ROYAL INSTITUTE
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Supplier structure
and
Housing construction costs

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Report 5:73
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Stockholm 2006

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Printed by Tryck & Media, Universitetsservice US-AB, Stockholm.

ISBN 91-975984-1-0
ISSN 1104-4101
ISRN KTH/BFE/M—06/73—SE

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ACKNOWLEDGEMENTS

First, I would like to thank Professor Hans Lind (my supervisor) for his guidance and valuable comments that made it possible for me to complete this thesis on time. Also many thanks to all my colleagues in the department of Building and Real Estate Economics who have helped me in different aspects to successfully finish this thesis. Han-Suck Song and Johan Nyström deserve special thanks. Sharing Han-Suck with the cubicle corner and Johan with similar subject allowed me to benefit their knowledge and literature resources respectively. I really appreciate the time and the effort that Henry Muyingo dedicated to proofread my thesis. Finally, I am a very grateful to the financial sponsorship provided by FORMAS (The Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning).

Introduction

The housing sector is one of the backbone sectors in the construction industry and determines the success and failure of this industry and plays a major role in the economy of many developed countries. Twenty six percent of EU's construction activities were from housing building (European Construction Industry Federation, 2005). Housing construction was normally used as an economic stabilizer in many countries. The construction sector, especially residential, was used by Sweden's central government as a cyclical stabilizer, in keeping with Keynesian economic theories (Swedish Industry, 2004). However, the performance of the industry and its contribution to the welfare of the society in comparison to other industries such as the manufacturing industry has lately been the focus of many commissioned reports and academic research publications. The perceived inefficiencies emanate from among other things, increasing construction costs, conflicts and client dissatisfaction, the fragmented nature of the industry, low competition, cost overruns and delays (Latham, 1994; Egan, 1998; Lind, 2003).

Swedish housing construction costs have risen more than the rate of inflation during the last decade. Increasing construction costs affect households' welfare in terms of housing affordability, weaken the relationship between developers and contractors, and destabilize the housing markets as well as the whole economy. Metropolitan regions of the country experienced higher construction cost increases while small regions showed less costs increases during economic booms (see Table 1). The effect of the construction costs escalation was not evenly felt in all regions and there was also an imbalance of housing stocks in various regions (Atterhög and Lind, 2004). The supply of new residential apartments stagnated at the same time as the construction costs were high particularly in the metropolitan regions where the housing demands were stronger. Higher construction costs reduce residential construction and thus affect movements in house prices and rent levels (Somervile, 1999).

Table 1: *Construction costs of Multi-family apartments: the country as a whole (all), big regions, and small regions.*

Year	Rental_all	Cond_All	Rental_Big	Cond_Big	Rental_Small	Cond_Small	Inflation
1998	14 054	15 421	14 804	16 026	13 368	14 294	257
1999	12 702	18 437	13 416	19 516	12 053	15 032	258,1
2000	15 911	18 913	20 505	21 418	12 778	14 735	260,7
2001	18 386	23 214	23 177	26 058	14 408	17 020	267,1
2002	17 848	25 488	21 847	28 885	13 473	18 489	272,8
2003	17 149	26 302	20 779	29 074	14 558	20 311	278,1
Change	22,0%	70,6%	40,4%	81,4%	8,9%	42,1%	8,2%

Cond=condominiums (bostadsrätt)
Source: SCB (Swedish statistics central bureau)

There is a large volume of literature dealing with the problems of high construction cost but only few studies tackle this issue within the context of changing economic conditions and the governance structure of construction firms. The type of relationship between developers and contractors, the firm structure such as developer-contractor or independent developer/contractor, and the level of foreign supplier competition found in these various regions might, among others, explain the disparity in construction costs increase observed in these regions. The difference in cost increases offered the opportunity to compare the regions and investigate factors - contractual relationship, firm structure, and foreign supplier - that can exist in some regions but not in other regions. The identified factors could alleviate or exacerbate construction costs.

The objective of this research is.

- To gather and synthesize construction cost related concepts in a way that makes it easier to identify factors behind construction cost increase disparities among the regions.

- To discuss the role that the previous working relationship and the strength of relationship between developers and contractors plays for the construction costs of building projects.

- To explore how developers perceive the behaviour of vertically integrated firms and the organization patterns in the construction industry in relation to construction costs. .

- To analyze the level of foreign suppliers, imported materials and labour that existed in the market during the study period and the impact that increased competition could have on the construction costs.

