half of the 1990s, it fell behind the even greater increase in M&A volume over the same period. This trend was reversed once the takeover activity slowed after the turn of the century. In 2006, divestitures made up 32% of all M&A transactions, somewhat below the annual average of 38% over the whole 1970–2006 period.

3.2. Valuation effects

Panel A of Table 1 shows the stock price reaction of the divesting firm for 18 selected studies with announcement dates in years 1963 through 1999. The studies typically

A: Number (line) and total transaction value (bars) of divestitures



B: Divestitures as a fraction of the U.S. merger and acquisition volume

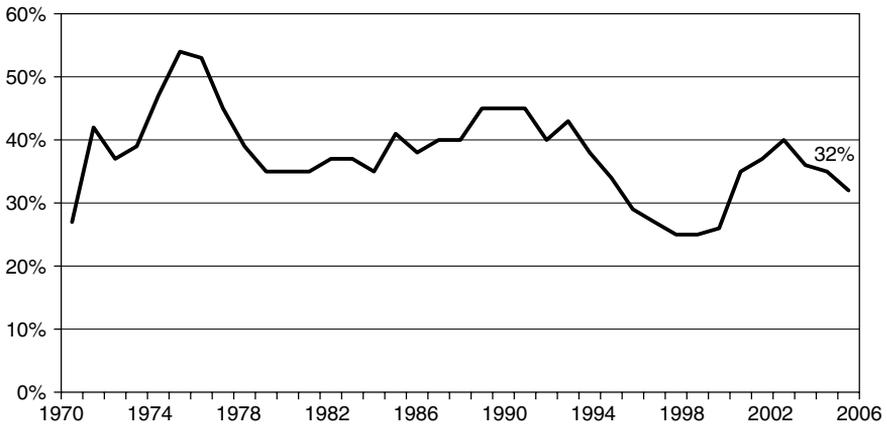


Fig. 1. Annual volume of U.S. divestitures, 1970–2006.

Source: Mergerstat Review.

report the cumulative abnormal stock return (CAR) over the two-day interval $(-1, 0)$ where day 0 is the announcement day.⁴ The average CAR for the announcements are

⁴ A typical approach is to estimate the parameters using a single-factor market model over approximately a year prior to the event: $R_{jt} = \alpha_j + \beta_j R_{mt} + \epsilon_{jt}$, where R_{jt} is the stock return of firm j and R_{mt} is the market return on day t . The abnormal return $AR_{j\tau}$ over event day τ is computed as $AR_{j\tau} = R_{j\tau} - (\hat{\alpha}_j + \hat{\beta}_j R_{m\tau})$, where $\hat{\alpha}_j$ and $\hat{\beta}_j$ are the coefficient estimates from the time-series regression. The cumulative abnormal return is $CAR(\tau_1, \tau_2) = \sum_{\tau=\tau_1}^{\tau_2} AR_{j\tau}$, where τ_1 and τ_2 define the event window relative to the announcement day 0.

Table 1

Cumulative abnormal returns (CAR) for divestiture announcement of 3,700 sellers and 1,243 buyers in 19 selected studies, 1963–1999

Relative size is the average ratio of the sales price of the divested assets to the pre-deal total assets (TA) and market value of equity (MVE) of the seller and buyer, respectively.

Study	CAR		Relative size		Sample size	Time period	Event window
	Mean	Median	TA	MVE			
Panel A: Seller returns:							
Alexander, Benson, and Kampmeyer (1984)	0.3%				53	1964–1973	[−1,0]
Linn and Rozeff (1984)	1.6%				77		[−1,0]
Rosenfeld (1984)	2.3%				62	1969–1981	[−1,0]
Jain (1985)	0.5%				1,062	1976–1978	[−1,0]
Klein (1986)	1.1%				202	1970–1979	[−2,0]
Hite, Owers, and Rogers (1987)	1.5%		16%		114	1963–1981	[−1,0]
Hirschey, and Zaima (1989)	1.6%				170	1975–1982	[−1,0]
Hirschey, Slovin, and Zaima (1990)	1.5%			38%	75	1975–1982	[−1,0]
Afshar, Taffler, and Sudarsanam (1992)	0.7%			10%	178	1985–1986	[−1,0]
Sicherman and Pettway (1992)	0.9%			30%	278	1980–1987	[−1,0]
John and Ofek (1995)	1.5%	0.8%		39%	258	1986–1988	[−2,0]
Lang, Poulsen, and Stulz (1995)	1.4%	0.7%	11%	69%	93	1984–1989	[−1,0]
Loh, Bezjak, and Toms (1995)	1.5%				59	1980–1987	[−1,0]
Slovin, Sushka, and Ferraro (1995)	1.7%	0.7%	33%	17%	179	1980–1991	[0,1]
Hanson and Song (2000)	0.6%	0.3%		27%	326	1981–1995	[−1,1]
Mulherin and Boone (2000)	2.6%	1.6%		18%	139	1990–1999	[−1,1]
clubb and Stouraitis (2002)	1.1%	0.5%		14%	187	1984–1994	[−1,0]
Dittmar and Shivdasani (2003)	3.4%		31%		188	1983–1994	[−1,1]
Sample size weighted seller average	1.2%		25%	27%	3,700	1963–1999	
Panel B: Buyer returns:							
Jain (1985)	0.5%				304	1976–1978	[−1,0]
Hite, Owers, and Rogers (1987)	0.6%		19%		105	1963–1981	[−1,0]
Sicherman and Pettway (1992)	0.5%				278	1980–1987	[−1,0]
Datta and Iskandar-Datta (1995)	0.0%			13%	63	1982–1990	[−1,0]
John and Ofek (1995)	0.4%	−0.5%		72%	167	1986–1988	[−2,0]
Hanson and Song (2000)	0.5%	0.2%			326	1981–1995	[−1,1]
Sample size weighted buyer average	0.5%		19%	25%	1,243	1963–1995	

positive—ranging from 0.3% to 3.4% across the different samples—and almost all of the estimates are statistically significant at the 1%-level (two-sided *t*-test against zero). The sample-size-weighted average CAR for the combined sample of 3,700 divestitures is 1.2%. In sum, the evidence indicates that the average divestiture increases the value of the selling firm.

As further shown in the table, firms sell one-quarter or less of their total assets in the average transaction. Several studies find that the seller firm announcement returns are increasing in the relative size of the divested assets (Zaima and Hearth, 1985; Klein, 1986; Mulherin and Boone, 2000). It is possible that the returns on asset sales are independent of the size of the assets, so that relatively larger assets have a greater impact on the parent firm's return. This is similar to the effect of the relative size of the target on bidder returns documented in the takeover literature and reviewed in Betton, Eckbo, and Thorburn (2008). (See Chapter 15 of this Handbook.)

Klein (1986) reports that the disclosure of the sales price is central to the market's assessment of the transaction. She finds a positive seller stock price reaction only when the price is disclosed at the initial divestiture announcement. Firms that fail to announce the transaction price have CARs close to zero. The significance of price disclosure is confirmed by Afshar, Taffler, and Sudarsanam (1992) and Sicherman and Pettway (1992). Clubb and Stouraitis (2002) find that the announcement returns tend to increase with the difference between the sales price and an estimated value of the assets in their current use. Overall, this suggests that the market's valuation of the transaction depends on the sales price relative to the value of the assets when operated by the firm.

The abnormal returns on divestiture announcements are positive also for buyers, although they are of a smaller magnitude than for sellers. For six selected studies with data for the period 1963–1995 and listed in Panel B, the average buyer announcement CAR ranges from 0.0% to 0.6%. The sample-size-weighted buyer ACAR is 0.5% for the combined sample of 1,243 divestiture announcements. Sicherman and Pettway (1992) document a size effect in the buyer's stock price reaction similar to that of sellers; that is, buyer returns tend to increase with the relative size of the acquired assets.

While both sellers and buyers appear to gain from a divestiture, most of the gains tend to accrue to the selling (divesting) firm. In each individual transaction, however, the division of the total gains depends on the relative bargaining strength of the two parties. Sicherman and Pettway (1992) use a debt downgrade prior to the asset sale as an indication of a weaker bargaining position vis-à-vis the buyer. As expected, they find significantly lower CARs for sellers whose debt was downgraded prior to the transaction.

Moreover, the value creation is conditional on the successful completion of the divestiture. Hite, Owers, and Rogers (1987) show that the seller stock price drops back to its initial level if a previously announced divestiture is canceled. In addition, announcement returns are positive for buyers completing the transaction, but insignificant for buyers in transactions that subsequently fail.

3.3. Drivers of value creation in divestitures

The positive announcement returns for sellers and buyers indicate that divestitures generally create value. We now turn to the evidence on the potential reasons for this value creation.

3.3.1. Increase in corporate focus

The typical divestiture involves sales of assets that are outside of the diversified firm's core business, and it results in an increased focus of the remaining operations. John and Ofek (1995) show that three-quarters of divested segments are unrelated to the seller's core business, defined as its primary four-digit Standard Industry Classification (SIC) code. Moreover, using various measures for firm focus, they find that sellers become more focused after the divestiture. Their focus measures include a sales-based Herfindahl Index across the firm's business segments, the total number of business lines reported by the firm, and whether the divested division is outside the firm's core business.

Schlingemann, Stulz, and Walkling (2002) find that firms tend to divest noncore segments that are relatively small. Maksimovic and Phillips (2001) and Kaplan and Weisback (1992) show that firms are more likely to sell peripheral assets. Kaiser and Stouraitis (2001) describe how Thorn EMI successfully raise cash by selling unrelated assets, reinvesting the proceeds in the company's core business. In sum, divested assets are typically outside the firm's core business, and the asset sales result in an increased focus of the firm's remaining operations.

John and Ofek (1995) find that the divestment announcement returns are positively related to measures capturing the increase in focus. Moreover, the operating profitability of the remaining assets increases after a divestiture, but only for the firms that become more focused. Denis and Shome (2005) show that large firms downsizing their assets become more focused and increase their operating performance. Berger and Ofek (1999) document average CARs of 7% for focusing-related announcements by diversified firms. Overall, there is substantial evidence that the value creation from divestitures is related to the resulting increase in the selling firm's focus.

3.3.2. Elimination of negative synergies

If the divested segment has negative synergies with other divisions of the diversified firms, the divestiture will create value simply by eliminating these negative synergies. Dittmar and Shivdasani (2003) examine the investment efficiency of divesting firms and find that segment sales are associated with a reduction of the diversification discount. Moreover, they document significant improvements in the investment decisions of the firm's remaining segments after the divestiture. Specifically, the investment level increases for segments that underinvest relative to single-segment firms and decreases for segments that overinvest relative to their peers. They also find that the announcement returns are higher the greater the subsequent reduction in the diversification discount and the greater the improvement in segment investments. Overall, their evidence suggests that divestitures create value by reducing costly cross-subsidization of inefficient investments in the diversified firm.

Colak and Whited (2007) reach a very different conclusion, addressing the endogeneity of breakup decisions. They confirm that firms selecting a divestiture or spin-off are different from their peers: the firms that restructure are typically larger and more diversified,

and are in relatively fast-growing industries. Controlling for these differences, they show that although spin-offs and divestitures are associated with improved investment efficiency, these improvements are not directly caused by the restructuring itself.

Kaplan and Weisback (1992) examine whether divestitures are evidence of failed acquisitions. Studying a sample of 271 large firms acquired between 1971 and 1982, they find that 44% of the targets were sold by the end of 1989. Only one-third of the divested segments are classified as failed acquisitions, however, based on accounting profitability and comments by managers and the business press. Kaplan and Weisback (1992) conclude that acquirers sell businesses that they have improved or that they once had synergies with but no longer do. See also Fluck and Lynch (1999) for a model where diversifying acquisitions are made to help finance marginally profitable projects, to subsequently be divested once the projects are profitable and can generate the necessary funds internally.

3.3.3. *Better fit with the buyer*

As discussed above, a divestiture will create value if the assets are worth more to the buyer than the value in their current use. A buyer could, for example, have substantial synergies or superior management skills. John and Ofek (1995) find that seller announcement returns are higher when the buyer has some comparative advantage in managing the assets, such as a buyer operating in the same industry as the divested division or a leveraged buyout group.

Using U.S. Bureau of Census data, Maksimovic and Phillips (2001) examine the effect of asset sales on the productivity at the plant level. They show that divestitures are more likely in business cycle upturns, when the assets are less productive than industry benchmarks, when the selling division is less efficient than the buyer, and when the firm has more efficient divisions in other industries. They conclude that most divestitures result in productivity gains by redeploying assets from relatively low-productivity sellers to higher-ability buyers.

Datta, Iskandar-Datta, and Raman (2003) also study the efficiency of the reallocation of assets in divestitures. They use Tobin's q , defined as the ratio between the market value and the replacement cost (here the book value) of the assets, as a proxy for management's capability to manage the assets. They find that the announcement returns are highest for transactions where the buyer has a relatively high q and the seller has a relatively low q , possibly because the assets are transferred to a better managed firm. Overall, the evidence suggests that divestitures create value by transferring assets to higher-valuation buyers.

3.4. *Corporate governance*

3.4.1. *Agency issues*

Although divestitures may be required to maximize shareholder wealth, some incumbent managements resist such actions. Berger and Ofek (1999) find that announcements of

focus-increasing transactions often are preceded by corporate control and incentive-altering events, including management turnover, outside shareholder pressure, changes in management compensation, and unsuccessful takeover attempts. Gillan, Kensinger, and Martin (2000) describe how Sears announced the divestiture of financial services and refocused on retail first after a long period of poor performance and coincident with substantial pressure from institutional investor activists. This suggests that the restructuring may have been postponed until it could no longer wait.

Consistent with a reluctance to sell assets, the monitoring of and incentives provided to top management are critical to the value created by a divestiture. Tehranian, Travlos, and Waagelein (1987) document significantly higher announcement returns for divesting firms that provide long-term performance plans to their top executives. Hirschey and Zaima (1989) find higher announcement returns for divestitures by companies with concentrated ownership than sales by widely held firms. Also, the returns are higher for firms where insiders are net-buyers of the firm's stock over the preceding six-month period. Hanson and Song (2000) further show that divestiture gains are increasing in the fraction of outside directors on the board and the percentage equity ownership of the management team. Pointing to the importance of banks as monitors, Hirschey, Slovin, and Zaima (1990) find some evidence of higher announcement returns for firms with bank debt. Overall, firms with better monitoring and more managerial share ownership seem to make divestitures that create more value.

The proceeds received by the divesting firm may be reinvested in the firm's remaining operations, used to retire debt, or distributed to shareholders. Lang, Poulsen, and Stulz (1995) and Kaiser and Stouraitis (2001) show that the announcement returns are positive when the proceeds are used to pay back debt, but insignificant for firms that reinvest the proceeds. Slovin, Sushka, and Ferraro (1995) also find higher announcement returns when the proceeds are paid out. This suggests that management may employ the funds inefficiently if retained by the firm.

Bates (2005) examines the payout and retention decision for 400 large asset sales between 1990 and 1998. He finds that the probability of retaining the cash proceeds increases in the divesting firm's growth opportunities, measured by its market-to-book ratio. However, firms retaining the proceeds consistently overinvest (have higher capital expenditure) relative to their industry peers. Also, the higher the equity ownership of officers and directors, the more likely it is that the sale proceeds are paid out. The evidence is again consistent with investment inefficiencies associated with retention of proceeds from asset sales.

3.4.2. *Financial distress*

Several studies indicate that asset sales are used as a way of generating cash when the firm is financially constrained. Divestiture announcements are typically preceded by a period of negative stock returns (Alexander, Benson, and Kampmeyer, 1984; Jain, 1985; Hanson and Song, 2003) and poor operating performance (Lang, Poulsen, and Stulz, 1995; Schlingemann, Stulz, and Walkling, 2002; Brown, James, and Mooradian, 1994).

Moreover, firms with high leverage are more likely to sell assets (Ofek, 1993; Kruse, 2002). Officer (2007) shows that selling firms have lower cash balances, cash flow, and bond ratings than size- and industry-matched control firms, all of which suggests that the sellers are liquidity constrained. Also, Nixon, Roenfeldt, and Sicherman (2000) find that financially distressed firms prefer a divestiture to a spin-off, which does not generate cash. In addition, Asquith, Gertner, and Scharfstein (1992), Ofek (1993) and others show that firms in financial distress frequently sell assets as part of the restructuring process.

The optimal use of proceeds from asset sales changes when the firm is in financial distress. The firm's ability to pay dividends to shareholders is typically limited by debt covenants at this point, and the choice stands between reinvestment in the business or repayment of debt. For a sample of distressed firms, Brown, James and Mooradian (1994) show that shareholder announcement returns are significantly higher when the proceeds are retained by the firm rather than used to repay debt. Also as expected, bondholder announcement returns are higher when the proceeds are used to pay off debt. They suggest that creditor influence over distressed firms may force asset sales that benefits the firm's creditors at the detriment of shareholders. Datta and Iskander-Datta (1996) find that divestitures by financially distressed firms generate positive announcement returns for bondholders but not for shareholders.

Schleifer and Vishny (1992) argue that financially distressed firms sell assets at depressed prices to lower-valuation industry outsiders because higher-valuation industry insiders are liquidity constrained. Pulvino (1998) finds that financially constrained airlines sell aircraft at lower prices than their unconstrained competitors. Moreover, Officer (2007) shows that acquisition multiples are lower when the parent firm has experienced negative abnormal stock returns over the year leading up to the sale and when the corporate loan spread above treasury rates are high. Examining firms auctioned in Swedish bankruptcy, however, Eckbo and Thorburn (2007) reject the fire-sale hypothesis: they find little evidence of fire-sale discounts when assets are sold as going-concerns.⁵

Liquidity may be a factor in the decision to sell assets. Kim (1998) documents that managers sell their most liquid assets first, before selling more illiquid assets. Moreover, Mulherin and Boone (2000) and Schlingemann, Stulz, and Walking (2002) show that breakup transactions tend to cluster in industries where the aggregate corporate transaction volume is large, that is, in industries with relatively liquid markets for corporate assets.

4. Spinoffs

In a spinoff, a public company distributes its equity ownership in a subsidiary to its shareholders. The distribution is a pro-rata dividend, and parent shareholders receive

⁵ See Chapter 14 (Hotchkiss, John, Mooradian, and Thorburn, 2008) for a more detailed review of asset restructurings by financially distressed firms.

subsidiary stock in proportion to their ownership in the parent firm. The spinoff involves a complete separation of the two firms. After the spinoff, the subsidiary becomes a publicly traded company with a unique ticker symbol and an independent board of directors. In contrast to a divestiture, a spinoff does not generate any cash proceeds for the parent company. Also, since the spinoff involves a public listing of shares, it has higher transaction costs and takes longer time than a divestiture.

A spinoff may be structured as a tax-free transaction if it qualifies under Section 355 of the Internal Revenue Code. Among the most important requirements under Section 355 are (i) the parent must have control of the subsidiary (own at least 80% of the voting rights) prior to the distribution; (ii) the parent must distribute control (at least 80% of the votes) to shareholders and retain no practical control of the subsidiary; (iii) the spinoff must have a valid business purpose; and (iv) the parent or the subsidiary cannot be acquired within two years after the spinoff. If the spinoff qualifies under Section 355, there is no tax on the distribution of stock, at neither the parent nor the shareholder level. Most spinoffs in the United States are structured as tax-free transactions.

If a spinoff does not qualify under Section 355, however, the distribution is taxed as a property dividend. The parent recognizes a gain equal to the difference between the fair market value of the subsidiary and the parent's tax basis in the subsidiary, similar to a capital gain. This gain is taxed at the corporate tax rate. Moreover, shareholders pay a dividend tax on the fair market value of the subsidiary (the distributed subsidiary stock).

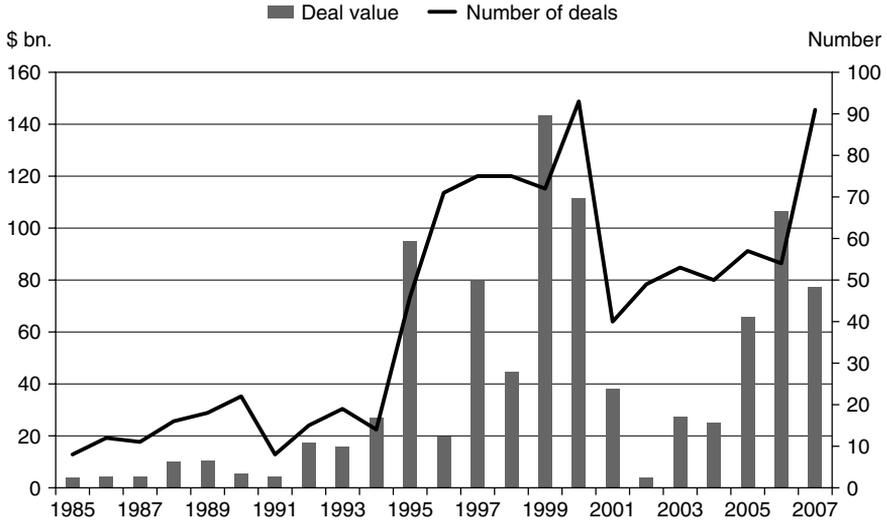
The condition under Section 355 requiring that the subsidiary is not acquired within two years of the spinoff is outside the parent company's control. Yet, a potential acquisition of the subsidiary after a tax-free spinoff would trigger an often substantial tax liability at the parent company level. To transfer the cost of this potential liability to the subsidiary and thus ultimately the acquirer, it is common practice that the subsidiary contractually commits to pay any such future tax liability of the parent, if the subsidiary is acquired within two years of the spinoff.

Maydew, Schipper, and Vincent (1999) compare 52 tax-free spinoffs with 218 divestitures in the period 1987–1995. They find that tax costs average 8% of the divested assets. They suggest that managers prefer a taxable assets sale when the sales price is high enough to offset the associated tax cost.

4.1. Transaction volume

Using data from Thompson SDC Platinum (SDC), Figure 2 plots the annual number (line) and total deal value (bars) of spinoffs announced between 1985 and 2007. As shown in Panel A, the number of U.S. spinoffs soared in the second half of the 1990s and reached a peak in year 2000 with over 90 transactions. The aggregate spinoff value peaked in 1999 with a total market capitalization of \$144 billion. While the interest for spinoffs plummeted with the burst of the internet bubble, the deal activity has recently recovered. In 2007, a total of 90 spinoffs were announced in the United States to a total value of almost \$80 billion. The largest U.S. spinoffs announced in 2006–2007

A: Number (line) and total transaction value (bars) of U.S. spinoffs



B: Number (line) and total transaction value (bars) of non-U.S. spinoffs

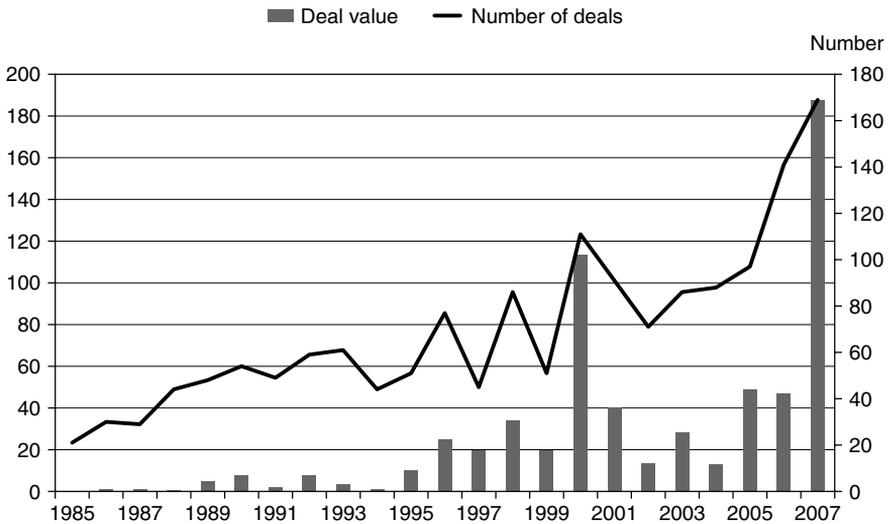


Fig. 2. Annual volume of spinoff announcements, 1985–2007.

Source: SDC

were Kraft Foods (market capitalization of \$51 billion), Tyco Healthcare Group (\$23 billion), Tyco Electronics (\$19 billion), Duke Energy Corp-Natural Gas (\$15 billion), and Discover Financial Services (\$15 billion).

Panel B shows the annual number and total deal value of non-U.S. spinoff transactions. The international volume of spinoffs has been growing relatively steadily since the mid-1990s, reaching an all-time high in 2007, with a total market value of \$188 billion across 169 transactions. Some of the largest spinoffs in 2006–2007 outside the United States include Philip Morris International, Switzerland (market value of \$108 billion); SK Corp-Petrochemical Business, South Korea (\$17 billion); HydroOGK, Russian Federation (\$12 billion); and Experian Ltd., the United Kingdom (\$11 billion).

4.2. Valuation effects

The results from 19 selected studies estimating shareholder gains from spinoff announcements are listed in Table 2. The samples contain a total of 2052 spinoffs announced between 1962 and 2000. Shareholder average cumulative abnormal returns are significantly positive and range from 1.7 to 5.6% across the various studies. The lowest average

Table 2

Cumulative abnormal returns (CAR) for 2,052 spinoffs in 19 selected studies, 1962–2000

Relative size is the ratio of the market value of equity of the spunoff subsidiary and the parent company prior to the spinoff.

Study	CAR		Relative size		Sample size	Time period	Event window
	Mean	Median	Mean	Median			
Miles and Rosenfeld (1983)	3.3%			10%	55	1963–1980	[0,1]
Hite and Owers (1983)	3.3%			7%	123	1963–1981	[−1,0]
Schipper and Smith (1983)	2.8%			20%	93	1963–1981	[−1,0]
Rosenfeld (1984)	5.6%				35	1969–1981	[−1,0]
Vijh (1994)	2.9%	2.1%	29%	18%	113	1964–1990	[−1,0]
Allen, Lummer, McConnell, and Reed (1995)	2.1%				94	1962–1991	[−1,0]
Slovin, Sushka, and Ferraro (1995)	1.3%	1.6%	33%	24%	37	1980–1991	[0,1]
Daley, Mehrotra, and Sivakumar (1997)	3.4%	1.4%			85	1975–1991	[−1,0]
Best, Best, and Agapos (1998)	3.4%				72	1979–1993	[−1,0]
Desai and Jain (1999)	3.8%		29%	18%	144	1975–1991	[−1,1]
Krishnaswami and Subramaniam (1999)	3.1%	1.9%	31%	14%	118	1979–1993	[−1,0]
Mulherin and Boone (2000)	4.5%	3.6%	22%	14%	106	1990–1999	[−1,1]
Gertner, Powers, and Scharstein (2002)	3.9%	2.2%	24%	19%	160	1982–1996	[−1,0]
Wruck and Wruck (2002)	3.6%				172	1985–1995	[−1,0]
Burch and Nanda (2003)	3.7%	3.2%	24%	20%	106	1979–1996	[−2,1]
Maxwell and Rao (2003)	3.6%	2.6%	25%	19%	80	1976–1997	[−1,0]
Seoungpil and Denis (2004)	4.0%	3.1%	25%	17%	150	1981–1988	[−1,1]
Veld and Veld-Merkoulova (2004)	1.7%	0.6%			156	1987–2000	[−1,0]
McNeil and Moore (2005)	3.5%		25%	23%	153	1980–1996	[−1,1]
Sample size weighted average	3.3%		26%	18%	2,052	1962–2000	

CAR of 1.7% is for a sample of 156 European spinoffs announced in 1987–2000 and examined by Veld and Veld-Merkoulova (2004). Combining the 19 studies, the sample-size-weighted abnormal announcement return is 3.3%.

The average CAR of 3.3% in spinoffs is higher than the 1.2% average CAR for divestitures reported above. Recall, however, that buyers also tend to experience positive announcement returns in divestitures (average CAR of 0.5%). In contrast, the total gains from a spinoff is reflected in the parent company stock. Thus, some of the difference in announcement returns between spinoffs and divestitures could be explained by buyers sharing in the value creation from the latter transaction.

Table 2 further shows that the market value of the subsidiary is about one-quarter that of its parent in the average spinoff. As for divestitures, the announcement returns for spinoffs are increasing in the relative size of the subsidiary. Miles and Rosenfeld (1983) show that shareholder CARs are on average greater in spinoffs of subsidiaries with a market value exceeding 10% of the parent company's market value compared to spinoffs of relatively small subsidiaries. In addition, Alli, Ramirez, and Yung (2001) find insignificant announcement returns for 47 spinoffs that are subsequently withdrawn, as if the market anticipates the withdrawal at the time of the announcement.

The evidence of positive announcement returns for spinoffs is compelling. Some studies also report long-term returns following spinoffs. Cusatis, Miles, and Woolridge (1983) estimate the buy-and-hold stock returns for parents and subsidiaries spun off in the 1965–1988 period. They find positive average returns for holding periods of 24 and 36 months compared with portfolios of industry and size-matched stocks. McConnell, Ozbilgin, and Wahal (2001) investigate portfolios of parents and subsidiaries in 89 spinoffs between 1989 and 1995. In contrast to the earlier work, they find little evidence of higher average buy-and-hold returns compared to portfolios matched on size and book-to-market. Also, using the Fama and French (1993) three-factor model as a benchmark, they reject the hypothesis that the portfolios of spinoff companies exhibit abnormal returns.

4.3. Drivers of value creation in spinoffs

4.3.1. Increased corporate focus

As with divestitures, a potential source of value creation in spinoffs is an increase in corporate focus resulting from the elimination of unrelated divisions. Daley, Mehrotra, and Sivakumar (1997) report that the positive announcement returns are limited to spinoffs that increase corporate focus, defined as the parent and subsidiary having different two-digit SIC industry codes. They document substantial improvements in the return on assets for parents in focus-increasing spinoffs, but not for parents where the spunoff subsidiary is in a related industry. Moreover, Desai and Jain (1999) find that focus-increasing spinoffs have significantly higher announcement returns, long-run abnormal stock returns, and improvements in operating performance than do non-focus increasing spinoffs.

Burch and Nanda (2003) estimate the change in the parent firm's diversification discount from the year prior to the year after the spinoff. They find that the diversification discount is reduced when the spinoff increases corporate focus, but not otherwise. Overall, the evidence suggests that shareholder gains in spinoffs are associated with a subsequent increase in firm focus.

4.3.2. *Elimination of negative synergies*

The separation of an unrelated business segment may further reduce any negative synergies that exist between the subsidiary and the rest of the firm. Gertner, Powers, and Scharstein (2002) examine whether spinoffs help eliminate value-reducing cross-subsidization in diversified firms. They show that the subsidiary's investment decisions become much more sensitive to the firm's investment opportunities after the spinoff. Specifically, the total capital expenditure decreases for firms in low Tobin's q industries and increases for firms in high q industries. These changes take place primarily for subsidiaries whose operations are unrelated to the parent's core business and in spinoffs generating higher announcement returns.

Seoungpil and Denis (2004) further find that, prior to the spinoff, parent firms trade at a discount to and invest less in their high-growth (high q) divisions than do their stand-alone peers. Following the spinoff, however, the diversification discount is eliminated and investments have increased for the high-growth segments. Also, McNeil and Moore (2005) show that subsidiary capital expenditures move toward industry levels after the spinoff, for both previously rationed and subsidized divisions. Announcement returns are greater when parent firms allocate capital in a seemingly inefficient way, defined as rationing high q and subsidizing low q spinoff divisions, as is the reduction in the diversification discount. Overall, the evidence indicates that spinoffs create value by improving the investment decisions in diversified firms.

Allen, Lummer, McConnell, and Reed (1995) propose that spinoffs provide a way to unwind unsuccessful prior acquisitions. They examine a sample of 94 spinoffs in which the spinoff entity previously had been acquired by the parent firm. Their evidence suggests that the original acquisition was value destroying: the average acquisition announcement return is negative both for the acquirer and for the target and bidder combined. Moreover, the spinoff announcement return is positive and negatively correlated to the acquisitions return; that is, the greater the anticipated loss from the acquisition, the larger the expected gain from the spinoff. While not identifying a unique source for the value creation in spinoffs, these results are consistent with the elimination of negative synergies between parent and subsidiary.

4.3.3. *Wealth transfer from bondholders*

A spinoff may increase shareholder value at the expense of the parent firm's creditors by reducing the total assets of the firm. Also, if the spinoff increases the volatility

of the cash flows of the two separate firms the expected payoff to debtholders will decrease, with a corresponding gain to shareholders (Galai and Masulis, 1976). MacMinn and Brockett (1995) further argue that a spinoff could transfer wealth from liability claimants by removing corporate assets from their reach. Nevertheless, the impact of a spinoff on debtholders is limited by the existence of restrictive debt covenants. Hite and Owers (1983) find insignificant bondholder abnormal returns for a sample of 31 spinoff announcements in 1963–1981, as do Schipper and Smith (1983).

In a case study of Marriott, however, Parrino (1997) documents a significant drop in the value of Marriott's bonds following its spinoff announcement. At the same time, shareholder announcement returns were positive, suggesting a wealth transfer from bondholders. Maxwell and Rao (2003) examine monthly bond return data for a sample of 80 spinoffs between 1976 and 1997. They find that parent bondholders tend to experience a price decline after the spinoff announcement. The average abnormal bond return (adjusted for the Treasury rate) in the month of the spinoff is -0.9% , and decreasing in the relative size of the spunoff subsidiary. Consistent with a bondholder loss, credit ratings are more likely to be downgraded than upgraded subsequent to the spinoff. They find, however, that the combined value of the publicly traded debt and equity increases, suggesting that a wealth transfer from bondholders could only explain part of the shareholder gains.

4.3.4. *Information asymmetries*

The aggregation of financial data across divisions may exacerbate informational asymmetries between outside investors and insiders for diversified firms. Krishnaswami and Subramaniam (1999) examine whether spinoffs reduce such information gaps, using the dispersion in analysts' forecasts and analysts' forecast error as a measure for the information asymmetry. They find that spinoffs are more common for firms with relatively high levels of information asymmetry compared to their industry rivals. The announcement returns are higher for firms with a greater degree of information asymmetry, and the information gap tends to decrease after the spinoff. Best, Best, and Agapos (1998) also find that spinoff announcement returns are increasing in financial analysts' earnings forecast errors. Overall, this suggests that one source of value creation in spinoffs is the mitigation of information asymmetries.

Analysts play an important role in producing and disseminating information about the firm. Gilson, Healy, Noe, and Palepu (2001) study changes in the coverage by financial analysts for a sample of 103 focus-increasing spinoffs and equity carveouts over the period 1990–1995. They document a 45% increase in analyst coverage in the three years following a breakup. The new analysts tend to be specialists in the subsidiary's industry. Moreover, the accuracy of the earnings forecast improves by 30 to 50%, and in particular for the industry specialists. In sum, increases in corporate focus seem to improve the information provided by analysts, in both quality and quantity.

Huson and MacKinnon (2003) further show that analysts tend to revise upwards their short-term earnings forecast in response to a spinoff. Also, idiosyncratic stock return volatility increases following a spinoff, and more so when the spinoff subsidiary is unrelated to the parent firm. They conclude that the stock price becomes more sensitive to firm-specific information, which benefits informed traders relative to uninformed traders.

4.3.5. *Clientele effects*

Previously combined into a single security, the spinoff creates the opportunity to hold the subsidiary stock separately. This expansion of investors' opportunity set increases liquidity and opportunities for investor diversification. In a sample of 113 spinoffs during 1964 to 1990, Vijh (1994) finds abnormal stock returns of 3.0% on the spinoff ex date, that is, the day that the subsidiary starts trading separately, accompanied by an increased trading volume. He attributes the positive returns to higher demand for the parent and subsidiary stocks once they have been separated.

Abarbanell, Bushee, and Ready (2003) show that institutional investors rebalance their portfolio holdings in parents and their spinoff subsidiaries dependent on the fund's investment style and fiduciary restrictions. However, they find little evidence that such rebalancing trades lead to abnormal price pressures for parents or subsidiaries around the spinoff. Chemmanur and He (2007) examine the trading of institutional investors in 66 spinoffs between 1999 and 2004. They find large imbalances in the post-spinoff trading of parent and subsidiary stock: 46% of the trades are in the opposite direction, and trades in the same direction are heavily concentrated in one of the firms. This imbalance increases in the measure of information asymmetry and the difference in beta risk and growth rates between the parent and subsidiary. Overall, spinoffs seem to relax a trading constraint that existed prior to distribution of the subsidiary stock.

4.3.6. *Increased probability of a takeover*

The fact that it is possible after the spinoff to acquire control of the division through a stock purchase increases the probability that the division will become a future takeover target. The spinoff may also increase the probability that the parent will become a target as the parent is now a smaller and more focused firm. Cusatis, Miles, and Woolridge (1993) examine 146 tax-free spinoffs over the period 1965–1988 and show that both the parent and the spinoff subsidiary are indeed more likely to become takeover targets, compared to a set of control firms matched on size and industry. They suggest that two pure plays created by a spinoff are more attractive as targets than the combined company. Most of the takeovers occur two to three years after the spinoff, possibly to protect the tax-free status of the spinoff. Given the large premiums typically paid in control transactions, they attribute the positive abnormal stock returns at the time of the spinoff to the increased probability of being acquired.

4.4. *Corporate governance*

Self-interested managers may be reluctant to downsize assets under their control. Ahn and Walker (2007) study the importance of effective corporate governance for firms' decision to spin off a subsidiary. Their sample is 102 spinoffs between 1981 and 1997. They find that firms conducting a spinoff have greater stock ownership by outside board members, and smaller and more heterogeneous boards relative to their peers. Following the spinoff, parent firms increase their market-to-book ratios and reduce the diversification discount. They conclude that effective governance increases the likelihood of a spinoff, which is a value-increasing strategy.

Wruck and Wruck (2002) examine the management team of the spunoff subsidiary. They show that 21% of spinoff top managers are outsiders, while 48% of the insiders are parent company top managers rather than division heads. They argue that subsidiary managers lack the corporate governance expertise required when the former division becomes publicly traded. Announcement returns are highest for spunoff subsidiaries led by a parent firm's top manager and a division head, combining corporate governance and operating expertise.

In a spinoff, the parent management can design the governance structure of the subsidiary without seeking approval from shareholders. Daines and Kausner (2004) find that the charters of spunoff subsidiaries include substantially more takeover defenses than do the charters of a sample of size- and industry-matched IPO firms, where shareholders have a say on the corporate charter. Moreover, the spunoff firms tend to have more takeover protection than do their parents. Thus, it appears that managers prefer more takeover defenses than shareholders do.

Pyo (2007) find that pay-performance sensitivity increases for subsidiary CEOs after a spinoff. The higher the pay-performance sensitivity, the greater the improvements in operating performance post-spinoff. Seward and Walsh (1995) propose that the likelihood of becoming a takeover target should be higher for spunoff firms with little CEO equity incentives. They find that the takeover probability—hostile as well as friendly—increases with the CEO's stock and option ownership in the spunoff subsidiary. While not discussed by Seward and Walsh (1995), it is possible that CEOs with relatively low pay-performance sensitivity also adopt more takeover defenses in the spunoff firm.

Allen (2001) examines the post-spinoff trades of senior managers, directors, and blockholders in 193 public subsidiaries and their parents over the period 1978–1991. He finds that insiders who trade during the first year following the spinoff earn excess returns of 36% over the subsequent 12-month period. He suggests that insiders take advantage of the spinoff as an opportunity to use private information on the relative prospects of the parent and the subsidiary.

4.5. *Splitoffs*

A splitoff is similar to a spinoff in that the subsidiary becomes an independent company with a separate stock listing. The splitoff, however, involves an exchange offer, where

shareholders are offered to exchange parent company stock for subsidiary stock. Thus, the splitoff effectively resembles a stock repurchase, where the parent company buys back its own shares using subsidiary stock as consideration. As a result of the exchange offer, the ownership structure in the parent and the subsidiary are different post-splitoff (depending on the extent to which parent shareholders participate in the exchange offer). Similar to a spinoff, a splitoff does not generate any new cash to the parent company. The tax treatment is also the same as for a spinoff.

Splitoffs are rare, partly because the valuation of the subsidiary stock is critical for the exchange offer. A splitoff is therefore always preceded by an equity carveout, which helps establish the market value of the subsidiary stock. Recent transactions include McDonald's splitoff of 51% of its interest in Chipotle Mexican Grill, announced in April 2006 and valued at \$660 million; Viacom's splitoff of Blockbuster in 2004; and General Motors splitoff of Hush Electronics in 2003.

We are unaware of any systematic empirical evidence on splitoffs—reflecting the limited number of transactions.⁶ Given the similarity with spinoffs, the research on spinoffs is likely relevant for splitoffs as well. In addition, some value may be created in splitoffs from the repurchase of parent stock, for example, by signaling that the parent stock is undervalued.

5. Equity carveouts

An equity carveout is a partial initial public offering (IPO) of the stock in a subsidiary. The subsidiary gets its own management team and a separate board of directors. It becomes subject to all financial and other reporting requirements of public companies, such as 10-K reports and proxy statements filed with the Securities and Exchange Commission (SEC).⁷

The parent company often retains a controlling interest, creating a public minority interest in the subsidiary. There are several reasons for the retention of a majority ownership of the voting rights: Retention of at least 80% allows consolidation for tax purposes and the opportunity to subsequently undertake a tax-free spinoff, while retention of 50% or more permits consolidation for accounting purposes. Allen and McConnell (1998) show that parent firms on average retain 69% (median 80%) of the subsidiary's shares, while Vijn (2002) reports a median parent ownership of 72%. Of course, since the subsidiary becomes a publicly traded company of its own, the carveout does reduce the parent's control over its former wholly owned subsidiary.

The shares offered in the IPO may be sold either by the subsidiary itself (a primary issue) or by the parent company (a secondary issue). A primary issue has no tax consequence, while a secondary issue is taxable to the parent as a capital gain. Because

⁶ For a case study, see E.I. du Pont de Nemours and Company: the Conoco splitoff (A), HBS 9-202-005.

⁷ See Hand and Skantz (1998) for an analysis of the accounting choice for equity carveouts under SAB 51. Allen (1998) describes the equity carveout strategy of Thermo Electron, which carved out 11 subsidiaries during 1983–1995.

of this difference in tax treatment, the majority of equity carveouts are primary issues. The parent company may require the proceeds or leave the proceeds in the subsidiary. The proceeds are streamed back to the parent using the following procedure: (i) prior to the carveout, the subsidiary issues a tax-free dividend to the parent in the form of a note (debt obligation); (ii) after the carveout, the proceeds from the IPO are used to repay the note.

5.1. Transaction volume

Figure 3 shows the annual distribution of equity carveouts worldwide from 1985 to 2007, using data from SDC. Most of the carveout transactions are outside the United States. The worldwide carveout volume peaked in the first half of the 1990s, in both numbers and dollar values. The total market value of subsidiary IPOs reached \$80 billion in 1993, and there were over 500 equity carveout transactions in 1994. The late 1990s saw a second surge in the dollar volume of carveouts (\$70 billion), however, without a corresponding increase in the number of transactions. In recent years, only a handful of equity carveout transactions have taken place each year.

Most large carveouts in 2006/2007 took place outside the United States. The way SDC classifies carveouts, this transaction category also contains subsidiaries carved out by the government (state privatizations). The largest equity carveouts in 2007 include France

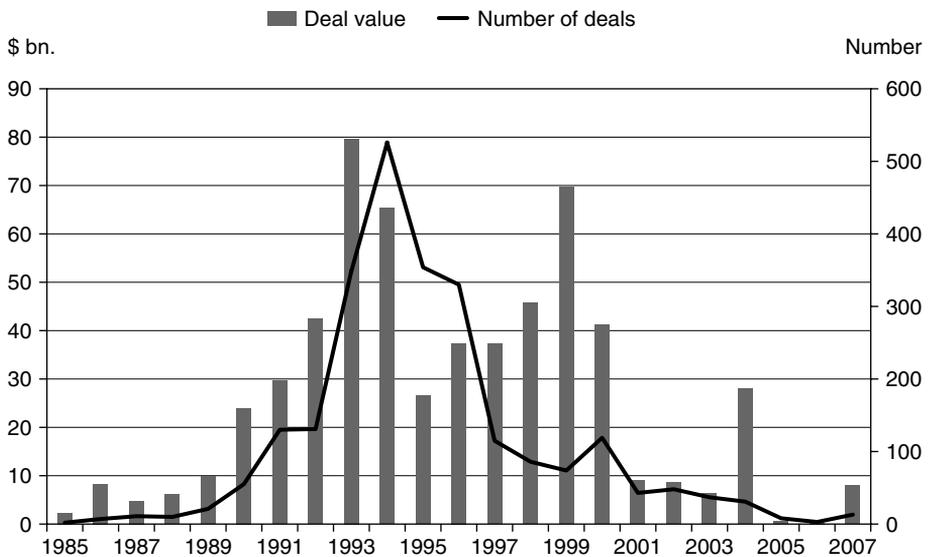


Fig. 3. Annual worldwide volume of equity carveouts, 1985–2007.

Source: SDC

Table 3

Cumulative abnormal returns for 1,050 equity carveout announcements in 8 selected studies, 1965–2002

CAR is the parent cumulative abnormal stock return over the event window relative to the announcement of the equity carveout. Relative size is the ratio of the market value of equity of the carved-out subsidiary and its parent company.

Study	CAR		Relative size		Sample size	Time period	Event window
	Mean	Median	Mean	Median			
Schipper and Smith (1986)	1.8%			8%	76	1965–1983	[−4,0]
Klein, Rosenfeld, and Beranek (1991)	2.7%				52	1966–1983	[−4,0]
Slovin, Sushka, and Ferraro (1995)	1.2%	1.5%	45%	31%	32	1980–1991	[0,1]
Allen and McConnell (1998)	2.1%		20%	14%	186	1978–1993	[−1,1]
Vijh (1999, 2002)	1.9%			18%	336	1980–1997	[−1,1]
Mulherin and Boone (2000)	2.3%	0.8%	37%	17%	125	1990–1999	[−1,1]
Hulburt (2003)	1.6%	1.1%		30%	172	1981–1994	[−1,0]
Wagner (2004)	1.7%		32%	22%	71	1984–2002	[−1,1]
Sample size weighted average	1.9%		33%		1,050	1965–2002	

Telecom SA (IPO proceeds of \$3.6 billion); China Agri-Inds Holding Ltd., Hong Kong (\$2.5 billion); Bank of Beijing, China (\$2.0 billion); Qatar Airways, Qatar; and Kiora Holding Pty Ltd., Australia.

5.2. Valuation effects

Equity carveouts are viewed favorably by the market. Table 3 shows the parent cumulative abnormal announcement stock return for eight selected studies of equity carveouts over the period 1965–2002. The average announcement return is positive and significant across all samples, ranging from 1.2 to 2.7%. The sample-size-weighted average is 1.9% for the total of 1050 cases. The announcement returns for a sample of German firms average 1.7%, which is similar to the returns for U.S. firms (Wagner, 2004). Interestingly, the positive returns found for equity carveouts are in stark contrast to announcements of seasoned equity offerings, upon which the parent stock price typically falls.⁸

The average carved-out subsidiary across the studies in Table 3 has a market value of about one-third that of its parent. As for other breakup transactions, the announcement returns are found to be increasing in the relative size of the carved-out subsidiary (Allen and McConnell, 1998; Vijh, 2002). Vijh (1999) estimates long-term (three-year) abnormal stock returns for both parent companies and the carved-out subsidiaries, and finds that these are insignificantly different from zero using a variety of benchmarks.

⁸ See Eckbo, Masulis, and Norli (2007) (Chapter 6 of this Handbook) for a review of security offerings.

5.3. *Drivers of value creation in equity carveouts*

Equity carveouts separate the subsidiary from its parent. After the carveout, transactions between the two companies must take place at arms length. As a result, many of the sources of value creation in spinoffs may also create value in carveouts.

5.3.1. *Increased focus*

Vijh (2002) examines a sample of 336 equity carveouts between 1980 and 1997. A majority of the motives offered for the carveout by the parent company involve lack of fit and focus, and a desire to restructure the operations. He shows that parents and subsidiaries in carveouts are typically in different industries, and documents that announcement returns are higher on average for carveouts of nonrelated subsidiaries.

The evidence on improvements in operating performance following carveouts is mixed. Hulburt, Miles, and Woolridge (2002) find that both parents and subsidiaries improve their operating performance relative to their industry peers in the year after the carveout. In contrast, Powers (2003) and Boone, Haushalter, and Mikkelsen (2003) show that the subsidiary operating performance declines after the carveout. Boone, Haushalter, and Mikkelsen (2003) find that the operating performance of the parent company improves only when it has completely divested its ownership in the subsidiary after four years.

5.3.2. *Financing subsidiary growth*

Information asymmetries between the firm and outside investors tend to increase the cost of capital (Myers and Majluf, 1984). Prior to the carveout, outside investors have access to the parent company's financial information, with information at the divisional level being less accessible. This opaqueness may increase the cost of funding divisional-level capital expenditures. Because a public listing of the subsidiary increases the quality of the financial information available to investors, Schipper and Smith (1986) suggest that equity carveouts help finance high-growth subsidiaries. Their data bears this out: in their sample, a frequently stated motive for the carveout is to enable the subsidiary to finance future growth. They also show that carved-out subsidiaries typically have higher price-earnings ratios than their parents, indicating higher growth rates.

Chen and Guo (2005) also report that parent firms prefer equity carveouts and divestitures to spinoffs when revenue growth and book-to-market ratios are high. Vijh (2002) further finds that, over a subsequent three-year period, both parents and their carved-out subsidiaries do a greater number of seasoned equity offerings than control firms matched by industry and size. In addition, the capital expenditures of the subsidiaries exceed those of their control firms. Overall, it appears that equity carveouts are used to increase financing opportunities and reduce financing costs for high-growth subsidiaries.

Michaely and Shaw (1995) document investment banking fees of 7% for carveouts and 2% for spinoffs in a sample of 61 carveouts and 30 spinoffs between 1981 and 1988.

They attribute the higher costs of carveouts to the greater scrutiny and more stringent disclosure standard associated with the continued control by the parent company. They also suggest that, because of the higher costs, carveouts are more attractive to firms with relatively low leverage that hold high-quality assets. Consistent with this, they find that larger less-leveraged parents with relatively large and low-risk subsidiaries tend to prefer a carveout to a spinoff.

5.3.3. *Wealth transfers and information asymmetries*

Carveouts have the potential for transferring wealth to shareholders from other claimholders. For example, the separation of assets from the parent possibly reduces the cash flow and collateral available to bondholders. Allen and McConnell (1998) find, however, positive excess bond returns when firms announce a carveout, thus rejecting the bondholder wealth transfer hypothesis.

Nanda (1991) models an equity carveout using the adverse selection framework of Myers and Majluf (1984). In equilibrium, only undervalued parents with overvalued subsidiaries perform carveouts. Thus, carveouts cause a positive announcement effect on average (and there are no wealth transfers).⁹ Slovin, Sushka, and Ferraro (1995) examine industry rivals of equity carveout firms. They postulate that the market's misvaluation may apply to all firms in the industry. For a sample of 32 carveouts between 1980 and 1991, they show that industry rivals of the carved-out subsidiaries experience negative announcement returns, consistent with the overvaluation argument. They also report insignificant abnormal returns to parent-company rivals. However, Hulburt, Miles, and Woolridge (2002) find negative returns for parent-company rivals as well, using a sample of 185 equity carveout announcements over the years 1981–1994. They argue this is evidence against the proposition that parents of carveouts tend to be undervalued.

Vijh (2006) examines the announcement returns to the seasoned equity offering (SEO) of 90 subsidiaries and 37 parents following equity carveouts. He documents negative returns to the issuer, but insignificant returns to the nonissuer, whether parent or subsidiary. Using a sample of equity carveouts from 1995–2002, Baltin and Brettel (2007) detect traces of market timing for the 1998–2000 “hot-market” period. Overall, the proposition that equity carveouts are designed to sell overvalued equity in the subsidiary receives mixed support.

5.3.4. *Follow-on events*

Equity carveouts appear to be a temporary organizational form. A majority of equity carveouts are followed by a subsequent event. In Schipper and Smith (1986), two-thirds of 76 carved-out subsidiaries were later reacquired by the parent (23), divested

⁹ By assuming the carveout's assets in place are sufficiently small relative to those of the parent, Nanda (1991) rules out the possibility that the parent of the carveout is also overvalued (which would result in a negative announcement effect of the carveout). Overvalued parents always prefer to issue their own shares.

entirely (17), spunoff (4), or liquidated (4). Moreover, Klein, Rosenfeld, and Beranek (1991) find that 44 of 52 carveouts (85%) are followed by a second event: 25 reacquisitions, 17 selloffs, and two spinoffs. Divestitures take place sooner than reacquisitions: three-quarters of the divestitures occur within three years of the carveout, compared to one-third of the reacquisitions. Also, the probability of a reacquisition is greater when the parent retains 80% or more of the subsidiary shares.

Klein, Rosenfeld, and Beranek (1991) argue that an equity carveout may be the first stage in a divestiture of a subsidiary. As noted above, the listing of the subsidiary's shares reduces informational asymmetries and exposes the subsidiary to the market for corporate control. Perotti and Rossetto (2007) model equity carveouts as a way for the parent to obtain information from the market on the value of the subsidiary as an independent entity. Though costly, the listing generates information about the optimal allocation of ownership of the subsidiary. Thus, the carveout improves the decision to exercise the option to sell or reacquire control, explaining the temporary nature of carveouts.

Gleason, Madura, and Pennathur (2006) document insignificant announcement returns for carveouts that are later reacquired. However, Klein, Rosenfeld, and Beranek (1991) show that parents experience significantly positive announcement returns when the follow-on event is a selloff, both at the initial equity carveout and at the subsequent divestiture. Moreover, the probability of becoming a target is higher for carved-out subsidiaries than for a sample of matched firms (Hulburt, 2003). This evidence is consistent with equity carveouts creating value by facilitating future corporate control events.

5.4. Agency issues

Allen and McConnell (1998) argue that some managers avoid selling off assets because their compensation (both tangible and intangible) is tied to the size of the assets they manage. When the financing of the investments require an asset sale, the preference is to sell a minority stake in a subsidiary, maintaining assets under control. For a sample of 188 equity carveouts, they find that parent firms perform relatively poorly prior to initiating a carveout: parents have lower interest coverage ratios, higher leverage, lower operating profitability, and lower return on assets than their industry rivals. In sum, the sample parents of the carveouts were poor performers and cash constrained.

Allen and McConnell (1998) also find that the stock market's reaction to the carveout announcement is determined by the use of the proceeds. Firms announcing that the proceeds will be reinvested in the firm experience insignificant announcement returns, while the average CAR is a significant 7% for firms that will use the proceeds for debt repayment or a dividend. This suggests that the stock market may be concerned with inefficient investment decisions if the firm retains the proceeds. Schipper and Smith (1986) provide further evidence on managers' reluctance to relinquish control of the subsidiary. They document that, in a majority of cases, the president or CEO of the carved-out subsidiary is also a parent company manager.

Powers (2003) suggests that managers use their inside information about the subsidiary prospects in determining what fraction of subsidiary shares to sell to the public. He shows that the subsequent improvement in subsidiary operating performance tends to increase in the size of the ownership stake retained by the parent. Similarly, Atanasov, Boone, and Haushalter (2005) show that carved-out subsidiaries tend to have lower operating performance than their peers only when parents retain less than 50% ownership. Their interpretation is very different, however. They suggest that parent managers either self-select the carveout to avoid consolidating the subsidiary's financial results, or transfer wealth from the minority shareholders in nonconsolidated subsidiaries through intercorporate transactions *ex post*.

6. Tracking stocks

Tracking stock—also called targeted stock or letter stock—is a separate class of parent company common stock whose dividends track the performance of a given division. That is, the holders of the tracking stock are entitled to the cash flow generated by this division, hence determining the value of the stock. The diversified company retains its legal form as one consolidated entity, however, with one and the same board of directors and top management team. There is no legal separation or transfer of assets, and the parent retains control of the division. As a result, the voting rights of the tracking stock is in the parent firm and not in the tracked division. These voting rights typically vary in proportion to the market value of the underlying division, but could also be fixed at the issue of the tracking stock.

There are several ways to distribute tracking stock. It can be issued to current shareholders as a dividend or used as payment in an acquisition. The most common way, however, is to sell the tracking stock in a public offering, raising cash for the parent firm. Once the tracking stock is listed, the underlying division files separate financial statements with the SEC. Thus, tracking stock creates a type of quasi-pure play, where the tracked division files its own financial statements and has its own stock, while still being part of the diversified firm. Since tracking stock is an issue of the company's own stock, it has no tax implications.

6.1. *Transaction volume*

The first tracking stock was issued by General Motors (GM) in 1984 as part of the payment for Electronic Data Systems (EDS). The new stock, GM-E, allowed the selling shareholders—most notably Ross Perot, who continued in a management position—to participate in the upside of EDS, despite being part of a much larger company going forward. GM issued its second class of tracking stock, GM-H, in 1985 when acquiring Hughes Aircraft. The next company to issue tracking stock was USX, separating its steel division from its oil division (Marathon) in 1991.

In total, 32 U.S. companies have issued some 50 different tracking stocks to date, most of them in the 1990s. The market seems to have lost its appetite for tracking stock since the turn of the century. The most recent issues of tracking stock include Sprint PCS and CarMax Group in 2001, and AT&T Wireless and Disney's Go.Com in 2000. Carolina Group announced an issue in 2002 that was subsequently withdrawn. Internationally, there has been only a handful tracking stock issues, including Sony Communication Network in 2001 (Japan) and Alcatel Optronics (France) in 2000.

6.2. *Valuation effects*

Announcements of tracking stock are received positively by the market. D'Souza and Jacob (2000) document an average abnormal two-day announcement return of 3.7% for 37 tracking stocks issued by 14 U.S. companies between 1984 and 1999. Billett and Mauer (2000), Elder and Westra (2000), Chemmanur and Paeglis (2001), and Harper and Madura (2002) also report positive tracking stock announcement ACARs of 2 to 3%. Notice, however, that, given the limited number of tracking stock issues, these studies use largely the same data.

The evidence on the long-run performance of tracking stock is inconclusive. Examining 19 firms issuing tracking stock, Chemmanur and Paeglis (2001) find that the stock of parent firms underperform industry indexes over a subsequent three-year period, while the average subsidiary outperforms its industry index. In contrast, Billett and Vijn (2004) document negative buy-and-hold returns for subsidiaries, but insignificant long-term excess returns for parents. Clayton and Qian (2004) further report insignificant long-run stock performance for tracking stock issuers. As discussed below, however, the strongest testament to a poor performance of tracking stock is the fact that they have almost entirely disappeared from the marketplace.

6.3. *Drivers of value creation in tracking stock*

A tracking stock is akin to a "quasi-pure play." On the one hand, tracking stock allows the firm to retain its internal capital market, file a joint tax return, and share certain fixed costs and resources (Billett and Mauer, 2000; Danielova, 2008). On the other hand, the requirement to file separate financial statements with the SEC provides some degree of separation between a division and its parent. Also, the tracking stock makes it possible to give stock-based compensation to subsidiary managers.

Clayton and Qian (2004) examine whether the separate listings increase the demand for the parent and subsidiary stocks. They document an ex-date abnormal return of 3% for the parent company, suggesting that the quasi pure-play created by the tracking stock increases investor interest in the firm. However, Elder, Jain, and Kim (2005) fail to find any increase in the liquidity of the parent firm after the tracking stock issue. Instead, firms issuing tracking stock have relatively low stock-market liquidity and greater bid-ask spreads than comparable control firms. Overall, the evidence is inconclusive as to whether tracking stock increases investor demand to hold the diversified firm.

Logue, Seward, and Walsh (1996) argue that tracking stock is most useful for firms where the benefits of consolidation and integration outweigh the benefits from a complete separation. However, it is questionable whether tracking stock separates the divisions sufficiently to successfully create a pure-play stock. Not surprisingly, D'Souza and Jacob (2000) show that the returns of tracking stocks are more highly correlated with other common stocks of the same company than with other firms in the same four-digit SIC industry as the tracked division. We now turn to a discussion of the major failure of tracking stock.