- To explain the various specific organizational forms that could emerge in response to changes in economic and market conditions faced by actors in the residential building sector.

The research is organized in three separate but sequential papers.

1. Construction costs: Central concepts, categories, and determining factors

2. Long run relationships, Vertical Integration, and International competition: Can they contribute to explaining regional construction cost differences?

3. Efficiency of the residential building sector: Theoretical analysis of some basic organization structure models

The cost concepts and categories as well as clarification of cost and price terminology contained in the first paper served as a catalyst to the other two papers where a number of more specific factors that could influence construction cost and organizational structure ramifications are examined. The empirical study presented in paper two indicated the importance of the organization structure that is analyzed in the third theoretical paper.

Summary of papers

1. Construction costs: Central concepts, categories, and determining factors

The first paper is intended to review various construction cost concepts. Unclear descriptions of what constitutes cost and what the building price is made up of is a common source of confusion and may hinder any attempt to single out the source of increasing construction costs. A direct and indirect cost structure seems to include most of the cost components incurred by the various actors in the construction process and indeed enhances the distinction between cost and price in relation to supplier structure.

The factors influencing construction costs were formed into four groups/layers; project-specific factors, client-contractor related factors, competition and market conditions, and finally macroeconomic and political factors. The grouping is based on the extent to which the construction actors, especially contractors and clients, could influence the factors. By aggregating many factors influencing construction costs into four groupings it is easier to analyze a specific situation as one first can determine which type of factor or layer to focus on.

The usefulness of each group of factors in explaining regional cost increase disparities breaks down to whether the impact of these factors is confined to a specific project, region, or the whole country. Project characteristic and client requirements such as size and quality could influence both the amount and the unit prices of the input resources needed to undertake a project and could increase the direct cost portion of the estimated construction costs. However, the issues related to the direct costs are mainly dealt with locally. Import of materials and labour mobility may resolve shortages of resources.

The impact of project-specific factors on regional construction cost differences could mainly be linked to the indirect cost part of the construction costs where client-contractor related factors such as contractor/client type and the extent of relationship between contracting parties seem to influence these costs. Besides, not all client-contractor related factors are helpful to explain regional cost increase differences. Contractor and client type as well as procurement method do not differ greatly between metropolitan and small regions. Client-contractor relationship is the only factor in this layer that presumably influences construction costs through indirect cost components where a long run and strong past relationship between

the parties could reduce transaction costs and the incentive to price according to current demand.

Client-contractor related factors are very susceptible to the level of competition and the intensity of construction activity. The level of competition and construction activity influences the cost of inputs and could also have an enormous impact on indirect costs. Competition and Market conditions affect both direct and indirect costs but their impact of the later is more exacerbated when client/contractor related factors are taken into consideration. Macroeconomic and political factors such as inflation and interest rate fluctuations as well as labour laws, general labour conflict and building regulations can impose heavy costs and delays in a building project. Most of the factors in this layer are uncontrolled but clients and contractors can predict them.

Two groups of factors are considered in our analysis of construction cost differences. Client-contractor related factors as well as competition and market conditions seem to contribute to explaining the observed cost increase disparities. The other two layers - project-specific factors and macroeconomic and political factors are, respectively, mainly confined to a specific project or in most cases not confined to any specific region. Thus their contribution in the analysis of regional construction cost differences is deemed to be negligible.

2. Long run relationships, Vertical Integration, and International competition: Can they contribute explaining regional construction cost differences?

The second paper covers the empirical part of the research. It contains the responses from the developers (interviews and posted questionnaires) and analysis of the three hypotheses that were postulated in order to examine the observed construction cost increases.

Hypothesis 1: A long run relationship between contractor and client tends to a lower cost increase during the boom.

The cyclical pattern of housing construction activities could induce one of the contractual parties - developer or contractor - to enhance his economic position at the expense of the other when there is no long-term relationship between them. Thus a short-term relationship may inhibit collaboration between the contractual partners and induce higher transaction costs that would ultimately inflate housing construction costs. This hypothesis postulates that the existence of long-run relationship between the actors in the housing building sector is a key factor in the fluctuation of construction costs. Long-term relationship curtails the opportunistic behavior associated with changing economic conditions of the housing construction sector. The presumption here is that contractors do not unreasonably increase the construction cost for short time gain and sacrifice the fostered relationship with the client that could lead to repeated work in the future. The client will eventually have the upper hand in a

recession or economic downturns and that the contractor then will be in a position to have to accept lower construction cost or have to compete with other contractors and face a lot of uncertainty.

It was investigated whether the developers believe that contractors take into consideration the previous working relationship when tendering new contract with the client under different economic conditions. Construction is a many-sided activity where the contractors not only deal with the client but also do business with one or more sub-contractors. Thus, the analysis of long-term relationship effects on the construction cost is expanded to include the contractor – subcontractor relationship.

Hypothesis 2: If the contractor on the rental housing market is also active as developer on the same market, the construction costs tend to be higher.

Apart from the benefits of competition, it is reasonable to contemplate that the concentration of a few vertically integrated firms (contractor-developer type) in metropolitan regions is one of the sources of the increased construction costs observed in these regions. Vertical integrated firms have to take into account the price effects that the new projects could have on the existing properties developed by this firm or projects undertaken by the same vertically integrated firm. In Sweden, a few large companies dominate the construction of rental apartments and condominiums. Some of these companies are not only contractors but also active to a large degree with project development for their own account (Swedish Industry, 2004).

The two above characteristics of Swedish residential construction - few companies (oligopoly) and governance structure (vertical integration) might have some effects on the construction cost of rental apartments and condominiums. In other words, those few companies might have a market power to control the construction costs of residential building projects contracted by property companies' or/and municipalities. The focal point of this hypothesis is to examine if there is a connection between the higher construction cost observed in these regions and the share of the vertically integrated construction (Contractor-Developer) firms operating in these regions.

Hypothesis 3: If it is easier for foreign suppliers to enter the market, then cost increase will be lower.

The final hypothesis that was intended to be tested was the impact that foreign firms would have upon construction costs. The higher the presence of foreign suppliers in a region the higher the competition and the lower the construction costs increases will be. The shares of foreign firms active in Swedish housing construction as contractors, major sub-contractors, or suppliers, and the regions that they are active in are the focus of hypothesis 3. Though foreign competition and globalization of the construction industry can lead to a borderless activity,

geographical location of a region or city, and convenience of main transportation lines still matters. Different regions of the country, depending on their geographical location and accessibility to other countries and regions, might to different degrees benefit from foreign competition that could reduce the construction costs. For instance the impact of foreign competition could be different in terms of labor and construction materials between a city adjunct to another country e.g. Malmö as compared to a city that is located further inland. In our analysis, a survey will be carried out and it will be tested whether the presence of foreign suppliers in certain regions is believed to result in lower construction cost increase.

The hypotheses were tested by collecting data from a number of rental housing projects from six cities in different regions. Projects that were built between 1998 and 2003 are considered in the survey since that period encompasses both high and low construction activities. Only projects that contain more than 20 units and that are equipped with elevators were chosen in order to have functionally similar buildings. Semi-structured interviews and posted questionnaires yielded mixed results. In non-metropolitan region, long-term relationship between developer and contractor is a crucial strategy and incentive mechanism in securing repeated work for contractors and lower construction costs increase for the developers. Short-term relationship as well as normal and adversarial relationship was more prevalent in the metropolitan region. The working relationship is also affected by the level of construction activity, project characteristics (size, complexity, etc.). Many developers of rental housing did not recognize the effects of vertically integrated contractors on construction costs and hence the relevance of concentration levels of vertically integrated firms in any region became inconsequential. The involvement of foreign contractors was not reported in any project considered in the study and the usage of imported materials was almost non-existent.

3. Efficiency of the residential building sector: Theoretical analysis of some basic organization structure models

The third paper describes various organization structure models and their implications on construction costs as well as the interdependence that exist among the construction actors. A holistic approach of analyzing the housebuilding industry in relation to different possible organizational patterns may enable us to understand bearers of risk and incentives, responsibility and control mechanisms, and consequently it may shed light on construction cost determinants. Several criteria are utilized in a theoretical evaluation of the efficiency of the organization patterns in the building sector. The analysis examines how risk is allocated among the actors, and how various supplier structures influence competition in the market, the degree of flexibility to respond to macroeconomic changes, and the needed competence level of actors.

In response to market and economic changes as well as competitive pressure and necessary competence to compete efficiently, major actors in the construction sector may undergo processes of integration and separation. Owner, developer, and contractor integration might increase the competence and competitiveness of the integrated organization, but it may also limit the flexibility of the amalgamated organization to adapt to economic changes. Contrary, a separate developer, contractor and specialist contractor may allow these actors to adopt competitively to the economic environment and lead to a better risk allocation. But the required competence of each actor may increase in order to engage contracting processes efficiently and autonomously. Thus the need for flexibility in adjusting unstable economic and market conditions may lead to less integration of construction actors.