6.4. Agency issues

Under U.S. corporate law, the board of directors has full discretion to transfer assets between wholly owned divisions (within contractual boundaries set by debt covenants). The assets underlying a tracking stock therefore lack legal protection from expropriation by the parent company.¹⁰ Toward the end of the 1990s, firms issuing tracking stock started to explicitly warn investors of the risk of expropriation. For example, in its 1999 prospectus for tracking stock in its online broker, Donaldson, Lufkin, & Jenrette (DLJ) warned of a conflict of interest: "The board of directors may make decisions that favor DLJ at the expense of DLJ direct."

There are several examples of expropriation taking place. When GM in August 1995 announced its plan to spin off its tracking stock in EDS (GM-E), it first required EDS to make a one-time contribution of \$500 million to the parent (GM). EDS shareholders challenged this payment in Delaware court—and lost: the court's decision was that the board of directors has full discretion to transfer money within the corporation—tracking stock or not. Similarly, before U.S. Steel spun off the tracking stock in its oil division Marathon in 2001, it first transferred \$900 million of debt to Marathon. Not surprisingly, the stock of the steel division soared 19% on the day of this announcement.

The poor legal protection of the assets underlying a tracking stock is likely the major reason for the near-disappearance of this security. In fact, most of the tracking stocks have been reversed over the last decade. In a press release issued on December 16, 1999, Kerry Hoggard, chairman of Fletcher Challenge Ltd., said: "It is clear the the Group's capital structure is seen as complex by investors, is perceived to raise governance issues, and has resulted in a significant structural discount being applied to all our stocks. We cannot allow this to continue, and will move as quickly as possible to a full dismantling of the target share structure."

Billett and Vijn (2004) examine 11 announcements to remove the tracking stock structure. They find significant and positive excess stock returns of 14% to the dismantling announcement. Tracking stock in its current form may very well be a phenomenon of the past.

¹⁰ Hass (1996) provides an in-depth discussion of the fiduciary duties of the company's directors as they relate to tracking stock.

7. Leveraged recapitalizations

A leveraged recapitalization (henceforth “recap”) is a significant payout to shareholders financed by new debt borrowed against the firm’s future cash flow. The company remains publicly traded, but with a substantially higher debt level. For a sample of 27 firms completing leveraged recaps over the period 1984–1988, Gupta and Rosenthal (1991) find a threefold increase in the average debt-to-total-capital ratio, from 22 of to 67%. Denis and Denis (1983) document that the median ratio of total debt to total assets increases from 45% to 86% for a sample of 39 recaps in 1984–1988. Moreover, studying 42 leveraged recaps between 1985 and 1989, Handa and Radhakrishnan (1991) report that the proposed payout averages 60% of the pre-recap market value of equity.

The cash distribution to shareholders is typically structured as a large, special, one-time dividend. Alternatively, the distribution could be in the form of a share repurchase or exchange offer. Management often forfeit the cash distribution on their shareholdings and instead takes additional stock. Consequently, leveraged recaps typically result in a substantial increase in managerial equity ownership. Handa and Radhakrishnan (1991) document that insider equity ownership increases by three times, while Gupta and Rosenthal (1991) report a doubling of the insider ownership (from 3.8 to 8.4%). In Denis and Denis (1993), the median ownership of officers, directors, and employees soars from 6 to 15%.

Prior to the widespread use of poison pills, leveraged recaps were sometimes used as a defense against a hostile takeover threat. See Denis (1990) for an analysis of leveraged recapitalizations as a takeover defense.

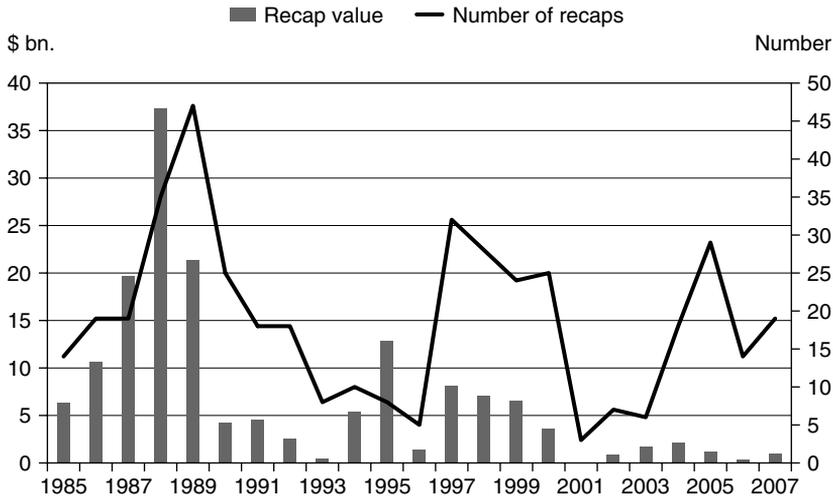
A leveraged recapitalization triggers a tax liability at the investor level. The tax depends on how the payout to shareholders is structured. For a special dividend, the amount distributed from the firm’s retained earnings is taxed as a dividend. If the special dividend exceeds the retained earnings on the firm’s balance sheet, the remaining cash distribution is a return of capital, treated as a capital gain. If the recap is structured as a share repurchase, the entire distribution is taxed as a capital gain.

The financial accounting for leveraged recapitalizations does not require any step-up of the company’s assets. As a result, if the new debt exceeds the book value of the firm’s equity, the company’s book equity becomes negative following the recap. What appears like a leveraged buyout by a private equity sponsor is sometimes structured as a recap. Recap accounting can be used if the buyer acquires less than 94.9% of the firm’s stock, and the owners of the minority interest, which must be widely held, are independent from the buyer.

7.1. *Transaction volume*

Figure 4 shows the annual volume of leveraged recapitalization transactions announcements from 1985 through 2007, using data from SDC. The recap volume has largely followed the ups and downs of the high-yield debt markets. As shown in Panel A, in the United States, leveraged recaps were particularly popular in the late 1980s, with a

Panel A: Number (line) and total transaction value (bars) of U.S. leveraged recapitalizations



Panel B: Number (line) and total transaction value (bars) of non-U.S. leveraged recapitalizations

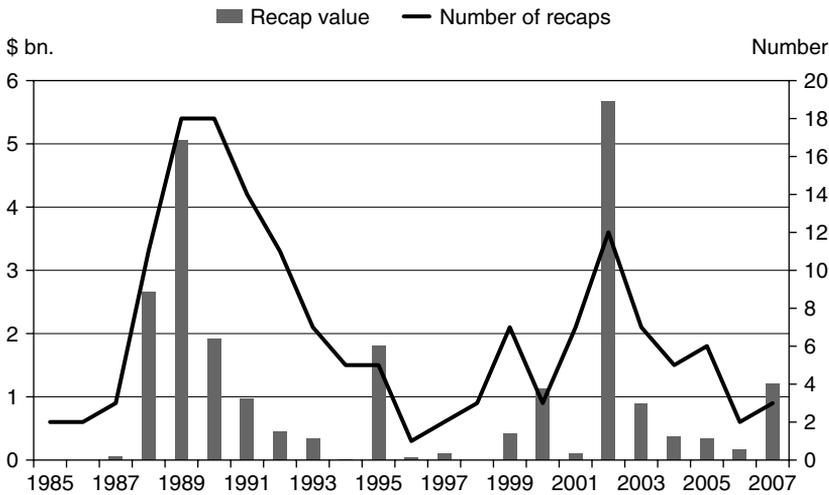


Fig. 4. Annual volume of leveraged recapitalizations, 1985–2007.

Source: SDC

peak in combined transaction value (bars) of \$37 billion in 1988 and 47 recaps (line) in 1989. There was a smaller surge in recapitalization transactions in the period 1997–2000, and then again in 2005, however, without a corresponding increase in transaction size. Panel B shows the non-U.S. volume of leveraged recapitalizations. The international

recap activity is generally lower and involves smaller amounts. Companies announcing leveraged recapitalizations in 2006–2007 include Charter Communications Inc, Palm Inc., Foster Wheeler Ltd., and Acadia Realty Trust.

7.2. Valuation effects

The wealth effects of leveraged recapitalizations are substantial. For a sample of 44 recaps over 1985–1990, Bae and Simet (1998) find a two-day shareholder ACAR of 5.7%. Moreover, Handa and Radhakrishnan (1991) report an average two-day abnormal return of 5.5%, and Gupta and Rosenthal (1991) find an average announcement CAR of 5.9%. Moreover, Balachandran, Faff, and Nguyen (2004) document a three-day average CAR of 4.4% for a sample of 167 leveraged recapitalizations in Australia between 1989 and 2002.

Since the leveraged recapitalization may be a response to a corporate control threat, several studies measure the returns over a longer event window. Denis and Denis (1993) use a window starting 40 days prior to initiation, defined as the first indication of a takeover or the announcement of the recap, through completion of the recap. They estimate an average abnormal return of 32% (median 26%). Kaplan and Stein (1990) compute the cumulative abnormal stock return starting 40 days prior to the recap announcement, or the day of a hostile bid if there is one, through the recap completion. They find an average CAR of 45% (median 47%) for 12 leveraged recapitalizations between 1985 and 1988.

Kaplan and Stein (1990) further estimate the change in systematic risk of the firm's securities after the leveraged recap. The increase in the equity risk is relatively modest. Using daily returns and market-model estimates, the average equity beta increases by 37% from 1.01 to 1.38 after the recapitalization. They then make two different assumptions about the change in total asset risk from the transaction. Assuming that the systematic risk of the assets (asset beta) is constant, the implied debt beta averages 0.65. However, when they assume that the entire market-adjusted premium represents a reduction in fixed costs, the implied debt beta averages 0.40. Overall, leveraged recapitalizations generate substantial shareholder wealth and appears to be associated with a surprisingly small increase in equity systematic risk.

7.3. Drivers of value creation in leveraged recapitalizations

As discussed earlier, the high debt in leveraged recapitalizations reduces the firm's free cash flow and hence managerial discretion over the investment decisions (Jensen, 1986). Denis and Denis (1993) examine the change in operating performance and investments for 29 completed recapitalizations between 1984 and 1988. They document large decreases in the undistributed cash flow (median -31%) and capital expenditures (median -35%), despite improvements in operating performance (median 21%) from the year prior to the year after the recap. Also, the post-recap cash flow covers only two-thirds of the pre-recap capital expenditures, forcing a reduction in the level of investments.

They further examine the market reaction for capital expenditure announcements and find a significantly negative ACAR over the five-year period prior to the recapitalization, suggesting a past pattern of overinvestment. Following the recap, the average number of announced investments drops from 1.2 to 0.3 per firm and year, with an average stock market reaction that is insignificantly different from zero. They conclude that the increased debt plays a central role in disciplining managers' investment decisions.

Consistent with these results, Wruck (1994) documents organizational and compensation changes in Sealed Air following its leveraged recapitalization in 1989. She suggests that the financial leverage was used as a tool to improve the internal control systems, which together with the high debt service created an environment that led to enormous performance improvements and value creation.

Peyer and Shivdasani (2001) study the efficiency of the internal allocation of investments after leveraged recapitalizations in 22 multidivisional firms between 1982 and 1994. Prior to the recap, companies allocate investments to high q divisions. Following the recap, however, investments become less sensitive to division q and more sensitive to division cash flow. While this may indicate that the internal allocation of capital becomes less efficient, the total level of capital expenditure declines, as do the firm's diversification discount. Peyer and Shivdasani conclude that the costs of distorted divisional investments are outweighed by the benefits of lower firm-level investments. Overall, leveraged recapitalizations appear to create value by curbing managerial overinvestment and improving operating performance.

Walker (1998) suggests that the benefits from leveraged recapitalizations are transitory, examining 39 recaps between 1985 and 1989. He finds that the recap firms have higher free cash flow prior to the recap than matching firms. However, the pre-recap level of capital expenditures is not significantly different from that of its peers. Moreover, operating performance increases from year -1 to $+1$ relative to the special dividend, but reverts in the subsequent years.

A leveraged recapitalization could be used to signal management's private information about the future cash flow of the firm. Healy and Palepu (1995) describe how managers at CUC International successfully undertake a leveraged recap in 1989 to communicate their optimistic beliefs about the firm's future cash flows to investors. Balachandran, Faff, and Nguyen (2004) examine if the positive information conveyed by a recap extends to other firms in the industry. They find insignificant stock returns for competitors of firms announcing a leveraged recapitalization, suggesting that the content of any new information is unique to the recap firm.

A large fraction of the leveraged recapitalizations in the late 1980s subsequently failed. Denis and Denis (1995) report that 9 (one-third) of 27 firms completing a leveraged recap between 1985 and 1988 became financially distressed. They find that the poor operating performance of the nine distressed firms is in line with that of their industry peers. Moreover, the stock market reacts negatively to announcements of asset sales as well as to economic and regulatory events associated with the demise of the high-yield market. They conclude that the incidence of distress is not related to poorly structured transactions, but rather to unexpected macroeconomic and regulatory developments.

8. Leveraged buyouts (LBO)

A leveraged buyout is the acquisition and delisting of an entire company or a division, financed primarily with debt. The buyer is typically a private equity fund managed by an LBO sponsor—or recently sometimes a consortium of funds. The sponsor raises debt to finance the majority of the purchase price and contributes an equity investment from the fund. The equity is injected into a shell company, which simultaneously borrows the debt and acquires the target.

The sponsor relies on the company's cash flow, often supplemented by assets sales, to service the debt. The objective is to improve operating efficiency and grow revenue for a 3–5 year period before divesting the firm. Debt is paid down over time and all excess returns accrue to the equity holders. The exit may be in the form of an IPO, a sale to a strategic buyer, or a sale to another LBO fund. While an IPO typically generates a higher valuation, it could take several years for the LBO fund to entirely unwind its holdings through the public markets.

Because of the heavy debt load, a target firm is traditionally characterized by a strong predictable cash flow, supported by a history of profitability. In addition, it is often in a mature industry, with low growth and limited need for additional capital expenditures. The industry scope of leveraged buyouts has increased over time, as has the importance of international deals. Also, while the conventional LBO involves a publicly traded target company, a majority of the leverage buyouts are of private firms.

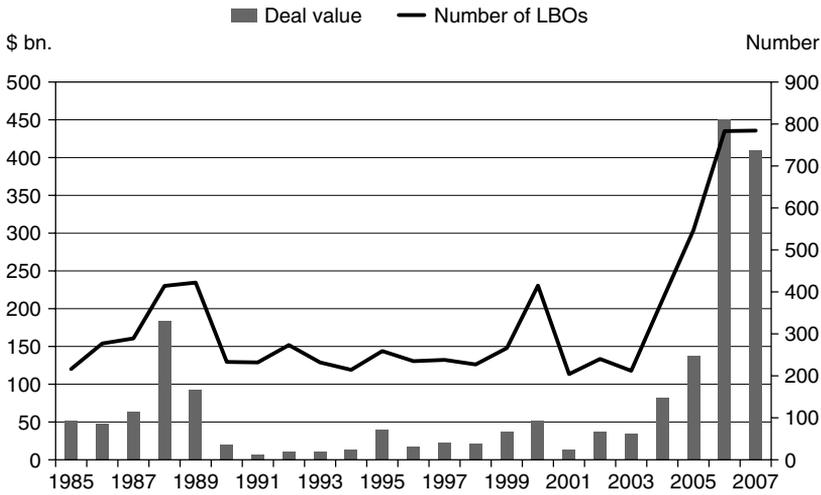
A management buyout (MBO) is a leveraged buyout of a segment, a division or a subsidiary of a large corporation in which key corporate executives play a critical role. MBOs are generally smaller than traditional LBOs and, depending on the size of the transaction, a sponsor need not be involved. In the following, MBOs are singled out only if this term is explicitly used to characterize a sample.

8.1. *Transaction volume*

The leverage buyout activity varies considerably over time. Figure 5 shows the annual number (line) and total deal value (bars) of LBOs announced between 1985 and 2007, using data from SDC. As shown in Panel A, a first surge in U.S. LBO activity occurred in the late 1980s. This is when landmark transactions such as KKR's buyouts of RJR Nabisco (worth \$25 billion) and Safeway (\$4 billion) took place. The economic recession in 1990–1991, combined with regulatory restrictions on investments in high-yield instruments, the bankruptcy of Drexel Burnham Lambert, and a reduction in new lending by commercial banks, put an abrupt end to this first wave of highly leveraged transactions.

Most of the transactions in the 1990s were LBOs of private companies and divisions. As the availability of debt financing soared in the mid-2000s, the public-to-private transaction reappeared in a second buyout boom. The total value of U.S. LBO transactions announced in 2006 and 2007 amounts to \$450 and \$410 billion, respectively. Recent large U.S. buyouts include Equity Office Properties (\$41 billion), HCA (\$33 billion),

A: Number (line) and total transaction value (bars) of U.S. leveraged buyouts



B: Number (line) and total transaction value (bars) of non-U.S. leveraged buyouts

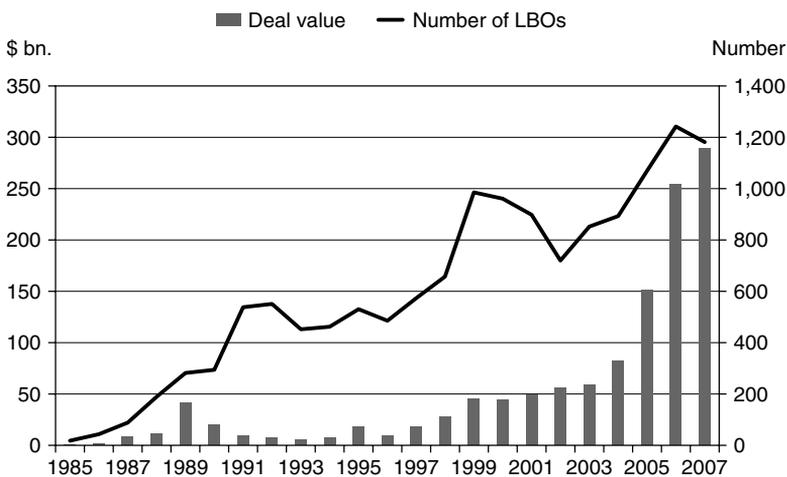


Fig. 5. Annual volume of leveraged buyouts, 1985–2007.

Source: SDC

TXU (\$32 billion), Harrah’s Entertainment (\$28 billion), Clear Channel Communications (\$27 billion), First Data (\$26 billion), SLM (\$26 billion), Kinder Morgan (\$22 billion), and Hilton Hotels (\$20 billion), to mention a few.

Panel B shows the corresponding LBO volume outside the United States. The number of non-U.S. buyouts has grown steadily since the mid-1980s, with a short dip in

transaction volume in 2002 after the burst of the Internet bubble. The international LBO volume reached a record high in 2007 with a total deal value of \$289 billion across almost 1,200 transactions. Large buyouts outside the United States announced in 2006–2007 include BCE, Canada (\$51 billion); Alliance Boots, United Kingdom (\$22 billion); BAA, Spain (\$22 billion); Altadis, Spain (\$18 billion); Thames Water, United Kingdom (\$15 billion); and Vodafone KK, Japan (\$14 billion).

Stromberg (2007) estimates the value of firms acquired in leveraged buyouts between 1970 and 2007 as a total of \$3.6 trillion, three-quarters of which represent LBOs undertaken after 2000. This second wave of large LBOs has spurred a renewed interest in leveraged buyouts in academic research. Since the financing market turmoil began in mid-2007, however, only a limited number of large buyouts have been announced in the United States and internationally.

8.2. *The LBO capital structure*

An LBO is financed with a mix of bank loans, high-yield debt, mezzanine debt, and private equity. The bank debt, which is often syndicated in the leveraged loan market, is secured and most senior in the capital structure. The interest rate is floating, generally quoted as a spread above the London Interbank Offering Rate (LIBOR). While the maturity varies with the firm's credit profile, it is commonly in the range of 5–8 years and always shorter than that of junior debt. The bank debt has to be amortized before any other claimholders are paid off. At times (but not in 2006/2007), cash sweeps are common, requiring the firm to use any excess cash flow for accelerated amortization of the bank loans.

The bank debt is typically structured as several tranches of term loans (A, B, C, and D), where the holder of Tranche A also provides a revolving credit facility. Term A, the pro-rata facility, is sold to traditional banks and is senior to the other tranches. In the second LBO wave, branches B, C, and D had minimal front-end amortization and were primarily sold to institutions and funds. The proportion leveraged bank loans in the capital structure varies, but was around 40% for U.S. buyouts closed in 2006–2007.

The remaining debt is raised from the subordinated debt markets. High-yield debt (junk bonds) is generally subordinated and/or unsecured. Interest is fixed, based on a spread to treasury bonds that varies with credit quality, and expressed as a coupon. This debt has a bullet maturity in 10 years and is as a rule callable at a premium. The high-yield bonds are typically sold to the public in a 144A offering, which requires a road show and hence takes time to close. It is therefore common practice to finance the high-yield portion through a bridge loan at deal closing, repaid within a year with the proceeds from the subsequent bond issue.

As an alternative to high-yield debt, which is publicly traded, the market for second lien loans took off in 2003. These loans are privately placed with hedge funds and Collateralized Loan Obligation (CLO) investors, and are secured in the firm's assets but subordinated to the bank loans. CLOs combine a large number of leveraged loans (first and second lien) into a pool, which itself is sliced in tranches sold to institutional

The debt multiple is the average ratio of the pro-forma total debt to adjusted EBITDA. The source is Standard & Poor's LCD.

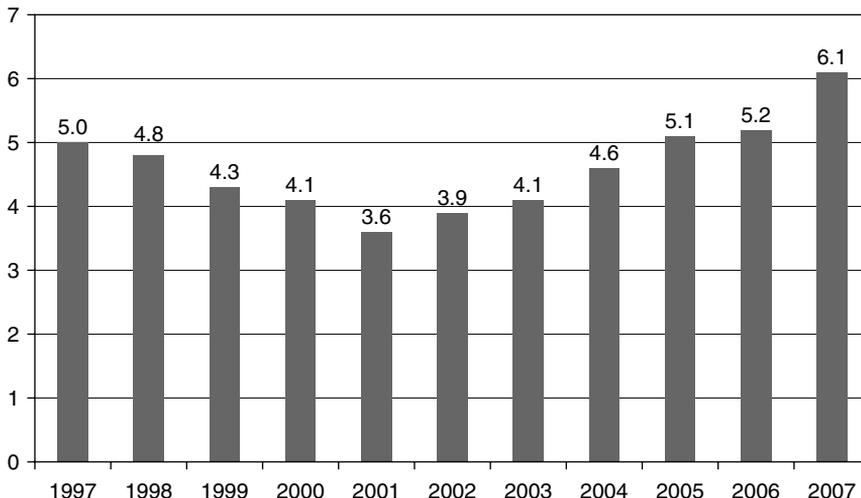


Fig. 6. Annual pro-forma debt multiples in LBOs, 1997–2007.

investors. In 2007, the total volume of second lien loans reached \$30 billion (Source: Standard & Poor's LCD).

Figure 6 shows annual debt multiples, defined as the pro-forma ratio of total debt to adjusted EBITDA, in LBO transactions between 1997 and 2007. Debt multiples reached a low in 2001, when the average transaction raised 3.6 times EBITDA in the debt markets. The expansion of the debt markets and aggressive lending practices in 2007 are reflected in a much higher average debt multiple of 6.1 times EBITDA. After the financial market turmoil in mid-2007, however, credit markets are constrained, and debt multiples are considerably lower again.

In periods when access to high-yield debt and bank loans is limited, sponsors resort to mezzanine financing, which replaces or is subordinated to the high-yield bonds. It is sold in a private placement to funds and institutions, thus avoiding any public filing requirements. The mezzanine is a committed financing with individually negotiated terms. It is structured as a debt contract or preferred equity, with warrants and other “equity kickers” attached to increase its total returns. All or part of the interest expense or dividend is often in the form of additional securities rather than cash, so-called pay-in-kind (PIK). The use of mezzanine financing is more widespread in Europe, where the leveraged loan markets and high-yield bond markets lag those of the United States.

Private equity is the most junior in the capital structure. It typically has voting rights but no dividends. This equity is raised from pension funds, endowments, insurance companies, and wealthy individuals into a fund managed by a private equity partnership

(the sponsor). Prominent LBO sponsors include Blackstone, Carlyle, and KKR. Most sponsors are paid a management fee of 2% on the fund's capital and receive a carried interest of 20% of the profits realized by the fund. In addition, some sponsors charge deal fees and monitoring fees to their portfolio companies. See Metrick and Yasuda (2007) for a detailed description and analysis of the fee structure in LBO funds. The capital raised for private equity is setting new record levels. In 2006, private equity funds had an inflow of \$225 billion in new capital.

Panel A of Figure 7 shows the average equity contribution in LBOs from 1987 through 2007. The source is Portfolio Management Data. The deals in the end of the 1980s were extremely highly leveraged, with an average equity portion of 8–13% of the total capital. Over the last decade, most LBO transactions have had a substantially higher fraction of equity financing, with equity constituting on average one-third of the capital structure in recent years. Managers are generally required to co-invest in the buyout equity along with the LBO fund. If a manager has been involved in a prior buyout, she is asked to roll over a portion of her equity in the target firm. If it is a first-time LBO, managers may be offered to buy equity at a discount, or receive additional stock and options conditional on certain performance goals.

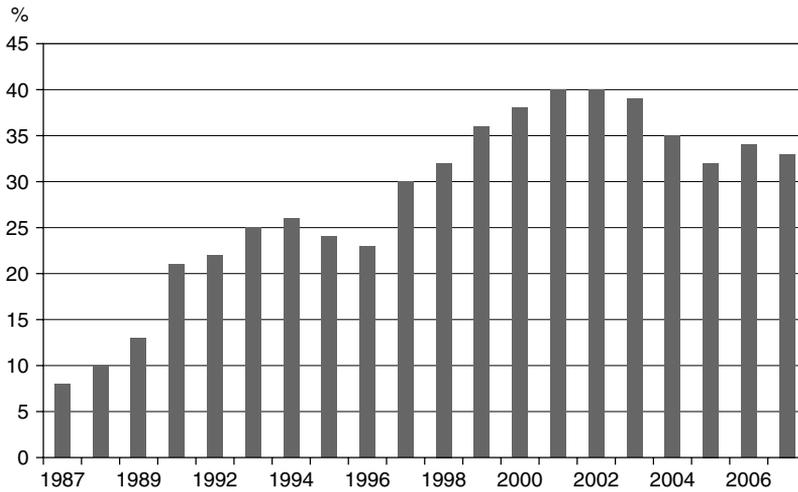
Panel B of Figure 7 shows the average price multiple in LBOs, defined as the ratio of the purchase price to the adjusted EBITDA, for the period 1997–2007. Average prices have risen from a low average multiple of 6.4 in 2001 to a high of 9.8 in 2007. The total funds raised in the buyout transaction are used for consideration to the seller as well as underwriter fees for the LBO debt (usually 1.5 to 2.5% of the principal amount) and call premiums on existing bonds.

Axelson, Jenkinson, Stromberg, and Weisbach (2007) document the financial structure of 153 large U.S. and European buyouts between 1985 and 2006. They find that the leverage of LBO firms is unrelated to debt levels of size- and industry-matched public firms. Instead, the leverage decreases in the interest rates prevailing at the time of the buyout. Prices also decline in interest rates, but are positively related to price multiples in public markets. They conclude that LBO capital structures are largely driven by the economywide cost of borrowing rather than firm-specific factors. See also Roden and Lewellen (1995) for an analysis of the structure of the LBO financing package.

8.3. *Value creation in LBOs*

The total value created in a leveraged buyout is divided between the selling shareholders and the LBO investors. Table 4 shows the premiums paid in 1058 leveraged buyout transactions between 1973 and 2006 as reported by seven selected studies. The premium is defined as the final offer price in excess of the target stock price 20 to 60 days prior to the announcement of the bid. As shown in the table, the average premium ranges from 27 to 59% across the seven studies, with a sample-size-weighted average of 37%. The median premium ranges from 27 to 42%, with an average of 32%. It appears that premiums are generally somewhat lower in the 2000s compared to the 1980s. The exception is the

A: Average equity contribution to LBOs in % of the capital structure, 1987–2007



B: Average purchase price multiples paid by LBO firms relative to adjusted EBITDA, 1997–2007

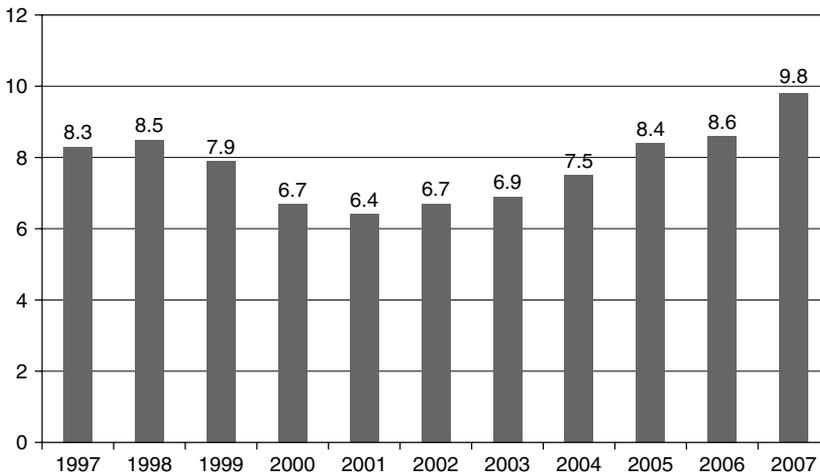


Fig. 7. Average annual % equity contribution and purchase multiples in LBOs.

Source: Portfolio Management Data.

study by Renneboog, Simons, and Wright (2007) of 177 buyouts in the United Kingdom between 1997 and 2003. They document an average premium of 40% (median 38%), which is higher than the contemporaneous LBO premiums of 27 to 29% in the United States (Billet, Jiang, and Lie, 2008; Guo, Hotchkiss, and Song, 2008).

Table 4
 Premiums paid in 1,058 leverage buyouts for 7 selected studies, 1973–2006

The premium is the ratio between the final offer price and the pre-buyout stock price less one.

Study	Premium		Type of deal	Sample size	Time period	Day of pre-buyout stock price
	Mean	Median				
DeAngelo, DeAngelo, and Rice (1984)	59%		LBO	23	1973–1980	–40
Lehn and Poulsen (1989)	36%		LBO	257	1980–1987	–20
Kaplan (1989b)	46%	42%	MBO	76	1980–1985	–40
Harlow and Howe (1993)	45%		LBO	121	1980–1989	–20
Renneboog, Simons, and Wright (2007)	40%	38%	LBO	177	1997–2003	–40
Billet, Jiang, and Lie (2008)	27%	27%	LBO	212	1990–2006	–60
Guo, Hotchkiss, and Song (2008)		29%	LBO	192	1996–2006	–20
Sample size weighted average	37%	32%		1,058	1973–2006	

Several studies find two-day average CARs of 16 to 17% for LBO announcements in the 1980s (DeAngelo, DeAngelo, and Rice, 1984; Lehn and Poulsen, 1989; Slovin, Sushka, and Bendeck, 1991; Van de Gucht and Moore, 1998). For a sample of 641 LBOs in 1980–2001, Brown, Fee, and Thomas (2007) estimate an average announcement CAR of 19%. The announcement return reflects a combination of the market's estimate of the target gains from a deal and the likelihood that the deal succeeds. Overall, the target shareholders tend to make substantial gains in leveraged buyouts.

The second part of the equation is the returns realized by the LBO investors. These returns have been difficult to estimate since the buyout targets are taken private and often do not return to public ownership. Kaplan (1989a) estimates a median market-adjusted return of 28% (mean 42%) for investors in 25 MBOs that went public after on average 2.7 years. Muscarella and Versypens (1990) examine the equity returns for 58 LBO firms that returned to public status after on average 2.9 years. Comparing the IPO price with the LBO price, they estimate an average annualized rate of raw return of 268%. This return is, however, not significantly different from the return of a hypothetical levered portfolio of S&P500 firms.

More recently, LBO fund return data has been available through self-reporting to Venture Economics. Jones and Rhodes-Kropf (2004) examine quarterly returns of 379 LBO funds formed between 1980 and 1999, using sponsor estimates of value changes. Estimating fund performance measured against the Fama and French (1993) three-factor model, they find fund excess returns (alphas) that are insignificantly different from zero.

Ljunqvist and Richardson (2003) use proprietary data from a large institutional investor. They study the returns to investments for 54 U.S. LBO funds raised between 1981 and 1993, observing the actual cash inflows and outflows of the funds. They find that the LBO funds outperform the stock market and have positive alphas. On a risk-adjusted basis, the excess return of the typical LBO fund is 5% annually. Groh and Gottschalg (2008) also find positive excess returns in a sample of 133 U.S. buyouts over 1984–2004.

Their benchmark is a portfolio of public market equivalents matched by systematic risk and timing, and they correct for self-selection.

Kaplan and Schoar (2005) study the returns net of costs for 169 LBO funds raised between 1980 and 2001. They estimate that the median fund underperforms the stock market index, generating 80% (mean 97%) of the return on the S&P500. However, for the subset of sponsors that have been around for at least five years, the median performance exceeds the S&P500 by 50% (mean 80%). They show that this performance is persistent, and they suggest that LBO sponsors may have different skills in managing portfolio companies. Phallipou and Gottschalg (2007) examine 739 LBO funds raised in 1980–1993, assuming that unrealized assets have zero value. They find that the funds net of cost underperform the S&P500 by 3% on average and confirm the persistence in LBO fund returns.

For a sample of 50 large U.K. buyouts over the 1997–2004 period, Acharya and Kehoe (2008) report positive industry-adjusted returns over the life of the deal. The returns are positively correlated to improvements in operating margins and asset growth. In contrast, Nikoskelainen and Wright (2007) find a median return to enterprise value of –5% (average 22%), adjusted for the return of the FTSE 100 index on the London Stock Exchange. They examine a sample of 321 exited buyouts in the United Kingdom between 1995 and 2004.

Overall, the total gains from LBOs are large, manifested in the substantial premiums paid to target shareholders. However, the evidence is inconclusive as to whether selling shareholders largely capture all the gains in leveraged buyouts. Depending on the sample, the benchmark portfolio, and assumptions about the value of assets that are not liquidated, the estimates of LBO fund abnormal returns range from positive to negative.

8.4. Drivers of value creation in LBOs

8.4.1. Operating efficiency

As argued by Jensen (1986), the high leverage in buyouts may result in improved managerial investment decisions for firms with high cash flow and few growth opportunities. Lehn and Poulsen (1989) examine 263 LBOs in the 1980s. They find some evidence that firms with high levels of free cash flow are more likely to go private and that acquisition premiums increase with the target firm's cash flow. They conclude that the mitigation of agency problems associated with free cash flow are a major source of buyout gains.

Opler and Titman (1983) find that LBO targets have a combination of high cash flow and unfavorable investment opportunities (low q), and are more diversified than firms that don't become targets. In addition, buyouts are less likely for firms with high expenditures for research and development (R&D). Similarly, Long and Ravenscraft (1993) show that LBOs typically target firms with R&D expenditures below the industry average. Also, Bae and Simet (1998) find that LBO announcement returns are increasing in the free cash flow of the target firm. In contrast, Servaes (1994) finds no significant difference in the capital expenditure level between target firms in 99 going private transactions and their

industry peers. Overall, however, the evidence suggests that the potential for incentive realignment in firms with high levels of free cash flow represents an important factor in the leveraged buyout decision.

If leverage successfully curbs overinvestment, this should show in the post-buyout operating performance. Kaplan (1989a) examines the performance of 48 large management buyouts between 1980 and 1986. He shows that the firms experience substantial increases in operating income (+42%), reductions in capital expenditure, and improvements of the net cash flow (+96%) over a three-year period following the buyout. Smith (1990) also reports significant performance improvements for 58 management buyouts in 1977–1986. She finds that operating returns, measured as operating cash flow per employee and per dollar of operating assets, increase significantly from the year prior to the year after the buyout. She examines changes in accounting line items and finds no evidence that repair and maintenance expenditures are postponed or that the R&D expenditures are reduced. Instead, the higher margins are a result of adjustments in the management of working capital.

Several other studies document improved operating efficiency after buyouts. Lichtenberg and Siegel (1990) examine data from the Longitudinal Business Database (LBD) of the U.S. Bureau of the Census for 131 LBOs in the period 1981–1986, with a total of 1132 plants. They show that plant total factor productivity (TFP) increases more than the industry average in the years following a leveraged buyout. Consistent with this finding, Harris, Siegel, and Wright (2005) find an above-industry increase in TFP for U.K. MBO plants in the 1990s. Moreover, Muscarella and Versuypens (1990) examine the performance of 72 LBO firms that went public again. They show that LBO firms reduce operating costs and experience significant improvements in their operating margins. Also, while there is a dramatic increase in leverage upon completion of the LBO, the debt ratios are gradually reduced before returning to public ownership.

The evidence of improvements in operating performance is weaker for more recent transactions. Guo, Hotchkiss, and Song (2008) examine 94 U.S. public-to-private LBOs between 1990 and 2005. They find that post-buyout gains in operating performance are comparable to or slightly exceed benchmark firms matched on industry and pre-buyout characteristics. The cash flow improvements are greater for firms with higher increases in leverage and when the CEO is replaced in the buyout transaction. Moreover, the median returns to LBO investors are 25% (average 57%) adjusted for Fama-French industry portfolio returns. Interestingly, the cash flow improvements and returns to capital are strongly related. However, due to the small magnitude of the cash flow gains, they suggest that recent transactions are not largely motivated by improving the operating efficiency of underperforming firms.

There is a concern that the trimmed organization and reduced capital expenditure may hurt the long-term prospects of LBO firms. Lerner, Sorensen, and Stromberg (2008) study a sample of 495 LBO firms that filed at least one successful patent application in the period 1986–2005. They show that firms continue to pursue high-impact patents after going private, concentrating their innovations in areas of historical core strengths. They

conclude that leveraged buyouts promote a beneficial refocusing of the firm's patent portfolios.

Overall, the results suggest that leveraged buyouts target firms with free cash flow, where the leverage could help improve investment decisions by reducing managers' discretionary funds. There is convincing evidence of post-buyout improvements in operating performance and plant productivity. Also, while total capital expenditures decline, critical investments in R&D seem to continue.

8.4.2. *Employment*

It appears that improvements in operating efficiency are associated with employee layoffs. Kaplan (1989a) finds that the median firm reduces its employee count by 12% relative to the industry from the year prior to the year after the buyout. Muscarella and Versuypens (1990) show that the average employment declines by 0.6% for LBO firms that subsequently went public. This job creation is in the bottom 10% of COMPUSTAT firms. Lichtenberg and Siegel (1990) report that white-collar compensation and employment decline in the years following the buyout. Moreover, for a sample of 33 LBOs in 1980–1984, Liebeskind, Wiersema, and Hansen (1992) report that LBO firms downsize the operations more than comparable firms in terms of number of employees, plants, and total revenues. In addition, there is some evidence that buyouts in the United Kingdom lead to modest declines in employment (Wright, Thompson, and Robbie, 1992; Amess and Wright, (2007)).¹¹

More recent evidence, however, suggests that the decline in LBO employment in existing facilities is outweighed by additional employment in new establishments, defined as new plants, offices, and retail outlets. Davis, Haltiwanger, Jarmin, Lerner, and Miranda (2008) examine LBD data for 5000 U.S. targets acquired in private equity transactions between 1980 and 1995. Consistent with previous work, they find that employment drops more in target establishments than in control firms following the buyout. However, the LBO firms create substantially more jobs in new establishments than their peers. They conclude that the private equity sponsors push the target firm to expand in new, higher-value directions. Overall, while LBO firms appear to trim their workforce to improve efficiency in existing production facilities, they also create additional job opportunities through new establishments.

8.4.3. *Corporate governance*

Highly leveraged transactions lead to increased monitoring by banks and the LBO sponsor (who has its own money at stake). Jensen (1989) argues that the combination of active governance by buyout sponsors, high-powered managerial incentives, and

¹¹ Perotti and Spier (1993) present a strategic model of temporarily high leverage. They show how shareholders, by retiring equity through a junior debt issue, can credibly threaten to underinvest in valuable new projects unless employees concede to wage reductions.

pressures from high leverage, provide a corporate governance system and incentive structure that is superior to that of widely held public firms. He predicts that the LBO organization eventually will eclipse the traditional, widely held public companies to become the dominant organizational form. While this has not yet happened, there is little doubt that the LBO organization carries with it a relatively efficient governance structure.

A central governance characteristic of leveraged buyouts is a meaningful management equity participation. Kaplan (1989a) shows that the median equity ownership of the top management team increases from 6 to 23% for 76 MBOs in the 1980s. Moreover, Muscarella and Versuypens (1990) report that the most highly paid officer owns 18% of the LBO firm's equity prior to an IPO exit.

The equity ownership of the top management team is also substantial in more recent samples. Kaplan and Stromberg (2008) study 45 LBOs from 1996 to 2004. They find a median equity ownership of 6% for the CEO and 16% for the management team. Nikoskelainen and Wright (2007) report an average equity ownership of 37% (median 35%) for 321 U.K. buyouts over the 1995–2004 period. Acharya and Kehoe (2008) examine a sample of 59 large buyouts in the United Kingdom between 1997 and 2004. They document an equity ownership including options of 3% for the CEO and 13% for the top management team as a whole. In sum, leveraged buyouts provide significant equity-based incentives to top management that help align managerial incentives with shareholders' interests.

Furthermore, the concentration of ownership provides LBO sponsors with a strong incentive to monitor the firm closely. Baker and Wruck (1989) describe the organizational changes at O.M. Scott after its leveraged buyout in 1986. The board had five members, of which one was a manager and three represented the buyout sponsor. All board members owned stock. The board met quarterly, and an executive committee monthly. More importantly, one of the private equity partners served as a liaison between the LBO sponsor and the firm's managers. The operating partner, which functioned as an advisor and a consultant, spent several weeks at O.M. Scott after the buyout closed and was thereafter in telephone contact with the CEO daily. Baker and Wruck (1989) conclude that the close monitoring by the LBO sponsor, combined with the restrictions imposed by the high leverage and significant managerial shareholdings and bonus plans, led to a substantial improvement in O.M. Scott's operating performance and investment policies.¹²

The evidence suggests that LBO sponsors are also active monitors in more recent transactions. Cornelli and Karakas (2008) examine the board structure for 88 U.K. buyouts sponsored by a private equity firm over the 1998–2003 period. They find that, on average, the board size decreases by 15%, from 6.5 to 5.5 directors after the buyout. Moreover, outside directors are replaced by individuals representing the LBO sponsor, who controls on average 40% of the board seats. Also, the CEO is replaced in half of the buyout transactions.

¹² See also Denis (1994) for an analysis of the organizational changes at Safeway after its leveraged buyout in 1986.

Acharya and Kehoe (2008) show that LBO sponsors on average own 77% of the equity in their portfolio companies. The average sponsor holds 45% of the seats on a board with eight members that meet monthly. The sponsor engages through weekly, often informal, meetings with management over the due diligence phase and the first three months after closing. They also report that two-thirds of the LBO firm's top management is replaced within 100 days of the deal. In sum, buyout sponsors play an important role through active monitoring of the LBO firm.

Cressy, Munari, and Malipiero (2007) compare the operating performance of private equity-backed LBOs with that of comparable nonbuyout private firms matched on industry and size. Their sample is 122 U.K. buyouts in 1995–2002. They find a higher post-buyout operating profitability for the LBO firms, and particularly when the sponsor specializes in the target firm industry.

While the monitoring by LBO sponsors is an important governance mechanism in leveraged buyouts, managers sometime undertake MBOs without the involvement of a private equity sponsor. Fidrmuc, Roosenboom, and van Dijk (2008) examine the choice between an MBO and a sponsor-backed buyout across 129 U.K. leveraged buyouts in 1997–2003 and where management stayed in control. They find that MBO targets have lower market-to-book ratios, more cash on hand, and greater managerial ownership. They suggest that managers invite LBO sponsors when they need help to complete a deal, and they conclude that MBOs and sponsor-backed LBOs are complementary transactions.

Cotter and Peck (2001) analyze how the equity ownership of the LBO firm interacts with the structure of the buyout debt. Their sample is 64 LBO firms in 1984–1989, of which a buyout specialist owns majority control in 40 firms (63%). They find that firms controlled by an LBO sponsor use less short-term and/or senior bank debt to finance the transaction. Moreover, the LBO firm's operating performance increases with the use of senior debt only in deals where no buyout specialist is involved. They suggest that bank debt, having more restrictive covenants, and debt with shorter maturity, and thus higher debt service, both help motivate and monitor management in the absence of an active buyout specialist. See also Grinstein (2006) for an analysis of how the debt structure is used to commit investors to disciplinary actions against management.

In sum, leveraged buyouts are characterized by powerful corporate governance structures. First, management owns a substantial portion of the equity. Second, the ownership is concentrated with an LBO sponsor who actively monitors management. Third, the high leverage puts additional pressure to generate cash flow. Together, these mechanisms provide compelling incentives for managers to improve the efficiency of the LBO firm.

8.4.4. *Wealth transfers from debtholders*

If the pre-buyout bonds lack protective covenants, the LBO firm may issue more senior debt. Bonds that lack protective covenants become more junior in the capital structure, resulting in a reduction in the value of those bonds. Thus, it is possible that some of the buyout gains represent wealth transfers from target firm debtholders. Marais, Schipper,

and Smith (1989) examine a sample of leveraged buyouts between 1974 and 1985. They find positive average CARs for convertible securities and preferred stock, most of which are redeemed as part of the buyout. A majority of the nonconvertible debt claims remain outstanding without renegotiation after the buyout. This debt typically lacks covenants restricting additional borrowing with higher seniority, and there are pervasive downgradings of public debt following successful buyout proposals, suggesting bondholder losses.

Asquith and Wizman (1990) investigate the one-month return for 199 bonds of LBO targets in the 1980s. They find an average abnormal return of -1% across all bonds. However, these losses are concentrated to bonds with no covenant protection (mean return of -3%). Bonds with strong covenant protection have insignificant returns. Overall, the losses to bondholders are small compared to the total gains accruing to shareholders in the same LBO. Warga and Welch (1993) document an average risk-adjusted LBO announcement return of -7% for 36 bonds. The bondholder losses, however, constitute at most 6% of the shareholder gains. They too conclude that bondholder expropriation is a minor source of gains in leveraged buyouts. See also Billet, Jiang and Lie (2008) for an examination of bond returns in leveraged buyouts. They suggest that bondholder wealth expropriation has declined with the increased use of change-in-control covenants.

Ippolito and James (1992) propose that LBOs could extract wealth from other stakeholders as well. They examine the termination of pension plans in 169 buyouts in the 1980s. They find that the incidence of pension terminations doubles following LBO announcements. However, many of these terminations are affiliated with plant closings or an adaptation to terms offered by the competitors of the LBO firm. Brown, Fee, and Thomas (2007) examine the effect of leveraged buyouts on the firms' suppliers, using a sample of 157 suppliers of firms undertaking LBOs in 1990–2001. They document an average announcement CAR of -1.3% for the suppliers. Moreover, the negative returns are concentrated to suppliers with substantial relation-specific investments. Thus, some of the LBO gains may come from the financial leverage as a commitment device in negotiations with suppliers and other stakeholders.

Another group of stake holders in the buyout transaction are the LBO bank lenders. Kracaw and Zenner (1996) examine the wealth effects of highly leveraged transactions on the stock prices of lead banks of the leveraged-loan syndicate. They find significantly positive average CARs of 0.5% when the transaction is announced and another 0.4% when the bank financing is agreed upon. Moreover, the bank stock returns are increasing in the size of the highly leveraged transaction. In all, bank lenders are expected to make profits on financing highly leveraged transactions and not the opposite.

Demiroglu and James (2007) investigate whether brand-sponsors borrow at better terms. Examining a sample of 181 LBOs completed between 1997 and 2007, they find that buyouts sponsored by high-reputation partnerships pay narrower loan spreads, have fewer and less restrictive loan covenants, and borrow more at a lower cost from institutional loan markets. In addition, sponsor reputation is positively related to the amount of leverage used to finance the buyout. Moreover, Ivashina and Kovner (2008) study 1582 leveraged loans financing private equity sponsored LBOs between 1993 and 2005.

They show that transaction loan spreads decline in the sponsor's relationship (past business) with the bank and the potential for future bank business. In sum, larger LBO sponsors can borrow at better terms. It is possible that this competitive advantage could help explain the persistence in returns across LBO sponsors documented by Kaplan and Schoar (2005).

8.4.5. *Wealth transfers from target shareholders*

While managers have a fiduciary duty to negotiate fair value in a buyout transaction, as acquirers of shares, they stand to gain from a low transaction value. By understating the true value of the target shares, they expropriate wealth from outside shareholders in the buyout. DeAngelo (1986) examines the accounting choices of 64 NYSE firms proposing an MBO during 1973–1982. Using a variety of tests, she fails to find any evidence that managers systematically understate earnings in the period leading up to the buyout. Perry and Williams (1994) employ a different methodology and a larger sample of 175 MBOs. In contrast, they find evidence of manipulation of the discretionary accruals that lowers the earnings in the year preceding the buyout announcement.

Kaplan (1989b) compares the financial forecasts that firms present at the time of a management buyout to subsequent performance. He finds that the actual post-buyout performance generally lags the forecast, rejecting the notion that managers capitalize on inside information in the MBO. Lee (1992) studies a sample of withdrawn MBO proposals to determine whether managers' proposals reveal information beyond the gains from the completed transaction. He finds that stock prices drop back to their pre-bid level after the withdrawal of the MBO proposal unless another bidder appears. He suggests that the wealth creation in LBOs primarily results from efficiency gains associated with the completed transaction rather than wealth transfers from pre-buyout shareholders. Moreover, Ofek (1994) finds that stock prices drop back to their pre-buyout level after MBO offers are canceled or rejected by the target boards. Also, there is no subsequent improvement in the operating performance of these firms. Overall, the evidence at large suggests that buyout gains come from other sources than expropriation of selling shareholders.

A relatively new practice is the so called club deals, where two or more private equity firms jointly sponsor an LBO. The equity portion in recent mega-deals may be too large for a single fund to finance on its own. However, a concern with these deals is that LBO sponsors may collude to limit competition, hence reducing the price paid to target shareholders. Indeed, the U.S. Department of Justice launched an inquiry in late 2006 into the effect of such private equity consortiums on takeover competition.

Officer, Ozbas, and Sensoy (2008) examine the collusion argument for a sample of 53 club deals and 133 single-sponsor LBOs completed between 1984 and 2007. Using target abnormal return estimates, they find that club deals are associated with significantly lower premiums than single-sponsor deals. Guo, Hotchkies, and Song (2008) show that club deals are associated with higher returns on the capital invested in the LBO. However, they also find higher returns for target shareholders, rejecting the proposal of lower prices. Boone and Mulherin (2008) examine 70 club deals and 94 single-sponsor deals

over the 2003–2007 period. Based on SEC filings, they show that the level of takeover competition is significantly higher for both types of LBO bidders compared to a control sample of takeovers. Moreover, target abnormal returns are largely the same across the different bidder categories. In sum, there is little evidence that club deals limit bidder competition in LBOs.

Outside investors may play an active role in the buyout, protecting target shareholder interests. Peck (1996) examines block trades in 111 MBO bids between 1984 and 1987. She finds that acquisitions of equity blocks increase around MBO offers, peaking three months prior to the offer. The participation of these blockholders increases the probability that the MBO proposal fails and a rival bidder acquires the firm. For a sample of 196 LBOs in 1990–2006, Huang (2008) finds significant increases in hedge fund holdings prior to the bid. He shows that the initial buyout premium increases with the level of hedge fund ownership in the target. Thus, outside investors seem to play an important role in increasing target returns.

8.4.6. Taxes

Interest expenses are deductible and therefore reduce the firm's cost of capital. In the 1980s, management could also choose to step up the value of the assets after the buyout, increasing depreciation deductions. Kaplan (1989b) estimates the value of potential tax benefits created in MBOs using a range of assumptions about the marginal tax advantage to debt and the debt retirement schedule. Depending on the assumptions, the median value of the tax benefits from interest deductions range from 13 to 130% of the premium paid to pre-buyout shareholders, or 5 to 53% of the market value of equity two months prior to the buyout. He finds a strong positive correlation between the total tax deductions and the premium, and suggests that taxes are an important source of gains in leveraged buyouts.

See also Schipper and Smith (1991) and Newbould, Chatfield, and Anderson (1992) for further analysis of tax deductions in leveraged buyouts. Jensen, Kaplan, and Stiglin (1989) estimate that leveraged buyouts have a positive overall effect on the tax revenue of the U.S. Treasury. Simulations of the net effect of leveraged buyout activity for the U.S. Treasury are found in Chatfield and Newbould (1996).

8.5. Industry effects

Slovin, Sushka, and Bendeck (1991) propose that leveraged buyout announcements convey private information about the future prospects of the industry. Examining the stock price reaction of 940 industry rivals of 128 buyouts in the 1980s, they find a significant and positive rival average announcement CAR of 1.3%. The rival returns are greater for rivals that are smaller in size than the target firm. Phallipou and Gottschal (2008) argue that LBO announcements signal the existence of an industrywide agency problem, encouraging industry rivals to improve their governance structure too. They document an increase in rival firm options awards, director share ownership, and CEO

turnover following LBO activity. It is not clear, however, whether their results are specific to rivals in industries with LBO activity or reflect a general trend in corporate governance.

One of the potential costs with high leverage is that it reduces financial flexibility and makes the LBO firm vulnerable to price competition by rival firms. Chevalier (1995b) examines how a leveraged buyout affects the pricing behavior of the LBO firm and its rivals in a local market, using data from the supermarket industry. She shows that prices rise when rival firms are also highly leveraged and LBO firms have higher prices than their competitors. However, prices fall when rival firms have relatively low debt levels and a single competitor controls a large market share. She finds that these low prices increase the probability that the LBO firm will exit, and suggests that rivals attempt to prey on LBO chains.

Phillips (1995) examines how financial leverage interacts with product market decisions for four different industries where a major player initiated a leveraged buyout. In three of the industries, characterized by difficult entry and high leverage of rival firms, prices increase and industry output declines with the average industry debt ratio. In the fourth industry, characterized by low leverage of rivals and low barriers to entry, prices fall and industry output increases with the industry debt ratio.

Overall, the evidence indicates that firms' leverage decisions affect industry pricing and output. See also Dasgupta and Titman (1998) for an equilibrium model explaining the interaction between capital structure and product markets, Fulghieri and Nagarajan (1996) for a model on the strategic role of high leverage for deterring entry in monopolistic markets, and Chevalier (1995a) for further evidence. Also, Parsons and Titman (2007) (Chapter 13 of this Handbook) discuss empirical studies on the interactions between leverage and corporate strategy.

8.6. *Organizational longevity and exit*

Are leveraged buyouts a transitory structure or a sustainable corporate form that lasts over a longer period of time? Jensen (1989) argues that the organizational form of a leveraged buyout is superior to public ownership for firms in low-growth industries, predicting long-lived LBO companies. In contrast, Rappaport (1990) claims that the lack of financial flexibility will ultimately harm the buyout firm and foresees a prompt return to the public equity markets. Kaplan (1991) examines 183 large leveraged buyouts completed between 1979 and 1986. He finds that the median LBO target remains in private ownership for seven years. Moreover, 45% of the LBO firms return to public ownership at some point. In a sample of 72 reversed IPOs, that is, LBOs that subsequently went public, Muscarella and Versuypene (1990) report that the average firm remains private for three years.

Stromberg (2007) studies holding periods and exits for 21,000 buyout transactions in 1970–2007. Of these buyouts 17,000 (80%) were backed by a financial sponsor. Given the large number of transactions in the 2000s, only 40% of the firms in his sample have exited. He finds that 39% of the exits are in the form of a sale to a strategic buyer. One quarter of the exits are a secondary buyout, that is, a sale to another LBO fund—an exit

form that has increased in importance over the last decade. IPOs account for 13% of the exits. Moreover, despite the significant leverage used in buyouts, only 6% of exiting firms file for bankruptcy or initiates a financial restructuring. Stromberg (2007) further shows that the median firm stays in LBO ownership for nine years, and only 8% of the firms are sold within two years of the buyout. Overall, the evidence suggests that leveraged buyouts are a long-term organizational form for many firms.

Van de Gucht and Moore (1998) use a hazard model to estimate the probability that an LBO firm returns to public ownership for a sample of 343 LBOs over 1980–1992. They show that 27% of the firms reverse through an IPO after 3.5 years on average. Another 9% of the firms are sold to a publicly held company. Almost half of the firms remain private, and 12% file for bankruptcy. Moreover, the likelihood for an IPO is higher when the industry average market-to-book ratio is rising.

DeGeorge and Zeckhauser (1993) study the decision to exit a buyout through a public offering for 62 reverse LBOs in the 1980s. They find that the IPO coincides with a peak in the buyout firm's operating performance. The stock of the reverse LBOs outperform comparison firms, however, suggesting that the market anticipates the subsequent decline in operating profitability. They conclude that LBO firms choose to go public when their performance is strong. Holthausen and Larcker (1996) further show that the accounting performance of LBO firms exceeds that of its industry rivals at the time of the IPO and for the following four years. See Liu (2006), Cao and Lerner (2006), and Cao (2008) for additional evidence on reverse LBOs.

Halpern, Kieschnick, and Rotenberg (1999) conjecture that there are two types of targets in leveraged buyouts. One is the classical public target with little managerial equity and high free cash flow. The other is a target that performs poorly because the manager has too much of her wealth invested in the firm and hence is suboptimally risk-averse. Examining 126 LBOs in 1981–1986, they find that their sample clusters into two groups. The first group has low prior managerial equity and takeover premiums that decrease in managerial equity. Moreover, the buyout is led by an outside sponsor, and the LBO firm is typically sold in an IPO or to a strategic buyer. The second group has high managerial equity and takeover premiums that increase in managerial equity. These buyouts are led by managers, and the LBO firm tends to remain private. In addition, managers in this group typically increase their ownership fraction but decrease the dollar investment in the LBO firm. The authors suggest that a partition into these two different types of target firms better describes the LBO population.

Why did so many deals fail in the early 1990s? Bruner and Eades (1992) examine the failure of Revco in 1988, only 19 months after its leveraged buyout. They simulate the ex-ante probability of survival, based on historical and predicted cash flows at the time of the deal. They conclude that the company was overleveraged from the closing of the deal, with little probability of successfully servicing its debt. Kaplan and Stein (1993) contend that the buyout market overheated toward the end of the 1980s, resulting in many poorly structured transactions. They find higher price multiples and leverage ratios, increased use of junk bonds with few restrictive covenants, and more money paid up-front to managers and investment banks.

9. Conclusions

In this chapter, we review the extant literature on corporate breakup transactions and highly leveraged transactions. For each individual transaction, we survey techniques, transaction volume, valuation effects and potential sources of restructuring gains. Corporate breakup transactions are optimal when the separation of the diversified firm's divisions increases firm value. The breakup transactions range from divestitures and spinoffs, which entirely separates a subsidiary from its parent, to equity carveouts and tracking stock, which preserves some parent control. The highly leveraged transactions result in the firm taking on substantial additional debt in its capital structure. This happens in leveraged recapitalizations and in leveraged buyouts.

A divestiture is a sale of a division or subsidiary in a private transaction. Asset sales generate cash to the parent firm on the one hand, but trigger a capital gains tax on the other. The average parent firm experiences an abnormal stock return of 1% and the average buyer a CAR of 0.5% when a divestiture is announced. These valuation effects have several explanations: (i) most divestitures involve divisions that are unrelated to the parent firm, increasing the corporate focus of the diversified firm; (ii) the parent firm's investment decisions tend to improve after the divestiture; and (iii) assets are often transferred to a higher valuation buyer. Moreover, it appears that managers are reluctant to sell assets, managers in firms with better corporate governance make better divestment decisions, and the retention of proceeds is associated with inefficient investments.

A spinoff is the separation of a subsidiary through a distribution of the stock to parent shareholders. Spinoffs can be completed without any tax implications, but also do not generate any cash to the parent. The parent stock price increases by 3% on average at the announcement of a spinoff. The value creation comes from: (i) increased corporate focus; (ii) elimination of cross-subsidization leading to improved investment decisions; (iii) reduced information asymmetries; and (iv) a higher probability of becoming a target. Investors rebalance their portfolios when the parent and subsidiary stocks start trading separately. Moreover, parent managers design the subsidiary corporate charter to include more takeover defenses compared to the parent firm itself as well as other IPO firms.

An equity carveout is a partial IPO of the subsidiary, where the parent typically retains a controlling stake. It generates cash (the IPO proceeds) but no tax. The average parent firm experiences an abnormal stock return of 2% at the announcement of an equity carveout. The gains in equity carveouts are attributed to: (i) an increase in corporate focus; and (ii) a reduction of the financing costs for high-growth subsidiaries. Equity carveouts are a temporary organizational form, and most carveouts are subsequently reacquired or sold off. It is possible that the carveout generates information about the value of the subsidiary as an independent company, improving the decision to exercise the option to sell out or buy back the subsidiary.

Tracking stock is a separate class of common stock in the parent company, tracking the performance of a given division. The tracking stock generates cash if it is offered to the public and has no tax implication. The average parent CAR is 3% on the announcement of a tracking stock issue. These announcement returns are, however, difficult to explain

beyond an initial market infatuation with yet another breakup transaction. The tracking stock is a “quasi-pure” play in that it requires separate divisional SEC filings, but has voting rights in the parent. In fact, tracking stock trades like its corporate sibling divisions rather than its industry. It lends itself for expropriation since the corporate board, without legal remedy, can transfer funds from the tracked division to the rest of the company. As a result of such expropriation, most tracking stock issues have been dissolved.

A leveraged recapitalization is a large special dividend financed by debt, substantially increasing the firm’s leverage. The average abnormal stock return is 5% on the announcement of a leveraged recapitalization and 20 to 30% through closing of the transaction. The gains in leveraged recapitalizations are attributed primarily to the incentive effects of debt: recap firms substantially cut their capital expenditures and increase operating profitability.

A leveraged buyout is an acquisition by private investors financed primarily by debt. Premiums paid to target shareholders in LBOs average 37%, and announcement CARs average 16–17%. The LBO gains are attributed to several sources: (i) improved investment and operating efficiencies; (ii) increased equity-based incentives to management; and (iii) strong monitoring by the LBO sponsor. Buyouts of the 2000s seem to have somewhat less improvements in operating efficiency, but in general create value similar to LBOs of the 1980s. Recent developments include club deals (consortiums of LBO sponsors bidding together), fund-to-fund exits (LBO funds selling the portfolio firm to another LBO fund), a highly liquid (until mid-2007) leveraged loan market, and evidence of persistence in fund returns (perhaps because brand-sponsors borrow at better rates).

In this survey, we have focused on the individual transactions and their associated empirical evidence. This is also how most of the literature progresses. A major drawback of this approach is the resulting lack of analysis of alternatives. That is, when a company self-selects a divestiture, what were reasonable alternative strategies? In what sense was divestiture superior to, say, a spinoff or an equity carveout? In what sense was going private via an LBO superior to a leveraged recapitalization? Are there systematic differences between public to private LBO transactions and private-to-private restructurings? Ideally, one would use a theoretical model to structure the answers to these types of questions. Perhaps the greatest challenge to the restructuring literature is to achieve a modicum of integration of the analysis across transaction types. Also, it is difficult to evaluate the expected return from buyout investments with only limited data on portfolio companies that do not return to public status within the sample period. We expect these issues to be resolved as both theories and data become more readily available in the future.

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EXECUTIVE COMPENSATION AND INCENTIVES

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Abstract

Since the seminal contribution of Jensen and Murphy (1990), our understanding of executive compensation and incentives has greatly improved. Through time, the strength of incentives has increased. In the 1990s, this was accomplished primarily through the use of stock options. The two most important sources of aggregate incentives are holdings of stock and holdings of stock options—these align managers' interests with those of shareholders. Firm size, firm risk, executive aversion to risk, executive productivity, the extent to which executives like or dislike taking certain actions that matter for shareholders, and characteristics of the industry all determine how strong or weak incentives should be. We know that, because shareholders have limited information about what managers do and limited ability to monitor managers, managers need to be provided with some incentives. The key limitation on the provision of incentives is the need to share risk between managers and other shareholders. Actual compensation practices reflect this trade-off. We also know now that boards and shareholders do not have the complete ability to set managerial compensation. Either because of CEO power or a limited supply of managerial talent, at least some CEOs have the ability to extract more compensation than what is dictated by straightforward pay for performance. At this stage, we have a reasonably strong understanding of the determinants of incentives, and incentives seem to work well. We still do not fully understand the level of compensation. A number of well-documented examples are consistent with the rent extraction view of the level of compensation. Instances of excessive compensation and rent extraction seem to be correlated with corporate governance failure, accounting fraud, and poor corporate outcomes.

Keywords

Executive compensation, incentives, agency, rent extraction

1. Introduction

Modern finance theory argues that the proper objective of managers is to maximize the value of the firm, which in general means running the firm in the shareholders' interests. But managers are self-interested individuals. Because managers have effective control over the firm, they can make decisions and take actions that serve their own interests. A common presumption is that the best way to ensure that managers act in the interest of shareholders is to tie their compensation to the company's performance. The higher the sensitivity of executives' pay to firm performance, the closer their interests will be aligned to those of the shareholders. Much of the academic literature has focused on the degree to which managers' interests are aligned with those of shareholders. Understanding this issue and how it informs the optimal design of compensation packages will be the major focus of this survey.

In public discourse about executive compensation, the dominant theme has been the soaring pay packages of chief executive officers (CEOs) and the contribution executive pay has made to rising income inequality in the United States. By 2004, according to *Business Week*, the average CEO compensation package, including bonuses and stock options, was roughly 300 times the average worker's paycheck. (In 2004, *Business Week* revised its calculation method, and so the multiple went down relative to previous years.) This theme has been picked up in recent academic work proposing that the driving force behind CEO compensation is rent extraction by CEOs (Bebchuk and Fried, 2004; Bertrand and Mullainathan, 2001). As this is now the leading alternative to agency explanations for compensation and incentives, this perspective will also be discussed. While earlier discussions of compensation focused on the incentives embodied in compensation and abstracted from concerns about the level of compensation, it is now fair to say that the level of compensation matters as well. For example, in the seminal contribution to the literature on executive compensation, Jensen and Murphy (1990) maintained that political considerations about income inequality limited the amount of incentives that could be provided. Almost 20 years later, after the options explosion, it is difficult to argue that CEO incentives have been limited by such considerations.

This survey begins by examining trends and components in executive compensation in Section 2. Section 3 then discusses what determines incentives, with a particular emphasis on the agency view. Section 4 turns to one of the larger puzzles in the literature: the general absence of the use of relative performance evaluation when compensating and providing incentives to top managers. Section 5 examines what managerial actions incentives should or do influence and, in turn, the associated impact on firm value. Section 6 looks at some alternatives to the agency view, including the increasingly popular skimming or rent extraction view of executive compensation. Section 7 presents conclusions.¹

¹ Two remarks are in order about the scope of this survey. First, many important papers have necessarily been omitted from this survey, both because of the choice of topics covered and simply out of the need for brevity. Second, this survey focuses relatively more heavily on the literature after 1998, which was written after Kevin Murphy's (1999) earlier and excellent survey of executive compensation.

2. Trends in executive compensation

In order to understand the determinants of incentives and, in turn, what incentives are designed to influence, we start by examining the components of executive compensation. As an illustrative example, consider the case of top management at IBM. Figure 1 presents executive compensation data for the five highest paid executives at IBM for fiscal year 2003. The figure includes data on salary, bonus, other annual compensation, restricted stock grants, grants of stock options, long-term incentive payouts (LTIPs), and all other compensation. It does not include data on stock options exercised, sales of stock, or existing holdings of stock or options. The components included add up to the total annual compensation of the executive.

Total annual compensation can be divided into two categories—short-term and long-term components of compensation.

2.1. Short-term components of compensation

Short-term components of compensation include salary, bonus, and other annual compensation. Annual salary is fixed in advance and generally does not have an incentive component associated with it. The exception to this statement is that future increases in salary may in part be determined by current firm performance. Jensen and Murphy (1990) show that the present value of current and future increases in salary and bonuses represents a small fraction of total incentives.

Annual bonuses are typically tied to measures of firm performance. Interestingly, the performance measures are often based on accounting information such as earnings, sales, or operating income. Common metrics employed include return on equity (ROE), return

Name	Title	Salary	Bonus	Other Annual	Restricted Stock Granted	Stock options Granted*	LTIP	All Other Comp.	Total Annual Comp.
S. J. Palmisano	Chmn., Pres., & CEO	1,550,000	5,400,000	11,037	0	12,283,900	769,095	181,500	20,195,532
N. M. Donofrio	Sr. V-P	637,501	1,185,000	1,390	0	2,900,400	425,566	36,075	5,185,932
J. R. Joyce	Sr. V-P & CFO	615,000	1,141,000	205	1,363,246	2,872,100	512,730	34,950	6,539,231
D. T. Elix	Sr. V-P & Group Exec.	622,501	1,010,000	764,092	1,187,740	3,296,100	553,748	33,925	8,098,106
W. M. Zeitler	Sr. V-P & Group Exec.	487,501	995,000	2,928	908,831	2,555,500	425,566	24,125	5,399,451

*Assumes 5% annual stock price appreciation, not a Black-Scholes value.

Fig. 1. Executive compensation, IBM Corp., fiscal year 2003.

Source: IBM Proxy Statement.

on assets (ROA), return on investment (ROI), and economic value added (EVA). Other measures of performance include subjective reports by board members or superiors for lower ranking executives and targets established by the board for investment, product or plant quality (e.g., “zero-defects”), market share, growth rates for income or sales, strategic objectives (e.g., expansion into new lines of business or restructuring of old businesses), and performance relative to that of industry competitors.

There are several points to note about short-term components of compensation. Short-term compensation does have some incentive features, especially the bonus component. Swan and Zhou (2003) argue that bonuses typically have thresholds associated with them (e.g., ROA must exceed 15%) and that performance incentives are quite high-powered around these thresholds. However, bonuses and other forms of short-term compensation are typically not linked to stock performance in the form of stock returns. Given that shareholders presumably care most about stock returns, this might seem surprising. It will become apparent, however, that long-term components of compensation are much more strongly linked to stock returns.

For this reason, the right way to think about annual salary and bonuses is that salary provides the executive with a minimum level of income prior to any performance standards or targets being met. Bonuses typically reflect how well the firm or executive has met nonstock-return-based objectives established by the board. Other annual compensation is usually negligible.² When looking at IBM in Figure 1, Chairman, President, and CEO Samuel J. Palmisano’s salary and bonus stand out as much higher than those of the other IBM executives.

2.2. Long-term components of compensation

Long-term components of compensation include new grants of restricted stock, new grants of stock options, long-term incentive plan payouts, and all other compensation. All other compensation typically includes gross-ups for tax liabilities, perquisites, preferential discounts on stock purchases, contributions to benefit plans, and severance payments and has historically been thought to be relatively unimportant.

Recent work by Yermack (2006), however, suggests that some forms of perquisites—the use of corporate jets—may actually be indicative that management is more interested in rent extraction than in shareholder value maximization.³ Consistent with this view, Aggarwal, Meschke, and Wang (2007) argue that corporate political donations are also a form of perquisites consumption that may indicate management’s greater interest in rent extraction than in shareholder value maximization. In addition, recent disclosures of executive compensation packages given to Jack Welch, former CEO of GE, and

² It is the case, however, that other annual compensation can include various forms of perquisites consumption as discussed in the next section.

³ Rajan and Wulf (2006) offer a contrasting perspective on perquisites such as the use of corporate jets. They state that corporate jets, chauffeur services, and country club memberships may enhance productivity and may therefore be valuable to the firm, and they offer evidence consistent with this view.

Richard Grasso, former CEO of the New York Stock Exchange, suggest that deferred compensation in the form of retirement benefits can be quite substantial. Bebchuk and Fried (2004) call retirement benefits “stealth” compensation. This view is discussed in greater detail later in the chapter.

2.2.1. Restricted stock

Restricted stock grants are restricted in the sense that the executive must remain with the firm for a specified amount of time in order not to forfeit the stock grant. Restricted stock grants with a five-year vesting period are typical. This restriction has two practical implications. First, the executive has potentially a strong incentive to stay with the firm in order to benefit from the grant (see Oyer, 2004, for a discussion of retention). Second, while the vesting period is in effect, the executive cannot sell the stock. She is, in effect, forced to have part of her compensation tied to firm performance over the vesting period. Restricted stock grants clearly align an executive’s interests with those of her shareholders.

For this reason, it is interesting that the use of restricted stock grants declined throughout the 1990s. As an incentive mechanism, they were supplanted by stock options. Since the 2000 stock market decline, the use of restricted stock has increased, and the advent of stock option expensing will most likely accelerate the use of restricted stock. Figure 1 shows that of the five highest paid executives at IBM, three received restricted stock in 2003.

2.2.2. Stock options

Throughout the 1990s, stock options were the primary mechanism through which managers’ interests were aligned with those of shareholders. Most stock options are granted at the money. A typical stock option grant has a life of 10 years. Interestingly, few options are held to maturity; most options are exercised early, and the stock is sold. Since stock prices on average increase from year to year, over time most stock options will move into the money, although Hall and Knox (2004) argue that a substantial fraction of option grants will be underwater for some period during their life. Stock options usually have a vesting schedule associated with them, such as 25% of an option grant vests every year (with 25% vesting immediately upon grant), so that the full grant vests over three years, with another seven years to maturity.

Historically, for purposes of reported earnings, options granted at the money or out of the money did not count against earnings. Options that are in the money or options that have a variable exercise price (such as indexed options where the option is indexed to aggregate stock market returns) did count against earnings. This explains why most options are issued at the money and why we so rarely see indexed options. Going forward, options will have to be expensed, which decreases the likelihood that we will see as many or as large option grants in the future. Furthermore, option expensing implies that we

are more likely to see indexed options and other forms of more tailored option grants to top executives.

For tax purposes, the focus here is on nonqualified options, which are the form of stock options that most executives receive. Nonqualified options have no tax implication at the time that they are issued. When the option is exercised, the executive pays tax on the difference between the stock price and the exercise price at the ordinary income tax rate. The firm deducts the difference between the stock price and the exercise price as compensation expense. If the executive later sells the stock, then the executive pays tax on the difference between the sale price and the market price at exercise of the option at the capital gains tax rate. Because the firm is able to deduct the difference between the stock price at exercise and the exercise price as compensation expense, nonqualified options have favorable tax treatment from the firm's perspective.

Favorable tax treatment is a significant part of the explanation for dramatic increase in the use of stock options. Favorable accounting treatment also explains why the use of stock options increased over the 1990s. For the most part, stock options never show up on accounting statements. In the past, firms were required to disclose grants of stock options but did not have to take an accounting charge for them. As a result, stock options were an excellent way of providing managers with deferred compensation without incurring an accounting liability, even though there is a real economic cost associated with the option grant (see Bulow and Shoven, 2005, for an excellent discussion of how this cost can be recognized dynamically over the life of an option). The fact that favorable accounting treatment only accrues to options that are granted at or out of the money with a prespecified exercise price and date helps to explain the prevalence of granting stock options at the money. Murphy (2002) argues that this favorable accounting treatment leads companies to erroneously view stock options as a low-cost mechanism for compensating executives.

Historically, stock options have been reported in two ways in company proxy statements. The first is to report the value of an option grant assuming the stock price increases by 5 or 10% annually. This is what IBM does, and this is what is reported in Figure 1. This method will generally overstate the value of the option grant. A more satisfactory approach from a researcher's point of view is to use the Black-Scholes formula. The most salient point about using the Black-Scholes model is that it may also overstate the value to the executive of the option grant. Hall and Murphy (2002) argue that because executives are risk averse and hold large, undiversified positions in their own firms, they will value stock options at a lower level than will a well-diversified outside investor.

Conversely, executives have better information than do outside investors about their firms' prospects. Yermack (1997) notes that executives receive option grants before good news is announced and often exercise options in advance of bad news. More recently, Lie (2005) and Heron and Lie (2007) have argued that stock option grants to many top executives have grant dates that are suspiciously the date of the firm's lowest stock price (for the quarter or the year). Since exercise prices are set on the grant date, this exceptionally good timing allows executives to reap windfall gains. They argue that this

pattern is consistent with options being backdated—the actual grant date is weeks or months after the chosen grant date.

IBM is quite typical in its grants of stock options. Stock options had become the dominant mechanism through which incentives were provided to managers. Clearly, stock options are tied to the firm's stock price performance. In many situations, they do a good job of aligning a manager's interests with those of the shareholders. This becomes more true as options move into the money. However, a case can also be made that stock options became the dominant mechanism through which executives were able to extract rents from firms. The example of option backdating illustrates one form of rent extraction, as is discussed later.

2.2.3. Long-term incentive plans

Long-term incentive plan payouts are similar to bonuses, but they are awarded for performance over several years. For example, a long-term incentive plan payout may be triggered if ROA is at least 15% for three consecutive years. In general, long-term incentive plans are not that important on a year-to-year basis because they occur only when a long-term target is met. For IBM in 2003, however, long-term incentive plan payouts were quite important for all five executives. As is clear from Figure 1, IBM's top five highest paid executives were quite well compensated in 2003.

2.3. Aggregate measure of compensation

The measure of compensation for incentive purposes that we will use is the total annual compensation of the executive (as in Fig. 1 for IBM), plus the annual change in wealth for the executive based on changes in firm value. Total annual compensation includes salary, bonus, new grants of restricted stock, new grants of stock options, long-term incentive plan payouts, gross-ups for tax liabilities, perquisites, preferential discounts on stock purchases, contributions to benefit plans, and severance payments. The most important elements of total annual compensation given by the firm in terms of magnitude are usually salary, bonus, grants of restricted stock, and grants of stock options. (IBM is a bit of an exception with its large long-term incentive payouts.)

The annual change in wealth for the executive includes changes in the value of existing holdings of stock and existing holdings of stock options; these elements often swamp all of the components of total annual compensation. The annual change in wealth focuses on how large a position the executive holds in the firm. For this reason, it is a good measure of how aligned an executive's interests are with those of other shareholders. At the same time, at least some of an executive's holdings of stock and options are voluntary in the sense that the shares and options are not restricted from being sold. Because some of the holdings are voluntary, the shareholders are not, strictly speaking, providing incentives. While this issue is real, it is also worth noting that the stock market reaction to insider sales is typically negative, implying that there are some limitations

on an insider's ability to sell shares. Overall, the annual change in wealth captures the bulk of incentives provided to executives.

2.4. Compensation statistics

Figure 2 provides summary information about the elements of compensation. The data are from Standard and Poor's ExecuComp dataset (see Standard and Poor's, 1995). The data cover the 1500 firms included in the S&P 500, S&P MidCap 400, and S&P SmallCap 600 from 1993 to 1997. For each firm, data are reported for the top five executives ranked annually on the basis of salary and bonus. Figure 2 divides executives into four categories based on the classification scheme in Aggarwal and Samwick (2003b). The first category is chief executive officers (CEOs). The second is executives with oversight authority for the firm—for example, executives with titles such as president

Group and Variable	Mean	Median	Standard Deviation
Total Annual Compensation (in 1997 dollars)			
CEO	\$2,739,000	1,494,000	5,183,000
Oversight	1,532,000	847,000	3,461,000
Divisional	973,000	605,000	1,324,000
Neither	873,000	555,000	1,254,000
Long-Term Components of Total Annual Compensation (in 1997 dollars)			
CEO	1,571,000	543,000	4,381,000
Oversight	879,000	296,000	3,252,000
Divisional	488,000	190,000	1,054,000
Neither	417,000	170,000	985,000
Holdings of Stock (in 1997 dollars)			
CEO	74,606,000	5,801,000	722,605,000
Oversight	17,039,000	1,079,000	117,583,000
Divisional	2,496,000	422,000	15,908,000
Neither	4,898,000	475,000	98,923,000
Holdings of Options (in 1997 dollars)			
CEO	7,968,000	2,218,000	22,664,000
Oversight	3,151,000	887,000	11,320,000
Divisional	2,018,000	583,000	7,964,000
Neither	1,776,000	578,000	4,514,000

Fig. 2. Descriptive statistics on compensation by job classification, 1993–1997.

Note: Long-term compensation is comprised of the following components of total annual compensation: grants of restricted stock, grants of stock options, long-term incentive plan payouts, gross-ups for tax liabilities, perquisites, preferential discounts on stock purchases, contributions to benefit plans, and severance payments. *Source:* Aggarwal and Samwick (2003b).

(non-CEO), chief operating officer (COO), chief financial officer (CFO), chairman, and vice chairman. The third is executives with divisional responsibility—CEOs of divisions or subsidiaries, executives in charge of a specific product line or geographical area, and executives with specific production-related responsibilities. The fourth is executives with neither oversight authority nor divisional responsibility—for example, vice presidents with no other information given.

2.4.1. Total annual compensation

Figure 2 highlights a number of important features of executive compensation. Executives, and especially CEOs, seem to be quite well paid. As shown in the figure, in the 1992–1997 period, the average CEO made \$2,739,000 in total annual compensation given by the firm. The average is skewed by the fact that some CEOs made enormous amounts of money in some years. Figure 3 lists the 20 highest paid CEOs in 1999, plus Kenneth Lay and Jeffrey Skilling from Enron. The spread in compensation among even

Name	Company	Total Annual Compensation
1. Robert Annunziata	Global Crossing, Ltd.	193,784,118
2. Joseph Nacchio	Qwest Communication Intl., Inc.	172,205,151
3. L. Dennis Kozlowski	Tyco International Ltd.	138,331,617
4. Thomas Siebel	Siebel Systems, Inc.	134,437,170
5. Michael Jeffries	Abercrombie & Fitch	124,513,616
6. Sanford Weill	Citigroup, Inc.	109,426,548
7. Carleton Fiorina	Hewlett-Packard Co.	101,299,548
8. Hugh McColl, Jr.	Bank of America Corp.	84,825,255
9. John Welch, Jr.	General Electric Co.	70,366,772
10. H. Brian Thompson	Global Telesystems, Inc.	66,548,901
11. John Chambers	Cisco Systems, Inc.	64,005,282
12. Charles Lillis	MediaOne Group, Inc.	62,515,711
13. Harvey Golub	American Express Co.	56,996,770
14. William McGuire	UnitedHealth Group, Inc.	51,611,855
15. John Wren	Omnicom Group	50,671,565
16. Robert Davis	Lycos, Inc.	50,526,628
17. Bernard Ebbers	WorldCom, Inc.	50,374,936
18. William Esrey	Sprint PCS Group	47,821,117
19. Michael Bonsignore	Honeywell Intl. Inc.	45,377,623
20. Timothy Koogle	Yahoo, Inc.	44,648,351
Kenneth Lay	Enron	22,154,808
Jeffrey Skilling	Enron	17,767,941

Fig. 3. Twenty highest paid CEOs—1999.

Source: Standard & Poor's ExecuComp database.

the 20 highest paid is quite dramatic—from \$193,784,118 for Robert Annunziata, the CEO of Global Crossing, to \$44,648,351 for Timothy Koogle, the CEO of Yahoo. Of the almost \$194 million in compensation Robert Annunziata received, \$182.319 million was in the form of a stock option grant (Black-Scholes value). In contrast, Lay and Skilling, though obviously highly compensated, do not particularly stand out.

As shown in Figure 2, the median CEO made \$1,494,000 over the period, substantially less than the average CEO. Other executives made smaller amounts, although in all cases executive compensation is quite substantial. Executives with oversight authority made, on average, \$1,532,000, with a median of \$847,000. Executives with divisional responsibility made, on average, \$973,000, with a median of \$605,000. Executives with neither oversight authority nor divisional responsibility made, on average, \$873,000, with a median of \$555,000. While these sums are substantial, they are not as large as is often portrayed in the media. For example, the average worker made about \$33,000 in 1997. The median CEO's total annual compensation was 45 times that of the average worker, not the 419 times claimed by *Business Week*. *Business Week* focused on the compensation packages of CEOs at the largest firms, which, as Figure 2 shows, is not representative of all firms. Clearly, politics matters in any discussion of CEO compensation. But comparisons of dollars of compensation cannot tell us much about the strength of incentives or how well aligned managers' interests are with those of shareholders.

2.4.2. Holdings of stock and options

Although the sums paid to executives on an annual basis are large, they pale in comparison to the dollar value of executives' holdings of stock and options, especially, CEOs. On average, the dollar value of CEOs holdings of stock is \$74,606,000, while the dollar value of options held is \$7,968,000. However, when dealing with estimates of executive compensation, one should always be concerned about the skewness of the data. For example, the median dollar value of holdings of stock for CEOs is \$5,801,000. Much of the reason the mean dollar value of stockholdings is so much greater than the median can be attributed to a few outliers. In particular, the holdings of one man, Bill Gates, who was CEO of Microsoft over the sample period, have a pronounced effect on the results. For a brief period in 1999, the dollar value of Bill Gates's holdings in Microsoft exceeded \$100 billion. Over the sample period, the dollar value of Bill Gates's holdings averaged about \$20 billion. Figure 2 also shows that the dollar value of holdings of stock and options for executives other than the CEO are quite substantial and quite skewed. These holdings of stock and options provide the bulk of incentives for all executives.

When looking at medians, holdings of stock are more important for CEOs and executives with oversight authority than are holdings of options. Conversely, for executives with divisional responsibility and executives with neither divisional responsibility nor oversight authority, options are more important than holdings of stock. This is not true when looking at average dollar values of holdings. Mean holdings of stock are greater than mean holdings of options for all four job groups. Again, medians are more likely to provide a representative picture of the dollar value of stock and option holdings.

One reason holdings of stock are more important for CEOs and executives with oversight authority than for executives with divisional responsibility and executives with neither divisional responsibility nor oversight authority is that the former two groups are more likely to include founders of the firm. Founders typically have large equity positions and may not participate in option programs (a good example of this is Bill Gates of Microsoft). Executives in the divisional and neither groups are less likely to be founders or early employees, and so may have fewer equity holdings. The dramatic extension of stock option grants to employees lower in the firm hierarchy is consistent with this pattern (for a discussion, see Oyer and Schaefer, 2004).

3. Incentives and agency

Given these basic facts about executive compensation, one may well wonder how compensation is translated into incentives and how incentives are determined. This section discusses some key issues in the design of incentives.

3.1. *Pay-performance sensitivities*

Incentives have historically been calculated as pay-performance sensitivities (PPSs). The idea behind the pay-performance sensitivity is to see how much compensation depends on how well the firm performs. Typically, firm performance is measured either in terms of stock returns or accounting returns (e.g., net income divided by the book value of equity or assets). In this section we will focus on firm performance based on stock returns. Pay-performance sensitivities can be calculated in two ways (Murphy, 1999). Under the implicit method, total annual compensation (or its logarithm) is regressed on firm performance (measured either as the dollar change in firm market value or the percentage change in firm market value). The coefficient on firm performance is the PPS. Estimates from the literature using the implicit method find that CEOs receive between \$3.25 (Jensen and Murphy, 1990) and \$5.29 (Hall and Liebman, 1998) for every thousand-dollar increase in shareholder wealth. Aggarwal and Samwick (1999a) show that these estimates are biased downward because they do not take into account the risk executives face from having compensation tied to firm performance. For this reason, the alternative method—the explicit method—will often be preferred to the implicit method.

Under the explicit method, incentives are calculated more directly. An executive's holdings of stock as a fraction of the total equity outstanding provide a measure of explicit pay-performance sensitivity from stockholdings. The number of shares options are written on divided by the total number of shares outstanding multiplied by the options' delta provides a measure of explicit PPS from options. An option's delta measures how the value of the option changes with a change in the price of the underlying stock on which the option is written. For options that are far in the money, the delta will be close to one and the option will have incentive effects similar to that of a share of the

Group and Variable	Mean	Median	Standard Deviation
Stock and Option PPS			
CEO	3.9941	1.2769	7.1526
Oversight	1.2504	0.3137	3.5974
Divisional	0.3750	0.1835	0.8289
Neither	0.4336	0.1765	1.0910
Stock PPS			
CEO	3.1658	0.3883	7.0067
Oversight	0.9112	0.0622	3.5339
Divisional	0.1626	0.0281	0.0307
Neither	0.2245	0.0307	1.0000
Option PPS			
CEO	0.8283	0.4153	1.2027
Oversight	0.3393	0.1609	0.5867
Divisional	0.2124	0.1160	0.3805
Neither	0.2092	0.1048	0.3641

Fig. 4. Descriptive statistics on incentives by job classification.

Note: Pay-performance sensitivities (PPSs) reflect the executives' percentage ownership of the firm on a scale of 0 to 100.

Source: Aggarwal and Samwick (2003b).

stock. For options that are far out of the money, delta will be close to zero, and the option will have no incentive effects given that it is unlikely to be exercised. An average value of delta for firms in the sample would be around 0.7 (see Hall and Liebman, 1998). The overall explicit PPS for an executive is the sum of the explicit pay-performance sensitivity from stock and the explicit pay-performance sensitivity from options. Summary statistics for these sensitivities are provided in Figure 4.

For CEOs, the average stock and option explicit PPS is 3.99%. That is, we can think of the CEO's holdings of stock and options as being 3.99% of the total equity outstanding in the firm. Pay-performance sensitivities are often reported as the dollars that accrue to an executive from a thousand dollar increase in shareholder wealth. On average, then, a CEO receives \$39.94 from changes in the value of his stock and option holdings for a thousand dollar increase in shareholder wealth. Once again, the medians are smaller than the means. At the median, a CEO receives \$12.77 from changes in the value of his stock and option holdings for a thousand dollar increase in shareholder wealth.

Several other points stand out. First, the skewness of explicit pay-performance sensitivities is much more pronounced for stock than it is for options. Second, CEOs have much greater explicit PPSs than do the other groups of executives. Third, at the median, all four groups of executives have greater explicit PPSs from options than they do from stock. To a large extent, this is a reflection of the fact that options became the incentive device of choice for most companies over the 1990s.

The following figures (Figs. 5 and 6) graphically illustrate the evolution of the use of stock and options as incentive devices from 1993 to 1997.

Although PPSs from stockholdings have remained relatively constant over the sample period, PPSs from options have shown a dramatic increase. From 1993 to 1997, PPSs from options for CEOs more than doubled. The same is true for executives with oversight authority. While the PPSs from options have shown large increases for executives with divisional responsibility and executives with neither responsibility, these increases have not been as large as the increases for CEOs and executives with oversight authority. Aggarwal and Samwick (2003b) argue that this is a reflection of the fact that

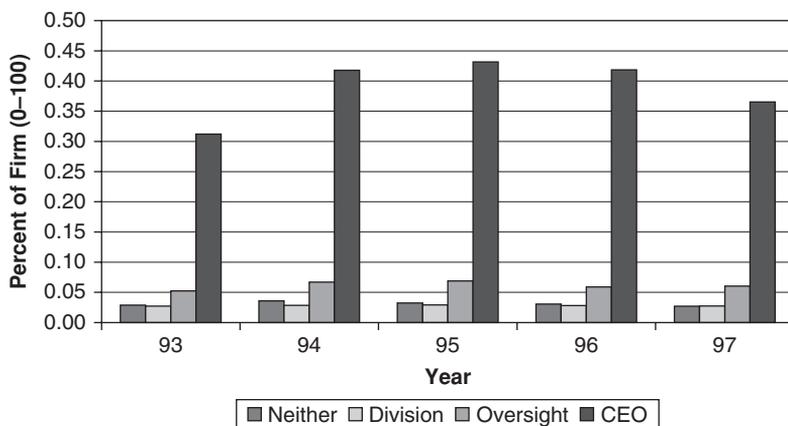


Fig. 5. Median pay-performance sensitivities from stock.

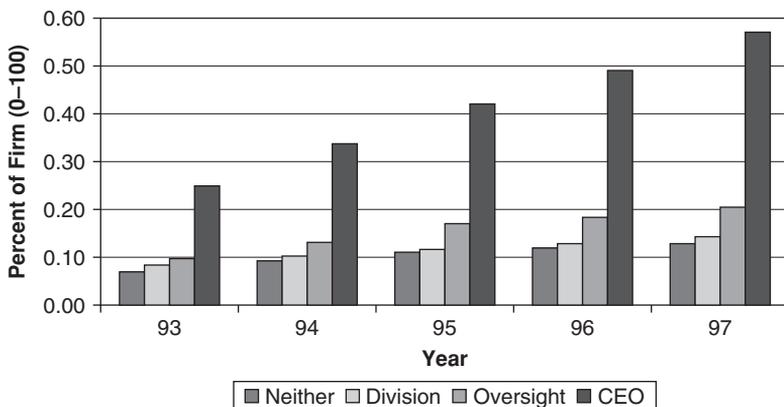


Fig. 6. Median pay-performance sensitivities from options.

overall firm returns are a better measure of a CEO's or an oversight executive's performance than they are of a divisional executive's performance or the performance of an executive with neither divisional responsibility nor oversight authority. In other words, CEOs and oversight executives should have more sensitivity of pay to performance. Barron and Waddell (2003) provide a complementary explanation for this finding. They rank executives by compensation and find that higher-paid executives receive more equity-based incentives. They argue that this is because it is more costly to the firm for a higher ranking executive to make mistakes in project evaluation.

The rise in pay-performance sensitivities from options corresponds to a large rise in the stock market as a whole. Rising stock prices will increase the PPS of existing grants of stock options because the options' deltas increase as options move further into the money. This effect is not driving the full increase in PPSs from stock options.

3.2. *How should incentives be set?*

Now that we have some sense of the magnitudes involved, how should incentives be set? The answer usually offered by academics is simple to state but fairly hard to implement. Incentives generally ought to be set to maximize the value of the equity held by the shareholders. Berle and Means (1932) noted that the separation of ownership and control in modern corporations creates an agency problem. Since most managers (executives) do not own all or even a substantial fraction of the equity of the firm, they will be more inclined to take actions that are in their own interests rather than in the shareholders' interests. On the other hand, managers are often fairly indispensable, so that eliminating them is not really feasible.

Jensen and Meckling (1976) later gave the agency problem more formal structure. Suppose that there is a single manager—the CEO. At the margin, suppose the manager can take an action that generates an additional dollar for the firm but that costs the manager (almost) a dollar to generate it. If the manager does not get the full dollar generated for the firm because she does not own all of the equity, then she will not take the action in the first place. As the manager's equity ownership decreases, this problem becomes increasingly acute. More and more value-enhancing actions are foregone by the manager. In addition, more and more value-decreasing actions are taken that benefit the manager at the expense of the shareholders.

Examples of this type of behavior include managers choosing not to work hard (shirking), managers choosing to invest too much (overinvestment or empire-building), managers investing too little (underinvestment), managers inefficiently diversifying the firm, managers overspending on corporate headquarters, corporate jets, and other forms of perquisites. Perhaps the best known anecdote describing this behavior is from the takeover of RJR Nabisco. The stories of managers at RJR Nabisco squandering shareholders' cash on corporate jet rides for dogs and celebrity golf tournaments are quite powerful; see Burrough and Helyar's (1990, p. 95). colorful description. This argument

has been tremendously influential in the corporate finance and corporate governance literatures.

Jensen (1986, 1993) focuses specifically on situations in which managers choose to overinvest. Jensen (1986) examines overinvestment in the oil and gas industry. He notes that long after oil prices had collapsed in the mid-1980s, oil and gas companies continued to explore and drill for oil. Shareholders would have been better off if development had ceased. Jensen (1993) focuses on value destruction at some of the world's largest corporations. In many cases, shareholders would have been better off if management had not invested in the business and instead, simply distributed the cash flow to the shareholders. In both cases, the inefficiency can be attributed to the fact that the manager does not own all of the equity in the firm.

So why is it that the manager does not own all of the equity in the firm? Generally, having the manager own all of the equity exposes her to too much risk (Mirrlees, 1999; Holmstrom, 1979). As a measure of firm performance, equity returns are subject to random fluctuations that are outside of the manager's control. If the manager is averse to risk, then full ownership of the equity is inefficient. Instead, the manager should share the risk by selling equity to other investors.

If these investors could count on the manager to take the optimal actions that maximize the value of the equity, then the manager should bear no risk and sell all of the equity to investors. In this situation, the manager should be given a fixed wage. Similarly, if investors can perfectly observe what the manager is doing, then there is no reason for the manager to hold equity. Instead, if the manager does not do what the shareholders say she should do, she can be fired.

Of course, as Berle and Means (1932) and Jensen and Meckling (1976) point out, managers are self-interested, and the actions they want to take may substantially differ from the actions shareholders want managers to take. In addition, rarely can shareholders perfectly observe the actions taken by managers (moral hazard). Even if the actions are observable, shareholders may not know enough to judge whether the action taken is the right one. This is especially true in a world in which there are many dispersed shareholders, few of whom own enough shares in any given company to make it worth their while to carefully monitor management (Grossman and Hart, 1980). As a result, management does have to be given incentives to take the right actions.

This trade-off between inducing the manager to take the right actions while not exposing her to too much risk governs how large incentives can be. The implication of this trade-off is that, in general, it will not be optimal for the manager either to have no equity stake or a full 100% equity stake in the firm. The size of incentives (the manager's equity stake or PPS) will be determined by how risk averse the manager is, how volatile the firm's stock is, and how much the manager dislikes taking actions that increase firm value or how much the manager likes actions that decrease firm value. Under a number of assumptions, Holmstrom and Milgrom (1987) derive the pay-performance sensitivity as

$$\alpha^* = \frac{1}{1 + rk\sigma^2}$$

where r is the coefficient of absolute risk aversion of the agent, k is the curvature of the agent's disutility of effort function, and σ^2 is the variance of the performance measure (frequently, stock price performance).

Jensen and Murphy (1990) present what is still perhaps the best-known estimate of the pay-performance sensitivity for CEOs. They carefully aggregate the pay-performance incentives from a variety of sources into a single PPS. They find that the typical CEO receives approximately \$3.25 of compensation per thousand-dollar increase in shareholder wealth. Of this amount, \$2.50 is due to the median CEO's holdings of stock in the firm, and \$0.15 is due to ownership of stock options. Increases in the present value of current and future compensation and decreases in the probability of dismissal are responsible for \$0.30 each.

Hall and Liebman (1998) show that incentives from stock and particularly stock options have grown substantially since the sample period used by Jensen and Murphy (1990). They calculate that the median CEO has a pay-performance sensitivity of \$5.29 per thousand-dollar increase in shareholder wealth. These estimates are dramatically lower than what is implied by 100% equity ownership—an increase in the manager's wealth of \$1000 when firm value increases by \$1000.

Jensen and Murphy (1990) argue that political forces and concerns with fairness make it quite difficult for managers to have pay that is strongly linked to performance. The implication is that these noneconomic forces cause firms to provide suboptimal incentives to managers. While Hall and Liebman (1998) conclude that pay-performance sensitivities of \$5.29 per thousand-dollar increase in shareholder wealth can lead to large swings in the dollar value of executive stock and option holdings, they do not conclude anything about the optimality of the incentives provided to managers.

Several papers have recognized that full incentives (100% equity ownership) will in general not be optimal for managers. Garen (1994) and Haubrich (1994) both recognize that a manager's risk aversion will put limits on the incentives that can be provided to him. Haubrich (1994) shows that for sufficiently risk-averse executives, Jensen and Murphy's (1990) PPS estimate of \$3.25 per thousand-dollar increase in shareholder wealth can be fully rationalized. Garen (1994) tries to show that the variance of firm returns (the riskiness of stock returns) explains the variation in incentives across CEOs, although his results are not always significant.

Aggarwal and Samwick (1999a) provide evidence that the variance of stock returns explains the variation in incentives across CEOs. They find a strong negative association between pay-performance sensitivities and the variance of dollar stock returns. They point out that earlier estimates of PPS are biased toward zero because they do not take into account the riskiness of firm returns when calculating PPSs. Risk-sharing considerations, they state, do explain why managers do not receive full incentives. Jin (2002) and Garvey and Milbourn (2003) extend this result to show that it is primarily the idiosyncratic component of stock return volatility that is responsible for the negative association between PPSs and the variance of stock returns. These results support one prediction of the Holmstrom and Milgrom (1987) optimal contracting model—that risk-averse agents have incentives that are decreasing in the variance of performance measures.

3.3. *Executive discretion*

Prendergast (2002) states that the contracting environment has an important influence on incentives. The simplified principal-agent model discussed earlier assumes that risk is in the form of adding noise to executive inputs, thereby making inference more difficult. However, in many settings, what matters is not how hard the executive works, but what task the executive chooses to work. Prendergast argues that in highly uncertain environments, the task decision matters more, and in uncertain environments, the principal is more likely to delegate the task decision (discretion) to the agent. Because of the uncertainty of the environment, the principal cannot monitor inputs and so offers the agent an output-based (high-powered or incentive) contract.

This model has two key implications. The first is that there is a positive relation between environments characterized by task uncertainty and incentives. In the executive compensation literature, the evidence does not generally support this implication (for entrepreneurs, see, e.g., Aggarwal and Samwick, 1999a; Jin, 2002; Garvey and Milbourn, 2003; and Bitler, Moskowitz, and Vissing-Jorgensen, 2005). The second implication is that there is a positive relation between the use of incentives and the delegation of authority. Nagar (2002) finds empirical support for this implication from the banking industry. He finds that there is greater delegation of authority to bank branch managers for high-growth, volatile, and innovative banks. These bank branch managers also receive more incentive-based pay.

3.4. *Firm size*

A number of other important points have been made in trying to understand the determinants of incentives. The preceding discussion about the merits of using full incentives proceeded with a very solid foundation in theory. But perhaps the most robust conclusion about compensation and incentives is that managers at larger firms generally receive higher compensation in dollar values and have lower ownership in their firms. This finding has been confirmed in papers by Schaefer (1998) and Himmelberg and Hubbard (2000).

Himmelberg and Hubbard observe that it requires more talent to run a large firm than it takes to run a small firm, so managers at large firms are better compensated. Baker and Hall (2004) maintain that CEO marginal products increase dramatically with firm size and that this can explain both the increase in CEO pay as firm size increases and the decrease in incentives. More recently, Gabaix and Landier (2008) show that small differences in CEO productivity or talent can generate dramatic differences in CEO pay by firm size. Section 6 covers this argument in greater detail.

3.5. *Accounting returns*

Another important issue concerns the use of performance measures other than stock returns. While stock returns are clearly of paramount importance to stockholders, stock

returns may not be the best way to provide incentives to managers. To see this, suppose that there exists some other performance measure for managers (say, accounting returns). If accounting returns do a better job of measuring managers' actions (regardless of the outcomes), accounting returns will be a better performance measure than stock returns. The reason for this is that outcomes are influenced by noise or external factors that are beyond the manager's control. The manager should neither be penalized nor rewarded for factors beyond her control. In principle, then, the ideal way to compensate the manager is based on the actions she takes. However, as noted earlier, the moral hazard problem states that shareholders do not directly observe managers' actions. As a result, compensation and incentives have to be based on observable measures, which are frequently outcome-based. If accounting returns, which are outcome-based, do a better job of measuring the actions taken by managers than do stock returns, then accounting returns should be the basis of compensation contracts.

The evidence on the usefulness of accounting returns in understanding incentives is mixed (see Lambert and Larcker, 1987; Janakiraman, Lambert, and Larcker, 1992; and Antle and Smith, 1986). Those papers find that accounting returns have more impact on salary and bonus than do stock returns. This is not surprising given that bonuses are usually tied to nonstock-based measures of firm performance. These papers also find conflicting evidence about the use of accounting measures in relative performance evaluation, which is discussed in greater detail in Section 4.

More generally, any measure that provides unique information about a manager's performance or actions should enter the compensation contract. These measures could be stock returns or accounting returns such as ROA or ROE, as we have already discussed. They could be measures such as divisional sales or profits for a divisional manager. They could be subjective measures such as a report from board members or other superiors for lower ranking executives. They could be other metrics such as EVA. While these measures are undoubtedly important, the evidence on their use and effectiveness is currently limited. Moreover, while accounting measures are important, how much compensation should be based on them is a matter of dispute. Given the possibility of earnings manipulation and gaming of accounting systems, accounting measures are likely to be of secondary importance to stock returns in designing incentive systems for top managers (see, e.g., Bergstresser and Philippon, 2006).

3.6. Ability

Milbourn (2003) argues that CEO ability is an important determinant of the heterogeneity in CEO incentives. In Milbourn's model, more able CEOs have better reputations (the market's assessment of their ability). Since more able CEOs are less likely to be fired, stock prices will be more informative about their efforts, and they will therefore have higher pay-performance sensitivities. Conversely, less able CEOs are more likely to be fired, and therefore stock prices will be less informative about their efforts (as a consequence of the fact that stock prices reflect the cash flows generated by the CEO

in place). As a result, less able CEOs will have lower PPSs. Using several different proxies for CEO reputation, Milbourn finds that CEOs with better reputations have higher PPSs.

Frydman (2005) observes that general skills have become more important in the CEO labor market over time relative to firm-specific skills. To the extent that general skills reflect ability that can be measured through both the presence of a general business education and greater occupational mobility, the rising importance of general skills can explain higher CEO pay and greater inequality in top executive pay.

Chang, Dasgupta, and Hilary (2007) present a very nice set of results that suggest ability matters. They show that announcement returns for a top manager's departure are negatively correlated with prior firm returns under that manager, suggesting that managers develop reputations for ability with financial markets. Managers whose departures are perceived to be bad news for the prior firm then go on to do well in subsequent labor market outcomes—they become CEOs at larger firms or earn high salaries in their new CEO positions. Those managers with high salaries at their prior firms (when corporate governance is good) also have good labor market outcomes, suggesting that ability is recognized in salaries. Finally, the loss of a good manager—as measured by negative announcement returns for a departure—is associated with subsequent poor accounting performance. Collectively, these results provide compelling evidence that ability is recognized, rewarded, and impounded into stock returns for top managers.

3.7. Incentives within firms

Interestingly, many companies provide incentives (often stock options) throughout the firm. In many cases, this seems hard to justify given that most employees will not have a first-order impact on firm returns. Oyer (2004) maintains that broad-based incentive pay can be optimal if an employee's future outside opportunities are positively correlated with firm performance. In states of the world in which the firm does well, incentive compensation will be triggered, eliminating the need for costly recontracting when the employee's reservation wage rises. Inderst and Mueller (2006) extend this retention argument by noting that using broad-based incentive pay can protect the employee against ex-post opportunistic behavior by management should the company no longer need the employee due to changes in the firm's strategy or business mix. This protection against ex-post opportunism induces employees to invest in firm-specific human capital.

Oyer and Schaefer (2004) examine three potential explanations for the existence of broad-based stock option plans for employees: incentive provision; sorting—using options to attract employees who are relatively optimistic about a firm's prospects; and employee retention by providing a compensation mechanism (stock options) that will be positively correlated with labor market conditions in the firm's industry to the extent that the firm's returns are positively correlated with industry returns. Oyer and Schaefer find that use of a broad-based stock option plan is associated with smaller firms, more rapidly growing

firms, less profitable firms, firms with higher stock returns, New Economy firms, and firms with greater stock return volatility. In calibration exercises, they argue that incentive provision seems unlikely to be the motive for broad-based stock option grants because the cost of compensating the employee for the additional risk of options simply dwarfs the cost of the additional effort generated by the employee. Similar calibrations provide more support for the sorting and retention explanations.

Another strand of the literature has looked at incentives for division managers. Cichello, Fee, Hadlock, and Sonti (2006), in examining the determinants of promotions and turnover for divisional managers, find that better divisional performance is associated with less turnover for divisional managers. Firm performance and performance by other divisions within the firm do not seem to matter, but performance by the division relative to its industry does seem to be important. For promotions, what matters is whether the manager's division outperforms the other division in absolute terms. These results are consistent with the use of tournament incentives (Lazear and Rosen, 1981) within the firm.

Kale, Reis, and Venkateswaran (2007) provide a more direct test for the presence and effectiveness of tournament incentives within firms. Tournament incentives are measured as the gap between the CEO's and the median executive's (non-CEO) pay. The paper finds that tournament incentives are associated with better firm performance, and this association is stronger when the CEO is close to retirement. Conversely, the association is weaker when there is a new CEO who is an outsider or when a succession plan is in place. The results are generally consistent with tournament incentives being both present and meaningful in influencing firm performance.

Wulf (2007) reports that for divisional managers who are also corporate officers pay is more sensitive to firm performance and that the relative weight on firm performance relative to divisional performance is greater than for division managers who are not corporate officers. In a similar vein, Aggarwal and Samwick (2003b) note that for divisional managers, pay-divisional performance sensitivities are positive and increasing in the precision of the divisional performance measure and that the pay-firm performance sensitivity is decreasing in the precision of the divisional performance measure. These papers are consistent with a multisignal principal-agent model in which both divisional and firm performance are informative about an executive's actions.

4. Relative performance evaluation

One additional measure that has received extensive attention is the use of industry or market performance as a benchmark for how well a manager has performed, or relative performance evaluation (RPE). In industries where all firms face common external shocks, executive compensation should be inversely related to competitors' performance. This way, an executive is paid when he outperforms his peers, but not when the entire industry happens to be in an upswing. In other words, the optimal compensation of executives is generally believed to rise with a firm's own performance and to decline with

that of competitors. While the logic of relative performance evaluation is clear, there is very little evidence supporting its existence and some evidence suggesting that it is counterproductive.

The most important question with respect to relative performance evaluation is what is the appropriate benchmark to use? There are at least two plausible answers to this question—aggregate stock market returns and industry returns. Both have advantages and disadvantages.

4.1. RPE using industry returns

Measuring firm performance relative to industry returns is appealing for a number of reasons. Industry competitors are most likely to face similar conditions and experience common shocks to performance. By comparing a firm's performance to the performances of its industry peers, common industry shocks can be removed while still maintaining a strong baseline of comparability. Interestingly, in their study of relative performance evaluation, Gibbons and Murphy (1990) do not find evidence of the use of relative performance evaluation at the industry level. They find more evidence of the use of relative performance evaluation at the level of the stock market as a whole.

What can explain this finding? Aggarwal and Samwick (1999b) contend that firms in the same industry not only experience common shocks to performance and similar business conditions, but they also directly compete with each other. Relative performance evaluation compensates a manager not only for how well she performs, but also for how badly the benchmark performs. In this case, the industry is the benchmark, and the manager does have some control over how badly the industry performs. For example, the manager can initiate a price war, which will worsen the performance of all the firms in the industry. But this is good news for the manager, since his compensation increases when the industry does worse. For this reason, relative performance evaluation is problematic at the level of the industry. Section 5.2.1 discusses this argument in greater detail.

4.2. RPE using market returns

Measuring firm performance relative to market performance is appealing in that the manager is not rewarded for a generally rising stock market. Clearly, with the large run-up in stock indices from 1994 to 2000, many firms and managers have benefited from marketwide movements in stock prices. Furthermore, managers are unlikely to be able to influence the performance of the market as a whole, so the benchmark is relatively secure from tampering. There are still some problems, however, with using the stock market as a whole for the benchmark.

First, to the extent that firms use relative performance evaluation, they tend to simply net out aggregate market returns. Jin (2002) and Garvey and Milbourn (2003) find that pay-performance sensitivities are not influenced by systematic risk and are decreasing

in idiosyncratic risk. Those papers point out that this is consistent either with firms using relative performance evaluation or with executives hedging out the market risk exposure of their compensation packages.

There are other problems associated with the use of relative performance evaluation more generally. For example, to truly use relative performance evaluation, a firm needs to benchmark the most significant sources of a manager's incentives. Let's suppose that the benchmark is aggregate stock market returns. The most significant sources of incentives are holdings of stock and options. Suppose that the firm's stock returns are lower than the aggregate market return. Then under relative performance evaluation, the manager should be required to pay the firm "negative" compensation in proportion to the amount of stock and options she holds. Given that the median CEO holds stock with a dollar value of \$5.8 million (from Fig. 2), a 20% underperformance relative to the market would require a transfer from the CEO to the firm of \$1.16 million. In a number of circumstances, CEOs would simply choose to quit rather than make the payment or see their base compensation cut.

One area in which the use of relative performance evaluation would seem to be quite sensible is in stock option grants. Specifically, it seems quite reasonable to suppose that the exercise prices of stock options would be indexed to increase or decrease with marketwide changes in stock prices. We do not, however, see this very often. Hall and Murphy (2002) argue that exercise prices are not indexed or set out of the money because managers hold large, undiversified positions in their own firms. As a result, they value stock option grants at a lower level than would an outside investor. Giving executives indexed options or options that are out of the money would simply make this problem worse.

5. Do incentives influence firm performance?

With some understanding of the determinants of incentives in hand, let us turn to the question of whether incentives influence firm performance. If incentives are to matter, they must have a significant impact on firm value. Interestingly, the basic question of whether greater incentives improve firm performance has been quite controversial. It is important to note that some simple agency models predict that greater incentives improve firm performance (e.g., Holmstrom and Milgrom, 1987) but others do not. The evidence on this point is also somewhat disjointed.

5.1. Some evidence

Morck, Shleifer, and Vishny (1988) present a well-known result in which greater use of incentives does not improve firm performance. They define incentives as the amount of stock managers' hold in their firms, and they find that firm performance is increasing in managerial ownership for ownership between 0 and 5% of the total equity in the firm. However, they report that firm performance is decreasing in managerial ownership

between ownership of 5 and 25%. They then show that firm performance is once again increasing for managerial ownership greater than 25%.

Morck et al. argue that for low levels of ownership (between 0 and 5%), incentives work and greater incentives lead to better firm performance. For intermediate levels of ownership (between 5 and 25%), incentives cease to function. Instead, greater ownership entrenches managers in the sense that they are hard to dismiss when they own a substantial fraction of the equity in the firm. As a result, managers take actions that benefit themselves while decreasing the value of the firm in this intermediate range of ownership. Managers are willing to forgo some firm value, even though this reduces the value of their own equity stakes, because outside shareholders still bear the majority of the value reduction while the managers get all of the benefits. For high levels of ownership (greater than 25%), incentives function once again. Managers own a sufficiently large fraction of the equity that they are no longer willing to take actions that reduce the value of the firm. Greater incentives again lead to better firm performance, although in this region of ownership the relationship is weaker.

One interpretation of these findings is that the full incentives advocated by Jensen and Meckling (1976) and Jensen and Murphy (1990) may not be necessary. Incentives that are sufficiently high (greater than 25% ownership) will have the same effect. An interesting implication of Morck, Shleifer, and Vishny's (1988) findings is that greater incentives are not always better—in the 5 to 25% ownership range, greater incentives are worse.

While this result has important implications for the amount of equity managers should hold in their firms, this result has not gone unchallenged. Himmelberg, Hubbard, and Palia (1999) make the point that we do not know if greater incentives lead to better performance or if firms that perform better happen to give their managers more stock. They much more carefully control for firm-specific factors when estimating the relationship between firm performance and incentives. They find that there is essentially no relationship between incentives and firm performance. One implication of their study is that incentives do not seem to matter much for firm performance.

Aggarwal and Samwick (2006) also examine the relation between firm performance and incentives. Their study looks at many more firms over more years than the Morck, Shleifer, and Vishny (1988) and Himmelberg, Hubbard, and Palia (1999) studies. Their study also incorporates holdings of stock options in addition to ownership of stock, and they find that firm performance is increasing in incentives for all levels of incentives. Interestingly, the implication Aggarwal and Samwick draw from their results is *not* that greater incentives lead to better firm performance. Instead, they argue that every firm is different, and that the amount of incentives each firm provides to its managers is appropriate for that firm.

Aggarwal and Samwick (2006) also point out that the original Morck, Shleifer, and Vishny (1988) paper is based on the disequilibrium idea that many managers have been provided with the wrong level of incentives. To see this, remember that Morck et al. find that firm performance is decreasing in incentives for managerial ownership between 5 and 25%. Firms with managerial ownership in this region could increase firm performance

by either lowering managerial ownership to 5% or increasing it past 25%. In practice, it may be easier to lower managerial ownership than to raise it by either having the firm issue equity (thereby diluting managers' ownership stakes) or inducing managers to sell some of their holdings of stock. For some reason, firms do not have managers lower their ownership levels when the firms are in the region of decreasing firm performance. The firms are behaving in what appears to be a value-decreasing fashion.

Aggarwal and Samwick (2006) propose that firms are not, in fact, behaving in a value-decreasing fashion. Instead, firms and managers have very different characteristics that determine how large the level of incentives should be. Managers differ in how risk averse they are, how hard they are willing to work, and how much pleasure they derive from wasteful spending on perquisites such as corporate jets, artwork, celebrity golf tournaments, and expensive corporate staffs. Firms differ in how risky they are, how productive their assets are, and how talented their workers are. All of these differences can influence the level of incentives. Aggarwal and Samwick conclude that firms with "better" characteristics (e.g., less risk-averse managers) have greater incentives and better performance. A firm with worse characteristics (e.g., very risk-averse managers) cannot increase incentives and demonstrate better performance. Increasing incentives would actually result in a worse outcome for shareholders. On average, firms seem to get the level of incentives about right. The conclusion is that incentives do influence firm performance, but the design of incentives relies crucially on firm characteristics.

A different strand of the literature examines whether greater use of incentive compensation can lead to poor firm performance. In effect, can incentives be too high-powered? Recent notable bankruptcies such as Global Crossing, Qwest, WorldCom, and Enron, along with the collapse in share prices since 2000, suggest this possibility. Specifically, the large stock option grants realized by the management teams at the aforementioned firms prior to the bankruptcies raises the question of whether stock-based incentives actually create perverse incentives.

Do stock option grants and other forms of incentive compensation lead to a focus on short-term results, manipulation of accounting statements, tax avoidance, and outright fraud, rather than aligning managers' interests with those of shareholders? Recent papers by Bergstresser and Philippon (2006) and Peng and Roell (2008) provide evidence suggesting that this may be the case. Bergstresser and Philippon (2006) find that there is more earnings manipulation (use of discretionary accruals) at firms with managers who have greater pay-performance sensitivities. Peng and Roell (2008) show that this option-induced earnings manipulation is associated with greater shareholder litigation.

In cases of very large stock option grants (such as those realized by the management teams of Global Crossing, Qwest, and WorldCom), the grants themselves may be symptomatic of deeper problems involving a culture of corporate greed, malfeasance, and failure of corporate governance. Look again at Figure 3, which lists the 20 most highly paid CEOs in 1999, plus Kenneth Lay and Jeffrey Skilling from Enron. One striking feature of this list is that the three highest paid CEOs, Annunziata, Nacchio, and Kozlowski, are from companies that are either bankrupt (Global Crossing and Qwest) or notorious

for high-level corporate greed (Tyco). Furthermore, Carleton Fiorina (Hewlett-Packard) was fired after a disastrous merger with Compaq. William McGuire (UnitedHealth) was forced to resign in an options backdating scandal. Bernard Ebbers from WorldCom (bankrupt) also makes the list, and Lay and Skilling from Enron (defunct) are not far behind.

All of these executives received large stock option grants in 1999; in most cases, stock option grants were virtually their entire compensation. Several years after the grants, their companies or the executives themselves were in trouble or bankrupt. The following interesting question arises: are these cases pathological, or do they point to larger problems with the use of stock options? To the extent that extremely disproportionate grants are correlated with deeper firm-level problems, then the existence of such grants can usefully serve as an early warning sign for investors, employees, regulators, and others about impending corporate crises and collapses.

The cases of Enron, WorldCom, and others seem to be characterized by entrenched managers, weak boards, generally poor corporate governance, and cultures of corporate greed. Incentive systems failed at these firms. Instead of using stock options as an incentive device, it now seems clear that these firms used stock options as a tool for management enrichment. These examples are good illustrations of the argument that boards of directors (and, by extension, compensation committees) are either stacked with friends and cronies of the CEO or have been effectively captured by the CEO (Bertrand and Mullainathan, 2001). We return to this argument in Section 6.

The use of stock-based incentives, specifically stock options, is neither inherently good nor bad (see also Holmstrom and Kaplan, 2003). In general, the use of stock options is associated with better firm performance, suggesting that companies use options appropriately. However, in cases of very large option grants that seem disproportionate such as those detailed in Figure 3, executive compensation may be symptomatic of deeper problems within the firm. Corporate governance may well have failed at these firms, and executives may only be constrained by what they can get away with. Thus the current set of corporate crises is not caused by excessive compensation, but excessive compensation may well be a leading symptom of impending collapse.

5.2. What actions are incentives designed to influence?

Given that incentives influence firm performance, it is natural to wonder about the mechanism through which this happens. Clearly, increasing incentives does not directly improve firm performance. Instead, incentives influence something that managers do, which then impacts firm value. What do managers do that is influenced by incentives? The early literature (e.g., Holmstrom, 1979) focused on inducing managers to work hard. Managers disliked working and had to be provided with incentives to do so. While this idea is conceptually appealing, it is not obviously true.

Specifically, can effort provision really be the basis for why managers get incentives? Holmstrom (1992) argues that this is probably not the case. It seems unlikely that incentives are structured to induce managers to work harder. Most top managers are already workaholics, which is perhaps an extreme version of intrinsic motivation. Furthermore, at the margin, it seems unlikely that at very high compensation levels managers would choose to work more. Instead, it seems likely that they would substitute more leisure time when offered higher compensation. If incentives do not influence how hard managers choose to work, what actions do incentives influence?

Several issues need to be considered here. First, managers take actions along many dimensions. They set the strategic direction for the firm, they make investment decisions, they decide to enter or exit different lines of business, they choose how hard to compete within a particular market, they determine how to allocate resources within the firm, they make production decisions, and so on. In short, managers can take many different actions, all of which have a large impact on firm performance. At the same time, for all of these actions, managers' preferences as to which action to take may not coincide with those of the shareholders.

In principle, the shareholders could monitor the actions being taken by the managers and insist that managers take the shareholders' preferred actions. In practice, this will be very difficult to achieve. Instead, shareholders look for a convenient summary measure of all of the actions taken by managers. This summary measure is the firm's stock price. Because compensation tied to the firm's stock performance is designed to influence many actions, it will not necessarily be straightforward to see much impact of incentives on any given type of decision. Nevertheless, a number of papers have examined specific types of decisions to determine whether incentives have any effect. Here we focus on four types of decisions that have been examined in the literature: the setting of prices in product markets; the choice of investment levels; the decision to diversify the firm into new lines of business; and the decision to engage in mergers and acquisitions.

5.2.1. *Incentives and pricing policy*

Pricing policy is an important decision for any firm, and it will have a large impact on firm value. Do incentives influence how managers set prices in product markets? Aggarwal and Samwick (1999b) find evidence for this influence in the United States, and Joh (1999) finds evidence of it in Japan. The argument is that shareholders are better off by providing incentives to managers to soften price competition. In effect, incentives can be used to foster tacit collusion within industries.

To see how this works, suppose that firms compensate managers not only for how well the firm but also the industry as a whole performs. Now the manager has incentives to improve not only his own firm's performance, but also that of the industry as well. In such a setting, the manager gets nothing from starting a price war, as both components of his compensation are reduced. Both the industry's and his own firm's performances are worsened. This idea is in stark contrast to what models of relative performance evaluation predict. Relative performance evaluation would compensate a manager if

industry performance were to be reduced. Trying to foster collusion can explain why we do not observe relative performance evaluation at the industry level.

Aggarwal and Samwick (1999b) observe that compensation depends positively on both firm performance and industry performance. This clearly suggests that there is no relative performance evaluation. This general finding is confirmed in Himmelberg and Hubbard (2000), and is also found for Japanese firms in Joh (1999). For firms in more competitive industries, the researchers report that how the industry performs is given relatively more weight than how the firm performs. In more competitive industries, the value of collusion is highest but also the hardest to enforce. There is no dominant competitor to enforce discipline, and there are many potential competitors who could cheat on the collusive outcome. In order to induce collusion, firms give managers relatively more incentives based on industry performance than on firm performance.

By contrast, in industries that are not very competitive, firms give managers relatively more incentives based on firm performance than on industry performance. In industries that are not competitive, there is relatively little to gain from fostering collusion. Firms do not compete directly, and so managers are unlikely to find it worthwhile to start a price war in the first place. As a result, little weight need be placed on industry performance.

Aggarwal and Samwick also offer an explanation for why incentives are not necessarily very large. It is not the absolute level of incentives that induces executives to choose the right pricing decisions and avoid price wars. Rather, executives are swayed by the ratio of the weight put on firm performance relative to the weight put on industry performance. In less competitive industries, this ratio will be higher—more weight is put on how the firm performs. In more competitive industries, this ratio should be lower—more weight is placed on how the industry performs. But since what matters is the ratio, the absolute level of incentives based on either firm or industry performance can be low.

The implications of this result for the design of compensation schemes are interesting. Shareholders need to pay attention to the structure of the industry when writing compensation contracts with managers. Attempts to use relative performance evaluation in competitive industries are likely to be counterproductive. Instead, managers should be rewarded for both good firm performance and good industry performance. By contrast, if a firm is in a monopoly position or in a weakly competitive industry, then industry performance is relatively unimportant and should not enter the compensation scheme.

5.2.2. Incentives and investment decisions

Another important decision made by managers is how much the firm invests from year to year. Investment decisions not only influence current but also future firm performance. Two issues are important with respect to investment and incentives: (1) Do incentives influence investment decisions? (2) If incentives influence investment decisions, how do they influence those decisions?

Aggarwal and Samwick (2006) maintain that incentives are needed to induce managers to invest more. In contrast, Jensen (1986, 1993) quite persuasively argues that managers

overinvest because they derive some benefit from doing so, such as empire-building (i.e., managers enjoy controlling more assets and running a larger firm for reasons of prestige; they believe that they will be paid more if they run a larger firm or that their ability to run an even larger firm in the future depends on the size of the firm they run currently). For these reasons, managers may choose to overinvest. Jensen (1986, 1993) contends that shareholders need to curtail overinvestment through the use of debt, dividends, or takeovers. Aggarwal and Samwick (2006) claim that incentives can be used to curtail overinvestment as well, but they find no evidence that incentives are, in fact, used to curtail overinvestment.

Instead, it appears that managers prefer to invest less and for several potential reasons. Investing requires that the manager oversee the investment. When firms expand existing facilities or start new product lines, managers are required to do more work or to spread their talents over a wider array of activities. As a result, managers will generally prefer not to invest more or, in other words, they will underinvest in the sense that they will forgo some positive net present value investment opportunities. Incentives are used to induce managers to invest more than they otherwise would. This result is consistent with the findings of Bertrand and Mullainathan (2003); they show that when managers are insulated from takeover pressure, they tend to let workers' wages rise, slow the closing of old plants, and open fewer new plants. Bertran and Mullainathan view these managers as preferring the quiet life.

The conclusion that incentives are used to induce managers to invest more does not imply that all managers should be given more incentives. Instead, incentives are set according to managers' specific characteristics. Managers who are less averse to risk can be given more incentives and will invest more as a result when compared to managers who are more averse to risk. Managers who are less risk averse will, as a consequence, run better performing firms. These findings stress the importance of choosing the right managers to begin with—those who are not averse to investing in the first place.

5.2.3. *Incentives and diversification decisions*

Perhaps an even more important managerial decision is to enter an entirely new line of business. Do incentives influence whether managers choose to diversify their firms? Substantial evidence is now available that diversification into new lines of business reduces firm value (Lang and Stulz, 1994; Berger and Ofek, 1995). There is also evidence that managers with greater incentives in the form of stock ownership choose to diversify less (Denis, Denis, and Sarin, 1997). These two pieces of evidence suggest that diversification is an agency problem along the lines of Berle and Means (1932) and Jensen and Meckling (1976), and that shareholders provide managers with incentives to prevent them from diversifying.

If diversification is harmful to firm value, however, shareholders should provide managers with enough incentives so that managers do not diversify at all. Yet this does not happen given the large number of diversified firms that we observe. Clearly, providing

managers with even more incentives is costly, but the agency problem argument above does not recognize the existence of those costs.

Aggarwal and Samwick (2003a) examine this question and explicitly consider the possibility that the actions that incentives are designed to influence can be multidimensional. They argue that incentives are designed both to induce managers to take positive actions such as working hard or investing more and to prevent managers from taking negative actions such as diversifying the firm. These authors show how these competing concerns influence the shape of the incentive scheme.

In general, managers who have a stronger preference for diversification will need to be given more incentives. And even though these managers have more incentives, they still diversify more than do managers with less of a preference for diversification (and hence less incentives). The reason for this is that incentives cannot fully offset the preference for diversification. Providing incentives is costly—shareholders give up some of their own returns in exchange for forcing the manager to bear more risk and more of the cost of the preference for diversification. As a result, managers with a stronger preference for diversification will have greater incentives, run firms that are more diversified, and show worse firm performance than will managers with a weaker preference for diversification.

5.2.4. *Incentives and acquisitions*

Another important decision managers face is whether to engage in a merger or an acquisition. Do incentives induce managers to undertake value-enhancing acquisitions? Here we consider incentives for both target CEOs and acquiring CEOs.

We start by looking at target CEOs. Hartzell, Ofek, and Yermack (2004) show that CEOs of target firms frequently do quite well as a result of the acquisition. While turnover at the time of and subsequent to the merger is quite high for target firm CEOs, they are usually quite well compensated as a result of change in control agreements. Hartzell et al. also show that when target CEOs receive extra compensation in a merger, target shareholders tend to receive lower acquisition premia. Wulf (2004) finds that in mergers of equals, target CEOs are willing to trade merger premia for greater control rights in the merged company. These results suggest that at least some acquisitions have characteristics consistent with rent extraction by the target CEO rather than shareholder value maximization.

For acquiring firm CEOs, the evidence is somewhat mixed. Datta, Iskandar-Datta, and Raman (2001) show a positive relation between equity incentives and merger performance, and Lehn and Zhao (2006) suggest that acquiring firm CEOs are more likely to be replaced after a poor acquisition. On the other hand, Harford and Li (2007) show that CEOs of acquiring firms are rewarded if the acquisition is not wealth destroying but are not penalized if the acquisition is wealth-destroying. In particular, new grants of stock and options offset the effects of poor stock price performance. This result is similar in spirit to Garvey and Milbourn's (2006) asymmetric benchmarking result. The Harford and Li (2007) result is also in contrast to more general forms of investment such as capital expenditures, where CEOs benefit if the investment is wealth-creating and

are penalized if it is wealth destroying. Consistent with the idea that acquisitions either insulate managers or are a form of rent extraction for acquiring CEOs, Grinstein and Hribar (2004) find that more powerful acquiring CEOs are able to extract larger M&A bonuses from their boards.

This section has considered several actions that managers can take to influence firm performance. Another mechanism through which incentives might work is capital structure decisions. Although some progress has been made in this area (see, e.g., Chang, 1993, and Qiu, 2006), we do not yet have a fully satisfactory theory supported by evidence. This remains an important area for continuing research. Importantly, however, we have been able to establish some of the other mechanisms through which incentives work. In doing so, we also have been able to determine the types of considerations that should influence the design of incentives. In looking at some of the actions that incentives are designed to influence, we have taken it for granted that some representative of the firm or the shareholders sets incentives. We now examine more carefully who actually sets incentives and executive pay.

6. Alternatives to the agency view

In general, compensation is determined by a compensation committee. The compensation committee is a subset of the board of directors that often includes outside directors and sometimes the CEO as well. A popular view in the press and now in the literature is that CEOs effectively set their own pay. The argument is that boards of directors (and, by extension, compensation committees) are either stacked with friends and cronies of the CEO or have been effectively captured by the CEO. When the CEO sits on the compensation committee, this view certainly seems quite plausible. In this view, compensation is divorced from firm performance. Instead, CEOs are able to skim firm profits and are constrained only by what they think they can get away with.

Gillan, Hartzell, and Parrino (2006) document several interesting facts that may shed light on possibilities for rent extraction, as well as the nature of contracting with top executives. They find that fewer than half of the CEOs in the S&P 500 have an explicit contract or employment agreement. In cases where CEOs do have an explicit contract, it appears that the contract is designed to protect the CEO from expropriation by the firm rather than to foster rent extraction by the CEO. This also leaves open the possibility that rent extraction by CEOs occurs when implicit contracts are in place—less formal agreement *ex ante* may foster or be a prerequisite for informal collusion *ex post*. In this section, we consider the skimming view as well as several other alternatives to the agency view.

6.1. *The skimming view and rent extraction*

Bertrand and Mullainathan (2001) suggest an interesting approach to see if skimming is a valid argument. They argue that if managers are able to skim firm profits, they will be

rewarded for “lucky” events that reflect nothing about the manager’s efforts or talent. We already know that the effects of common stocks are not removed through the use of relative performance evaluation. Bertrand and Mullainathan (2001) look at specific stocks in certain industries. For example, they examine exchange rate movements and changes in the price of oil. They argue that it is unlikely that managers have much influence over these stocks, so these are truly lucky or unlucky events for the manager. For the oil price example, they find that managers at oil companies often see their pay fluctuate with oil prices. When oil prices are up, compensation goes up, and when oil prices are down, compensation goes down. This suggests that CEOs are being rewarded and penalized for random events. However, Bertrand and Mullainathan also find that in a reasonable number of cases, CEOs are shielded from the consequences of random but downward movements in oil prices—oil prices decrease but compensation does not. This suggests that managers are rewarded for good luck but not always penalized for bad luck (see also Garvey and Milbourn, 2006).

Bertrand and Mullainathan (2001) draw several conclusions. First, they argue that in poorly governed firms, managers essentially set their own pay and are able to skim firm profits in the form of pay for luck. Second, skimming is less prevalent in firms that are well governed. Well-governed firms are those in which the board of directors and compensation committees are independent of the CEO. Third, there is evidence that managers are not overpaid in firms that are well governed in the sense that stock options are substitute compensation for other forms of compensation. By contrast, in firms that are not well governed, stock options seem to be strictly additional compensation. These findings suggest that board independence is an important check on CEO compensation.

6.2. Pay without performance and stealth compensation

Bebchuk and Fried (2004) state that managerial power explains the rise in executive compensation. In their view, boards are controlled by CEOs, and so there is no arms-length bargaining or efficient contracting between boards and top executives. Instead, CEOs dictate the pay-setting process. As a result, CEO compensation is often independent of firm performance. In particular, the more powerful the CEO, the less sensitive CEO pay is to firm performance. They further argue that the only limits to CEO rent extraction come from outrage costs. Compensation that is too high will draw scrutiny and criticism from the media, shareholders, and other activists.

Bebchuk and Fried extend this argument by showing that many forms of compensation are hidden from the view of shareholders by effectively skirting SEC disclosure requirements. As an example, retirement benefits are not disclosed at the time that they are paid because the executive is no longer with the company. Historically, companies did not disclose the present value of supplemental executive pensions; instead, they estimated the annual payment based on number of years of service. As a result, an executive’s pension could be quite large in relation to their actual compensation while serving. The case

of Richard Grasso, the former CEO of the NYSE, whose pension rose to \$140 million in value, is instructive in this regard.

There are numerous other examples as well. Yermack (1997) presents evidence that stock returns are abnormally high after stock option grants. Lie (2005) and Heron and Lie (2007) also present evidence that stock returns are abnormally low prior to stock option grants. Furthermore, the frequency with which stock option grants occur when stock prices are at their lowest within some interval (usually a quarter) is strikingly anomalous. Lie (2005) argues that this result is strongly suggestive of stock option backdating, in which executives choose grant dates after the fact. Subsequent confirmed examples of backdating at companies such as United Health have borne this hypothesis out. Because backdating implies an immediate transfer to the executive from the shareholders, it is perhaps the clearest example of stealth compensation. It appears that often only the executive and the board or some members of the compensation committee are even aware of it.

Stock option backdating can be viewed as the most compelling evidence for widespread rent extraction by top executives. Stock option backdating can explain, for example, the Bertrand and Mullainathan (2001) and Garvey and Milbourn (2006) results that executives are not penalized for poor stock returns. Indeed, poor stock returns can become an opportunity for rent extraction. Lie and Heron (2007) show that the pattern of abnormal negative returns prior to stock option grants and abnormal positive returns after stock option grants largely disappears after 2002, when the SEC required that stock option grants be reported within two business days. This suggests that at least one channel for rent extraction has been shut down.

Kuhnen and Zwiebel (2007) model hidden or stealth compensation and show that it emerges naturally in a setting in which executives have discretion over their pay. They emphasize that if an executive takes too much stealth compensation, then the shareholders' assessment of the executive's ability will become more negative, increasing the likelihood of termination. As a result, the use of stealth compensation is more likely in environments with greater noise in either output or managerial ability.

6.3. *The shortage view*

An alternative interpretation of how CEO pay is established is that it is set in the managerial labor market. Himmelberg and Hubbard (2000) have noted the insufficient supply of talented top managers. As a result, those top managers with talent are able to command high wage premiums. One potential implication is that compensation is divorced from firm performance because firms must pay CEOs what they demand. Himmelberg and Hubbard argue that this is what explains the lack of relative performance evaluation and not the idea that CEOs skim as much profit as possible. They examine the possibility that the supply of talented CEOs is thin by arguing that the size of the firm a CEO manages is a good proxy for how talented the CEO is. More talented CEOs will work at larger firms where their talents are presumably better employed.

The authors then examine how the sensitivity of CEO pay to firm performance is influenced by macroeconomic shocks. The idea is that favorable macroeconomic shocks should increase the demand for talented CEOs without increasing the supply of talented CEOs (at least, in the short run). They find that macroeconomic shocks disproportionately increase the pay of CEOs for large firms.

Gabaix and Landier (2008) develop a competitive matching model that implies that the most talented CEOs will manage the largest firms. As firms increase in size, CEO pay will grow as well, as a reflection of CEO productivity. Calibrations of the model can explain both the increase in CEO pay in the United States and cross-country dispersion in CEO pay. Intriguingly, Gabaix and Landier contend that the increase in CEO pay over the period 1980–2003 can be explained by the increase in firms' market capitalizations. In addition, their calibrations suggest that small cross-sectional differences in CEO talent drive large differences in CEO pay. One concern with their paper is that they compare CEO pay (a flow variable) with firm market value (a stock variable). A more appropriate comparison might be between changes in CEO firm-specific wealth and changes in firm value. Because much of compensation occurs in the form of stock options, which have convex payoffs, the change in CEO firm-specific wealth might well be nonlinear in relation to changes in market capitalization.

Two competing ideas—that there is an insufficient supply of talented CEOs and that CEOs skim firm profits—make it clear that it is hard to disentangle how compensation is being set. Nonetheless, one feature that does stand out from the Bertrand and Mullainathan (2001), Himmelberg and Hubbard (2000), and Gabaix and Landier (2008) studies is that compensation does appear to be strongly linked to firm performance. Much of the literature also shows that compensation committees do not use relative performance evaluation when they set CEO compensation, presumably because CEOs do not wish to be evaluated on a relative basis. Is this because CEOs have a strong bargaining position or because they have co-opted the committee? As an illustration of this point, consider what happens when a CEO is separated from her firm.

6.4. The value of termination

In this section, we examine what happens when CEOs and other executives are terminated. In general, CEO dismissals are newsworthy events (e.g., Carleton Fiorina's termination at Hewlett-Packard). Furthermore, the stock market reaction to such dismissals is often quite positive (Hewlett-Packard's market capitalization was up \$4 billion upon Fiorina's termination). To address the causes and consequences of termination, researchers typically estimate models of the likelihood of CEO turnover as a function of different variables, including firm performance. The assumption is that most turnover represents firings unless there is evidence to the contrary, such as the manager reaching retirement age or becoming CEO elsewhere. Not surprisingly, poor performance is associated with a much higher likelihood of being terminated. Above-average performance is associated with promotions to CEO at other firms (Fee and Hadlock,

2003). Intriguingly, stock performance matters more than does accounting performance. A recent example of this is the termination of Robert Nardelli, former CEO of Home Depot, who generated consistent accounting performance but poor stock return performance.

In addition, performance relative to industry benchmarks seems to be important, suggesting a role for relative performance evaluation. Jenter and Kanaan (2006) show that CEOs are much more likely to be terminated after poor industry or market performance, even after controlling for firm-specific performance. This result seems to be at odds with relative performance evaluation, since arguably both industry and market performance are outside of the CEO's control. Going a step further, they also find that within a peer group of CEOs, those whose firms perform the worst are most likely to be fired. Thus, there appears to be a form of asymmetric relative performance evaluation in firing decisions. When there is a positive market or industry shock, the probability of being fired is low even with poor performance in a relative sense. When there is a negative shock, the weakest performers within the group are more likely to be fired.

The turnover–performance relation is stronger for firms with outside dominated boards, suggesting a role for monitoring (Weisbach, 1988). The turnover–performance relation is weaker when managers have a sizeable equity stake, which supports the view that equity ownership can serve to entrench management for some levels of ownership. The turnover–performance relation is weaker when the CEO is also chairman of the board, again suggesting a role for management entrenchment. There is evidence that turnover rates have increased sharply over time, perhaps suggesting heightened shareholder scrutiny (Hadlock and Lumer, 1997; Huson, Parrino, and Starks, 2001). This increased pressure on executives may lead them to focus more on increasing shareholder value, but the increased pressure may also enhance incentives to mislead capital markets (Peng and Roell, 2008).

Turnover–performance sensitivities in the United States are relatively high compared to those of other countries. These sensitivities are relatively higher in firms where performance is a relatively more precise signal of managerial ability. If a firm is performing particularly poorly, it is likely to choose an outsider as the replacement CEO. If it is doing moderately poorly, it is likely to hire an inside replacement. In addition, many other senior executives leave when the CEO is dismissed (Fee and Hadlock, 2004).

What are the consequences of CEOs being terminated? In general, new managers make many changes at the firm, and accounting performance improves. For the dismissed CEOs, there is both good news and bad news. They typically get large severance payments on the order of two times their salary. But they usually have poor labor market prospects, especially if their dismissal occurs in bankruptcy or in conjunction with a scandal (Fee and Hadlock, 2004).

Given that CEOs typically get paid quite well upon departure, one could ask why CEOs are rewarded for performance that induces termination. The *skimming view* is that the CEO writes his own compensation contract (including payments for termination). On the other hand, an insufficient supply of talented managers should not imply that a CEO who is about to be terminated would receive a large payment. Presumably, a CEO's bargaining

power is weakest when the CEO is about to be terminated. However, this presumption need not be correct. In order to induce the CEO to depart, the board may have to pay the CEO quite handsomely. The threat of not departing may give the CEO quite a lot of bargaining power.

As an example, consider the case of Mattel, Inc. Mattel's CEO, Jill Barad, made \$39,130,708 in compensation in 1997. In 1999, Mattel suffered enormous losses attributable to its acquisition of the Learning Company. Barad resigned from Mattel on February 3, 2000. Barad's severance package was worth more than \$37 million, with some estimates as high as \$50 million. It is hard to argue that Barad's severance package reflects pay for performance. If the board's intention was to allow Barad to skim some value from the firm, her severance package suggests that the board succeeded. On the other hand, the negative publicity and controversy generated by the severance package were certainly not good news for Mattel and the board. The alternative interpretation is simply that it took \$37 million to \$50 million to induce Barad to leave. If the general point of incentives is to induce the manager to take the right actions, then termination incentives may also have to be strong. While the board presumably could have simply fired her, contractually they may not have been able to avoid most of these payments. In any event, voluntary departure is typically viewed as better for the firm.

6.5. *Common agency and boards*

Aggarwal and Nanda (2006) argue that boards seem to take into account the objectives of a diverse group of stakeholders. They maintain that this is true even in the United States, where nominally boards have a fiduciary responsibility to shareholders. In their model, shareholders may grant access to the board to constituencies in exchange for noncontractible assets that these constituencies possess. As an example, the threat of hold-up by a union (e.g., a strike) can be ameliorated by giving board representation to the union. Here the asset is the union's right to strike, which is traded for the ability to influence how employees are treated through participation on the board. Aggarwal and Nanda state that because the different constituencies (and their board members) have divergent interests, each will try to influence the actions taken by management. As a consequence of this dissonance, managerial incentives are weakened, and management does less of every task that matters to the various board members.

Aggarwal and Nanda test this theory and find evidence consistent with the argument—firms with more board members pursue a greater variety of objectives, provide their executives with fewer stock-based incentives, and exhibit weaker share-price-based performance. Importantly, these outcomes are still consistent with ex-ante efficiency: accepting weaker ex-post incentives is the price of getting the various constituencies to contribute their assets to the firm. Thus, their argument can be viewed as an alternative to the skimming or board capture view. Boards may tolerate (and, in fact, encourage) weaker incentives as part of a larger optimization that incorporates other factors of production but is still consistent with shareholder value maximization.

6.6. *Executive compensation and executive beliefs*

Executives' decisions about whether to sell shares that they hold can provide insight into whether executives believe that their stock is overvalued or undervalued (Jenter, 2005). Jenter finds that executives in firms with high book-to-market ratios add to their personal holdings of their firms' stock, while executives in low book-to-market firms reduce their personal holdings. He also finds that firm-level capital structure decisions mirror the decisions of executives in their personal portfolios—executives selling stock from their personal portfolios run firms that issue equity. Intriguingly, after controlling for book-to-market and size, Jenter finds that executives do not earn abnormal returns from their personal portfolio trades. This suggests that the information executives have about their firm's stock is already publicly available. This result also suggests that book-to-market is indicative of market mispricing rather than risk. It is unlikely that executives would choose to increase their exposure to their own firm's idiosyncratic risk rather than purchase a portfolio of high book-to-market stocks.

Malmendier and Tate (2005) contend that an executive's option exercise decisions can be used as a metric for how overconfident the executive is. Their argument is that executives are overexposed to firm-specific risk because of vesting periods on options and restricted stock grants. Thus, executives should exercise stock options early to reduce their exposure to their own firms. Executives who, for example, hold their options to expiration are deemed to be overconfident. Malmendier and Tate find that overconfident executives have higher investment–cash flow sensitivities. Baxamusa (2007) suggests that this result is also consistent with the possibility that instead of being overconfident, executives believe that their firms are undervalued by the market, as argued by Jenter (2005). It is fair to say that executives' decisions about their holdings of stock and options in their own firms do inform us about divergences between their own beliefs and those of the market. What is less clear is whether the executives are right or the market is right, and in what situations one is more likely to be right than the other.

7. Conclusion

What can we conclude about the appropriate design of incentives? Since 1990, when Jensen and Murphy made their seminal contribution to the literature on executive compensation, our understanding of executive compensation and incentives has greatly improved. After almost two decades of research, we know that, through time, the strength of incentives has increased. During the 1990s, this was accomplished primarily through the use of stock options. While the other components of compensation (salary, bonus, long-term incentive plan payouts, and restricted stock grants) are important, the most important source of new incentives has been stock options. The two most important sources of aggregate incentives are holdings of stock and holdings of stock options; they are what align managers' interests with those of shareholders.

We know that firm size, firm risk, executive risk aversion, executive productivity, the extent to which executives dislike or like taking certain actions that matter for shareholders, and characteristics of the industry all determine how strong or weak incentives should be. We know that, because shareholders have limited information about what managers do and limited ability to monitor managers, managers need to be provided with some incentives. The key limitation on the provision of incentives seems to be the need to share risk between managers and other investors (shareholders). Actual compensation practices when it comes to granting executives stock and options seem to reflect this trade-off.

There are strong reasons to believe that firm performance should be evaluated relative to an industry or marketwide benchmark. Yet in practice we do not see this happening. While the industry would appear to be the most informative benchmark, it is also the benchmark that is most susceptible to tampering by a firm's managers. The market as a whole is also potentially a useful benchmark, but several conceptual problems are associated with its use. Indexed options might provide a reasonable way to achieve some benchmarking, but they may not provide sufficient incentives to risk-averse managers. In addition, indexed options have historically had unfavorable accounting treatment associated with them, which has limited their use. With the advent of option expensing in the United States, this situation may well change.

We also know that boards and shareholders do not have the complete ability to set managerial compensation. Either because of CEO power or a limited supply of managerial talent, at least some CEOs have the ability to extract more compensation than what is dictated by straightforward pay for performance. At this stage, we have a reasonably strong understanding of the determinants of incentives, and incentives seem to work well. We still do not have a full understanding of the level of compensation, however, although the recent paper by Gabaix and Landier (2008) represents a good start. A number of well-documented examples are consistent with the rent extraction view of the level of compensation. Instances of excessive compensation and rent extraction seem to be correlated with corporate governance failure, accounting fraud, and poor corporate outcomes. The extent of such instances has not yet been fully documented. A better understanding of issues related to the level of compensation is the next critical task for researchers in the field of executive compensation.

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MANAGING CORPORATE RISK

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Abstract

Recent developments in corporate risk management include an expansion of the available instruments, a material reduction in the costs of risk management products, and a more sophisticated understanding of their benefits. The chapter examines the underlying theory of how risk management increases firm value, and it summarizes the evidence on the use of risk management instruments.

Keywords

risk management, derivatives, insurance, taxes

1. Introduction

Risk management by firms has expanded substantially over the past two decades. This expansion has produced both a more sophisticated understanding of the benefits of an appropriate risk management program and a material reduction in the cost of risk management products. Much of the risk management literature focuses on the use of derivatives—forwards, futures, swaps, and options—in hedging corporate exposures to interest rates, foreign exchange rates, and commodity prices. But the array of risk management instruments is much broader. Both financially engineered hybrid instruments and engagement in specific real production activities represent important alternative methods of managing risk.

Devising and implementing an effective risk management strategy involves several steps: (1) the identification and quantification of risk exposures, (2) the design of potential risk management instruments and an assessment of their respective effectiveness, (3) an assessment of the potential benefits and costs of risk management, and (4) the selection and implementation of the strategy.

Much of this discussion focuses on the underlying theory of the mechanisms through which risk management can increase the value of the firm. This is a critical step in the design of an effective corporate risk management strategy. For example, there is apparent disagreement on how one should measure a firm's risk exposures: Should management focus on cash flows, firm value, or reported earnings? Discovering *why* a firm hedges has direct implications for *how* one should measure these corporate exposures as well as *what* instruments the firm should employ to hedge.

2. Risk exposures and hedging

Some of the risks to which firms are exposed affect only individual firms, while others affect a broad cross section of firms in the marketplace. Figure 1 arrays these risks along a spectrum. At one end of this risk spectrum are marketwide risks; these risks—for example, the impact of unexpected changes in interest rates, FX rates, or oil prices—are not localized to a specific firm or industry. At the other end are firm-specific risks; these include fires, lawsuits, outcomes of research and development projects, and outcomes of exploration and development activities for firms in natural resource industries.

2.1. Risk management instruments

An advantage of arraying the sources of risk as in Figure 1 is that it illustrates the fact that different risks are managed with different hedging instruments. In the second column of the figure, for example, insurance policies are employed to manage firm-specific risks like fires. Marketwide risks, such as exposures to interest rates, can

Risk Exposures		Financial		Real Production
		Specialized	Hybrid	
Firm-specific	Fire	Insurance		Loss prevention program
	Lawsuit			Joint venture
	Research & development projects	Warrants	Convertible bonds/ convertible preferred stock	
	Exploration & development projects			
Market-wide	Commodity prices		Oil-indexed notes	Technology choice
	FX rates	Forwards/ futures/ swaps/ options/	Dual currency bonds	Plant siting
	Interest rates		Reverse floating rate notes	Vertical integration

Fig. 1. Corporate Risk Spectrum.

be managed with specialized derivative instruments, such as forwards, futures, swaps, and options.¹

Over the past two decades, many new financially engineered securities have been introduced to provide customized solutions to corporate risk management problems.

Since these hybrid securities are structured around bonds or preferred stock, they normally are carried on the firm's balance sheet. In creating these hybrids, financial engineers operate much like General Motors in producing automobiles to meet specific customer demands: GM customizes its cars by assembling various combinations of

¹ Although forward, futures, and simple swap contracts differ in administration of the contract, liquidity, and settlement terms, all three instruments have similar exposure profiles. In buying a forward, futures, or swap contract, the value of the contract appreciates with unexpected increases in the underlying asset price, and it falls with unexpected reductions. Writing a forward, futures, or swap contract produces the opposite exposure; the value of the position falls with unexpected increases in the underlying asset price (see Smith, Smithson, and Wilford, 1989).

off-the-shelf components—frames, engines, trim packages, interior appointments, and so on. Similarly, hybrid securities are customized, but the components that make up these instruments are themselves fairly basic off-the-shelf debt instruments, preferred stock contracts, swaps, forwards, and options.²

As illustrated in Figure 1, the firm's choice of real production activities also can be used to manage its risk exposures. For example, moving production overseas changes a firm's foreign-exchange exposure. But producing in a new market with new suppliers, new workers, and different labor laws is a major strategic decision. One material advantage offered by financial risk management products is that they allow more effective separation of production and risk management activities. Moreover, financial contracts are more liquid, so if market conditions and exposures change, this added flexibility permits more rapid adjustments.

2.2. Risk exposure

In analyzing a firm's hedging incentives, it is important to understand the relation between an underlying risk and firm value. Some relations are straightforward; for example, an uninsured casualty loss directly reduces firm value. However, other exposures can be more subtle.

Figure 2 illustrates the exposure profile for an oil company. Because this corporation owns substantial oil reserves, higher oil prices raise revenues and increase firm value. The exposure profile relating the unexpected change in firm value that results from an unexpected change in oil prices thus has a positive slope. (For simplicity, this relation is shown as a straight line.)

But the exposure profile would look quite different for a petrochemical firm: higher oil prices would raise the costs of a major input. Thus, the exposure profile relating the

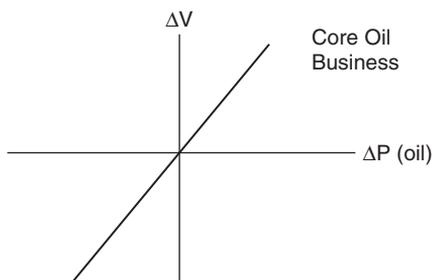


Fig. 2. Exposure profile for an oil company relating the unexpected change in firm value resulting from an unexpected change in oil prices.

² For example, an oil producer might issue bonds that include a forward contract on oil, a silver-mining firm might issue bonds incorporating an option on silver, and a copper producer might issue a bond giving investors a strip of copper options, one at every coupon payment (see Smith and Smithson, 1990).

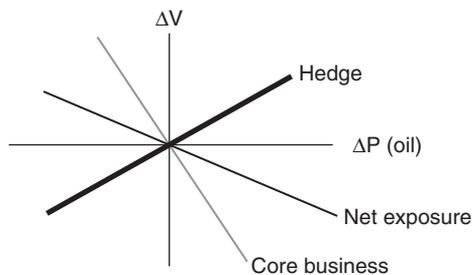


Fig. 3. Exposure profile for a petrochemical company. The Core Business curve relates the unexpected change in firm value resulting from an unexpected change in oil prices. The Hedge curve illustrates the payoff to an oil swap which receives cash-flow based spot oil prices. The net exposure curve reflects the modification in exposure to oil prices from the hedge.

unexpected change in firm value that results from an unexpected change in oil prices has a negative slope. This exposure profile is illustrated in Figure 3.

With the firm's exposure identified, I now can illustrate a basic impact of risk management on firm value. For example, to hedge its exposure to oil prices, the chemical company in Figure 3 must employ a hedging instrument that appreciates in value if oil prices increase. Because gains on such a hedge would offset losses in the firm's core business, risk management reduces the volatility of firm value.

Richard Breeden, former Securities and Exchange Commission chairman, notes that "derivatives are the moving vans of risk—they shift risk from place to place by substituting one type of risk for another." Yet this analysis suggests that such a characterization of derivatives ignores a critical aspect of these instruments. The differences in exposures across firms offer potentially important gains from the use of derivatives. For example, an oil swap with our petrochemical firm as one end-user and our oil company as the other allows both firms to hedge. Therefore, derivatives do more than just shift risk from place to place; they also can reduce the total risk in the system.

Although this hedging activity reduces the exposure of firm value to oil prices of our chemical firm, hedging generally will not affect the firm's optimal pricing or production decisions. Basic economic theory implies that optimal production and pricing occur where marginal cost equals marginal revenue. Relevant costs reflect opportunity costs, and the opportunity cost of the oil is its spot price. For this reason, hedging affects neither the firm's relevant marginal costs nor marginal revenues. Therefore, pricing and production decisions and their decisions to use financial instruments to hedge their exposures generally are separable.

3. Benefits of risk management

Because financial risk management reduces the volatility of firm value, one might presume that all firms would want to engage in risk management. Yet there is wide variation

in the use of risk management instruments across firms, even among firms that have similar exposures. There are firm characteristics that can provide firms with strong economic incentives to hedge.

3.1. Ownership structure

In analyzing risk management benefits, it can generally be assumed that the objective of the firm is to maximize its current market value. In their personal affairs, risk-averse individuals have incentives to manage risk because doing so lowers the required rate of return in order to engage in a particular risky activity. Thus, for example, an insurance company has a competitive advantage over most individuals in bearing risk and hence is willing to do so at a price lower than the individual would demand. Similarly, for an individual proprietorship, a partnership, or a closely held corporation, the risk aversion of the firm's owners is sufficient to motivate the firm to engage in risk management activities. But for a widely held corporation this logic fails. Portfolio theory implies that a corporation's required rate of return does not depend on total risk but on the systematic risk of its cash flows. Thus, a hedging instrument that works primarily on diversifiable risk does not provide a lower discount rate for a widely held firm whose owners hold well-diversified portfolios. And even if risk management affects systematic risk, as long as the investment is appropriately priced, risk management still will not affect firm value. To illustrate, consider a capital asset pricing model framework. To increase firm value, the firm must acquire an asset that plots above the security market line. But a fairly priced asset will plot on the line. Thus, even if hedging changes the firm's beta, a fairly priced hedge would simply move the firm along the security market line—it would not increase firm value.

Risk management increases the value of a widely held firm by increasing the firm's expected net cash flows—not by reducing its required rate of return. To understand how this might occur, recall the Modigliani-Miller proposition: The firm's financing decisions, including its risk management activities, will not affect firm value, assuming the firm's investment decisions are fixed and as long as there are no taxes and no contracting costs. For my purposes here, it is useful to restate this proposition in a logically equivalent way that emphasizes its managerial implications: If financial decisions, including risk management decisions, affect firm value, they must do so through their effect on investment decisions, taxes, or contracting costs.

3.2. Risk shifting within the firm

Thus far, I have viewed the firm from the perspective of its investors. Of course, the corporation is a vast network of contracts between various parties with conflicting as well as common interests. In addition to bondholders and stockholders, a corporation has other constituencies, such as employees, managers, suppliers and customers. All have vested interests in the company's success.

Like the owners of private or closely held companies, the firm's managers, employees, suppliers, and customers may not be able to diversify their risks; if not hedged, these risks can affect their future payoffs in their respective relationships with the firm. Because they are also risk averse, these groups are likely to require extra compensation to bear any risk that is not assumed by the owners or transferred through hedging to a counterparty (see Smith and Stulz, 1985; Stulz, 1990).

Employees will demand higher wages (or reduce their loyalty or perhaps their work effort) at a company where the probability of layoff is greater. Managers with alternative opportunities will demand higher salaries (or maybe an equity stake in the company) to run firms where the risks of insolvency and financial embarrassment are significant. Suppliers will be more reluctant to enter into long-term contracts, and trade creditors will charge more and be less flexible with companies whose prospects are more uncertain. And customers concerned about the company's ability to fulfill warranty obligations or service their products in the future may be reluctant to buy those products.

Because of limited liability, the amount of risk that can be allocated to stockholders is limited by the capital stock of the company. Companies in service industries, for instance, often employ limited capital. And for such companies, where the claims—and thus the risks—of managers and employees are likely to be large relative to the claims of investors, substantial benefits may be gained from hedging those risks.

Note, however, that one important aspect of achieving these potential risk-management benefits has received little attention—a firm's ability to pre-commit to a hedging strategy. This is less of a problem with some firm-specific risks: supplier, employment, and customer contracts have long stipulated levels of insurance coverage. But it is rare to see a supplier contract that specifies that interest rate risk be managed on an ongoing basis.

Without an ability to pre-commit to hedge, the realized gains to a firm in these dimensions will be lower. It is difficult to rely on implicit reputational effects to support an ongoing hedging policy because of potential incentive incompatibility problems. In circumstances where these claimholders might value hedging quite highly, the firm's stockholders face big incentives to unwind the hedge. (Morellec and Smith, 2007, examine conditions under which shareholders have incentives to maintain the firm's hedging policy after fixed claims have been issued.)

Consideration of comparative advantage in risk-bearing also has implications for the design of compensation contracts. Effective compensation plans achieve an appropriate balance between two potentially conflicting goals—strengthening employees' performance incentives and insulating them from risks beyond their control. Incentive considerations dictate that firms link compensation to performance measures such as share price changes or earnings. Yet a potential problem with such performance proxies is that they contain significant variation that is unrelated to employees' actions. Because financial price risks are a potential source of such noise, companies may also achieve economies in risk-bearing by excluding them more effectively from performance measures that serve as the basis for employee evaluations and bonuses. (See also DeMarzo and Duffie, 1991, 1995; Breeden and Viswanathan, 1998).

3.3. *Taxes*

With progressivity in the tax structure, after-tax payoffs are concave; thus, hedging reduces the expected tax liability, increases after-tax liability, and increases after-tax cash flows and value (Mayers and Smith, 1982; Smith and Stulz, 1985). In their analysis of more than 80,000 COMPUSTAT firm-year observations, Graham and Smith (1999) find that in approximately 50 % of the cases, corporations face convex effective tax functions and thus have tax-based incentives to hedge. In approximately 25% of the cases, firms face linear tax functions and thus have no tax-related incentives to hedge. The remaining firms face concave effective tax functions, which provide a tax-based disincentive to hedge. Of the cases with convex tax functions, roughly one-quarter of the firms have potential tax savings from hedging that appear material; in extreme cases savings exceed 40% of the expected tax liability. For the remaining firms, the tax savings are fairly small. Thus, the distribution of potential tax savings from hedging appears quite skewed.

Firms most likely face convex tax functions when (1) their expected taxable incomes are near the kink in the statutory tax schedule (i.e., taxable income near zero), (2) their incomes are volatile, and (3) their incomes exhibit negative serial correlation (hence the firm is more likely to shift between profits and losses).

The Graham/Smith methods also allow them to decompose the basic structure of the tax code to examine the incremental impact of statutory progressivity, net operating loss carrybacks and carryforwards, investment tax credits, the alternative minimum tax, and uncertainty in taxable income. They find that most of the convexity is induced by the asymmetric treatment of profits and losses in the tax code. Carryback and carryforward provisions effectively allow firms to smooth their losses, thereby reducing tax function curvature at its most convex points but making the function convex over a broader range of taxable income. In contrast, the alternative minimum tax and investment tax credits have only modest effects on the convexity of the tax function.

3.4. *The underinvestment problem*

Although well-diversified stockholders and bondholders may not be concerned about the prospect of unhedged losses per se, they will become concerned if such losses raise the likelihood of insolvency. For example, companies that wind up in Chapter 11 face considerable involvement by the bankruptcy court in their operating decisions as well as substantial direct costs of administration and reorganization. And short of the formal bankruptcy process, financial difficulty can impose large indirect costs. One such cost is the underinvestment problem identified by Myers (1977).

If a company's effective leverage is high enough, management can have incentives to reject an available positive net present value project. As Myers demonstrates, if enough of the value of the new investment is captured by the fixed claimholders so that what is left for the shareholders fails to provide them a normal return given the capital employed and the risk, then the stock price will fall. Taking the project would generate a wealth

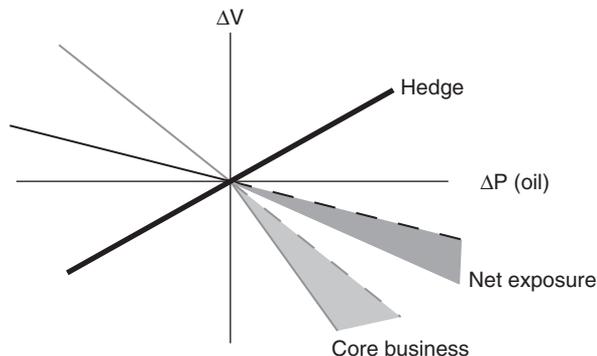


Fig. 4. Underinvestment and Hedging. For a petrochemical firm, an increase in oil prices raises costs and lowers firm value which induces an increase in leverage, an exacerbation of underinvestment problems, and a further fall in value—the shaded wedge. Hedging reduces these underinvestment costs.

transfer from stockholder to lenders. To illustrate, again consider our petrochemical firm from Figure 3. Without hedging, an unanticipated increase in oil prices would raise costs, lower profits, and reduce firm value. But this reduction in firm value causes an induced increase in leverage; higher leverage exacerbates the underinvestment problem and further reduces firm value. This is depicted by the shaded wedge below the core business line in Figure 4. (One can think of the original “core business” line as one that holds investment policy fixed and the steeper line reflects the underinvestment costs.)

Now if this petrochemical firm were to hedge its oil price exposure, the reduction in operating cash flows from an unexpected increase in oil prices would be offset by the increased value of the hedge. Thus, the induced increase in leverage and the exacerbation of the underinvestment problems would be smaller. In Figure 4, this is illustrated by the smaller shaded area associated with the firm’s net exposure. Note that this benefit of hedging is that this wedge is reduced, not that the curve is flatter.

Hedging can be an important mechanism for controlling underinvestment costs; it can be a more effective method than reducing leverage. So, an additional benefit of hedging is that it can increase the firm’s debt capacity (see Stulz, 1984). This benefit of controlling underinvestment problems should be more pronounced for firms whose value lies primarily in its growth opportunities.

3.5. Information problems

Froot, Scharfstein, and Stein (1993) note that a similar result is obtained when one considers the information asymmetry issues raised by Myers and Majluf (1984). Froot et al. state that raising external capital is costly because of this information asymmetry, and thus a firm like our petrochemical firm in Figure 4 might hedge. Without hedging, higher oil prices would lower firm value, raise leverage, and thus induce management to raise expensive external equity. By reducing the fall in firm value when oil prices rise,

hedging reduces the induced increase in leverage and thus the likelihood that the firm would have to access external capital markets. Note, however, that these information asymmetry costs are likely to be small in the specific cases where hedging opportunities are greatest. Because investors can observe events such as a fire, a lawsuit, or a fall in oil prices, informational asymmetries are smaller and managers who raise external capital in these circumstances face more limited costs. This benefit of hedging should be greatest for firms with substantial informational asymmetries between managers and external investors.

3.6. Free cash flow problems

Hedging also can control the free cash flow problem. Jensen (1986) defines free cash flow as cash flow generated by the firm in excess of that required to fund available positive net present value projects. He argues that financing a firm generating substantial free cash flow with debt allows managers to make believable promises to distribute the free cash flow. If we again return to our petrochemical firm in Figure 3, however, unexpectedly lower oil prices reduce costs, increase firm value, decrease the firm’s effective leverage, and thus exacerbate the free cash flow problem. The shaded area in Figure 5 illustrates this free cash flow. (Again, one can think of the original “core business” line as one that holds investment policy fixed, and the flatter line reflects the induced overinvestment because of the free cash flow incentives.)

Morellec and Smith (2007) state that hedging can control this free cash flow problem. For example, if this petrochemical firm now hedges its oil price exposure, the increase in operating cash flows from an unexpected reduction in oil prices is offset by the reduced value of the hedge. Thus, both the induced reduction in leverage and the exacerbation of the free cash flow problems are smaller, as illustrated by the

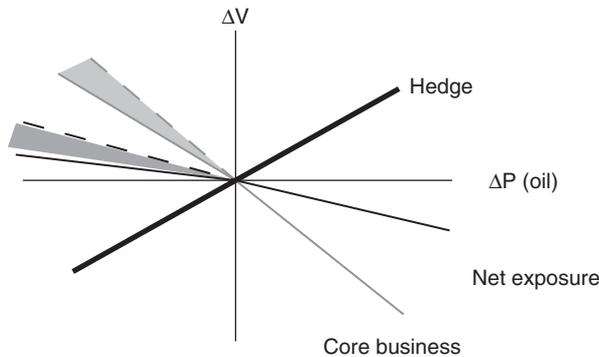


Fig. 5. Free Cash Flow and Hedging. For a petrochemical firm, a reduction in oil prices reduces costs and raises firm value which induces a reduction in leverage and less effective control of the free cash flow problem and a fall in firm value—the shaded wedge. Hedging reduces the free cash flow costs.

smaller shaded area associated with the firm's net exposure in Figure 5. This benefit should be more pronounced for firms whose value is comprised primarily of assets in place.

3.7. Hedging motives and methods

Understanding the motives for risk management is a critical step in designing an effective hedging program for a firm. If the primary consideration for a particular firm in hedging is taxes, this firm should focus on hedging its taxable income. If hedging is prompted by risk-sharing concerns, then a firm where the bonus is linked to accounting returns might focus on hedging accounting earnings. If the cost of financial distress and the underinvestment problem are the primary factors that motivate hedging, the firm should hedge firm value.

In general, hedging value and hedging earnings are not the same thing. FASB rules have evolved to a point where it is typically difficult to obtain hedge-accounting treatment for an off-balance-sheet hedge. Most firms that use standard derivatives are thus required to mark the hedge to market in each accounting period. Yet accounting rules also generally prohibit the firm from marking to market the value of its core assets or liabilities that give rise to the exposure. This means that a firm can engage in risk management activities that, while reducing the volatility of firm value, increase the volatility of reported earnings.

Because access to hedge-accounting treatment for derivatives has been restricted, there has been an increase in the use of structured notes and other hybrid securities. This has occurred in part because accounting rules generally do not require that a risk management contract bundled with a loan or preferred stock issue be marked to market.

Finally, note that with three independent instruments, three different targets can be achieved. Therefore, in principle, with the appropriate choice of hedging instruments a firm could simultaneously manage the impact on its value, reported earnings, and taxable income.

4. The costs of risk management

It is important to identify those aspects of the risk management transactions that represent real costs. Basically, the relevant cost of hedging is the sum of any out-of-pocket fees, the implicit cost of the bid-ask spread, and the opportunity cost of management's time in the administration of the program. For standard swaps, many of these costs have fallen dramatically over the past two decades. In the early 1980s, the bid-ask spread for swaps at times exceeded 100 basis points. In 2006, it could be as low as two basis points for a standard interest rate swap. Thus, profound reduction in hedging costs, which reflects the material increase in the liquidity of these markets, makes the net benefit from accessing the market greater and explains part of the observed growth in these markets. Moreover, standardization and increased familiarity with these instruments and their uses have lowered the administrative costs.

In addition to this variation in cost over time, there is also important variation in costs across hedging instruments at a given date. In general, the costs of hedging will be lower: (1) the greater the volume of transactions in a given market, (2) the lower the volatility of the underlying asset price, and (3) the less private information is relevant for pricing the underlying asset. Therefore, hedging costs are generally lower for derivatives on interest rates and major currencies but higher for more customized hedging instruments.

5. Evidence on corporate hedging

Derivative instruments can be used either to speculate on financial price movements or to hedge. Thus, a basic question to be addressed is: do firms use derivatives to hedge or to speculate? Although the evidence is still preliminary, the answer appears to be, for the most part, to hedge.

An early survey of the corporate use of derivatives was conducted by Dolde (1993). The overwhelming majority of the 244 Fortune 500 companies that responded to Dolde's questionnaire reported that their policy was to use derivatives primarily to hedge their exposures. At the same time, however, only about 20% of the responding firms reported that they attempted to hedge their exposures completely. Moreover, smaller firms—those likely to have lower credit ratings and, hence, greater default risk—reported hedging larger percentages of their exposures than big companies.

About 90% of the firms in Dolde's survey also said that they sometimes took a view on the market direction of interest rates or exchange rates. And although roughly one in six of even these companies hedged its exposures completely, the rest claimed to modify their positions to accommodate their view.

For example, if they expected rates to move in a way that would increase firm value, they might hedge only 30% of their exposure; but if they expected rates to move in a way that would reduce firm value, they might hedge 100% of their exposure. Only two firms said that they would use hedge ratios outside the 0–100% range. In effect, this means that less than 1% of the firms said they would use derivatives to speculate and enlarge an existing exposure.

Of course, surveys present a number of problems. For example, some companies might be reluctant to admit that they use derivatives to speculate. Yet other evidence on hedging also bears out this corporate propensity to hedge. For example, a mounting number of studies find that firms with operating characteristics that theory suggests should make hedging more valuable appear to use more derivatives. If derivatives were used primarily to speculate, no such associations should be expected.

Before examining those empirical results, however, I must note one caveat about the data examined by these studies. There are important limitations in our current ability to judge whether one firm hedges more than another. These limitations are of three basic varieties.

First, some firms hedge using derivatives, whereas others employ hybrid debt and preferred stock issues. Many empirical studies of corporate hedging focus on hedging

using derivatives but ignore the risk management implications of hybrid securities issued by the firm.

Second, over the past decade there has been wide variation in the disclosure of corporate hedging activities. Prior to the adoption of SFAS 105, disclosure by firms was generally required only if a hedging activity was material. Yet, some firms voluntarily disclosed more than was required. This means that firms with essentially equivalent hedging policies might appear different simply because of different disclosure policies. The adoption of SFAS 105 reduced this problem but did not eliminate it.

The third problem is more fundamental. Even with complete access to hedging data, if two firms employ different risk management instruments, judging which firm hedges more can be difficult. For example, assume that firm A has \$10 million (notional principal) of three-year interest rate swaps, firm B has \$20 million of three-year swaps, and firm C has \$10 million of seven-year swaps. Firm A clearly hedges less than either B or C, but comparing B with C is more difficult. For the next three years, B hedges more than C, but for the following four years firm C hedges more.

If we turn to options, the problems become dramatically more difficult—attempting to compare firms with contracts of different size and different exercise prices is quite difficult. In principle, one could estimate the contracts' deltas, but deltas depend on the prices at which they are evaluated. These data problems limit the power of all the empirical work in this area.

5.1. Investment policy

Geczy, Minton, and Schrand (1997), Nance, Smith, and Smithson (1993), and Mian (1996) examine whether firms with more growth opportunities in their investment opportunity sets are more likely to hedge. Nance et al., who examine hedging activity by 169 Fortune 500 firms, conclude that firms with more growth options hedge more. Mian, analyzing data for 3022 firms listed on Compustat, finds conflicting evidence across different measures. Geczy et al., who examined the use of currency derivatives by 372 large firms, find no significant relation. Morellec and Smith (2007) suggest that one reason studies fail to find a robust relation between the firm's investment opportunities and hedging is that hedging can control both underinvestment and free cash flow problems. Thus, firms with both substantial assets in place and growth options can have important incentives to hedge.

5.2. Financing policy

Several studies (e.g., Block and Gallagher 1986, and Geczy, Minton, and Schrand, 1997) examine the association between hedging and leverage. Most report no significant association between the two. This result potentially reflects a fundamental statistical problem. Both leverage and hedging decisions are endogenous. Thus, simply putting leverage on the right-hand side of an ordinary-least-square (OLS) regression to explain hedging

choices introduces a potential simultaneous-equation bias in the reported coefficients. At our current state of knowledge, this will be a difficult problem to solve. It is not clear that our theory is sufficiently rich to identify structural equations so that simultaneous equation estimation methods can be employed.

Booth, Smith, and Stolz (1994), Wall and Pringle (1989), and Mayers and Smith (1990) examine the impact of the probability of financial distress on the incentive to hedge. Booth et al. study the use of interest rate futures by 238 financial institutions; Wall and Pringle, hedging by 250 swap users from the NAARS database; and Mayers and Smith, reinsurance purchases for a sample of 1276 property-casualty insurance companies. Wall and Pringle find that firms with lower credit ratings use more swaps, Mayers and Smith report that insurers with lower Best's ratings reinsure more, and Booth, Smith, and Stolz report that S&Ls hedge more than banks. These results suggest that with a higher probability of financial distress, firms have stronger incentives to hedge.

5.3. *Managerial incentives*

Tufano (1996) examines managerial incentives to hedge and concludes that firms that compensate managers with more stock hedge more, although firms that use more stock options hedge less. He argues that with more restricted stock, managerial risk aversion increases the incentives to hedge. But the impact of volatility on option values (see Black and Scholes, 1973) implies that managers who receive options should hedge less. Geczy et al. (1997) also look at managerial option ownership. The evidence suggests that firms that use currency derivatives grant more options to their managers than nonusers.

Geczy et al. are appropriately concerned about simply inserting a measure of managerial compensation as an explanatory variable in a hedging equation. Compensation is endogenous and thus doing so would introduce simultaneous equation problems. Interestingly, Tufano's analysis is less likely to suffer from such problems. He focuses on 48 firms in the gold-mining industry. Because our theories are unlikely to be able to explain the observed variation in compensation structure across this reasonably homogeneous population of firms, any simultaneous equation bias is likely to be small in his analysis.

5.4. *Firm size*

Booth et al., Block and Gallagher, Nance et al., Mian, Geczy et al., and Tufano (1996) all report that large firms are more likely to hedge than are small firms. This finding is consistent with the proposition that there are significant transaction and information costs as well as scale economies. Hedging instruments frequently are viewed as sophisticated products, and large firms are more likely to hire managers with the requisite expertise to manage a hedging program.

The analysis in Mayers and Smith, however, indicates that small insurers reinsure more. This result is consistent with size-related tax and financial distress incentives.

Moreover, the information cost issues that are associated with derivative instruments for industrial or financial firms are likely to be less important for insurance companies' reinsurance purchases.

5.5. *Taxes*

Geczy et al., Graham and Rogers (2002), Mian, Nance et al., and Tufano test the proposition that statutory progressivity of the tax function provides an incentive for firms to hedge. Some find that the greater the likelihood that a firm's pretax income falls in the progressive region of the tax schedule, the more likely the firm is to hedge. The effective tax schedule can be convex because of limitations on the use of tax credits. Mian finds more hedging by firms with more foreign tax credits, and Nance, Smith, and Smithson document more hedging by firms with more investment tax credits. They report inconsistent evidence on the impact of tax-loss carryforwards.

Note, however, that these variables may proxy for things other than a firm's tax status. For example, the presence of tax-loss carryforwards also might proxy for financial distress; similarly, ITCs may proxy for aspects of a firm's investment opportunities; finally, foreign tax credits potentially proxy for a foreign currency exposure. (Both Mian, 1996, and Houston and Mueller, 1988, find that firms with foreign operations are more likely to hedge.)

To the extent that these variables proxy for firm characteristics other than the progressivity of the firm's effective tax schedule, we have a potentially important identification problem. More powerful tests of these tax hypotheses will require proxies that better isolate the firm's tax status.

5.6. *Ownership structure*

There has been little analysis of the use of forwards, futures, swaps, or options by closely held firms, largely because of data limitations. Within their sample of property-casualty insurance companies, however, Mayers and Smith examine closely held insurance firms. In their analysis of hedging through reinsurance contracts, they find that closely held insurance firms buy more reinsurance. This finding is consistent with the proposition that firms with owners whose portfolios are more ill-diversified have stronger incentives to hedge.

6. **Conclusion**

Derivative instruments represent a material addition to the corporate financial officer's tool kit. These instruments provide incredible flexibility in structuring a customized risk management strategy for the firm.

To realize their potential requires a detailed understanding of the instruments and their uses. Used appropriately, they reduce risk and increase firm value. But used inappropriately, they have caused firms to collapse. As noted above, implementation of a risk identification strategy involves several steps: (1) exposure identification, (2) instrument design, (3) net benefit assessment, and (4) strategy implementation. Heretofore, the academic community has focused substantially all its attention on the first three steps. Yet the implementation step is critical to an effective strategy. As with other aspects of organizational design, it involves three critical aspects: (1) the assignment of decision rights—who has the authority to structure and implement the policy and who has the responsibility to monitor these decisions, (2) the methods of rewarding these key individuals, and (3) the structure of systems to evaluate the effectiveness of the policy, including the details of its implementation (see Brickley, Smith, and Zimmerman, 2004). To date, this last step has received little academic attention, yet it may be the single most important in terms of creating firm value.

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