Two organization structure patterns, that represent the two extremes of possible models, and six transitional models are proposed. The first organization form, which is called *the base model*, contains an integrated owner, developer, and contractor with no outside contracting. This organization model is exposed to two types of risk. Market risk that this firm shares with both the development and construction businesses and the risk emanating from not subcontracting and the subsequent higher fixed costs that could be transformed into variable costs by changing the organizational pattern.

The base model is mirrored to another organization model that contains similar actors but totally separated and where subcontracting is also allowed. In this organization model, actors are contracting throughout the market and each one of them is compelled to either rely on its skills to reduce risk or depend on prior good relationship with other parties that could depress any opportunistic behavior.

The other six models emerge when the major actors in the building sector integrate or separate, and subcontracting as well as the services of specialty contractors and consultants is considered. Frequent developers may contract directly with specialty contractors and get the opportunity to work repeatedly and build long-term relationship. In the absence of strong relationship with contractors or subcontractors, infrequent developers that are not integrated may rely on the services of consultants and utilize the expertise and resources of the consultants that could otherwise be costly for the this type of developer to acquire.

It is noteworthy to point out that though this paper covers a very important subject of organization structure models from an efficiency point of view, it also encompasses other issues such as the impact of long run relationship between contracting parties and vertical integration on the transaction costs that could ultimately affect the level of construction costs.

Research contribution and limitation

The harmonization of cost concepts and categories as well as the clarification of important terms can be seen as a step forward that will smooth the progress of identifying the factors

affecting the construction costs that could ultimately explain the cost escalation differences among the Swedish regions.

The contribution of this research is also to offer an understanding of the behavior of contractors in specific economic situations - by taking into consideration the long run relationship. It ascertains that if there is an opportunistic behavior from the contractor/subcontractor side during the economic boom this will result in a higher construction cost increase. The analysis can also enrich the current understanding of governance structure of Swedish construction firms and how they could influence the construction costs. We attempt to utilize transaction cost theory in exploring construction sector structures and this should be seen as a first step in trying to understand changes in the sector from an efficiency perspective. The contributions are unique in the sense that neither behavioral relationship between client and contractor nor structural analysis of firms has been fully investigated. The third hypothesis of the second paper invigorates what many academics and professionals already pointed out, which is the need of increased competition and more foreign supplier participation in the sector in order to ease the increase in construction costs.

Though the response rate of the semi-structured survey is considered to be high compared with the typical postal questionnaire surveys of the construction industry, the inference power of the responses were limited due to not fully completed answers and disproportional participants of public developers. Only a few private developers in the Stockholm region have participated in the survey.

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Paper 1

Construction Costs: Central Concepts, Categories and Determining Factors

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Stockholm 2006

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Construction Costs: Central Concepts, Categories and Determining Factors

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Abstract

Causes of construction cost escalations can be numerous and any effort to ascertain them in order to explain regional disparities requires that all the major construction cost components affected by the increase must first be recognized. Imprecise concepts and categories as well as mix-up of what constitutes cost or price makes it difficult to systematically identify these cost constituents. The aim of this paper is to synthesize these concepts and systematize the factors that determine construction cost factors in a way that makes it easier to tackle the issue of Swedish regional construction cost escalation differences. The factors influencing construction costs were divided into four groups/layers based on the extent to which the construction actors, especially contractors and clients, could influence the factors; project-specific factors, client-contractor related factors, competition and market conditions, and macroeconomic and political factors. Factors in the first and final groups may not contribute valuable analysis that explains the regional construction costs differences. The other two groups of factors; client and contractor-related factors and competition and market conditions could have huge influences on construction costs and hence could explain different construction costs increase observed between metropolitan and smaller regions in Sweden.

Keywords: Construction costs, direct and indirect costs, cost overrun, cost escalation.

1. Introduction

While there is no notable disagreement about the consequences of high construction costs, much of the difference of opinions arises from the question of the real causes of higher construction costs (Saukkoriipi and Josephson, 2003). European Commission report (2003) emphasizes the consequences of this high construction cost on certain cities of Sweden by referring to the latest housing market survey of the Swedish Department of Housing that states that Sweden's commercial centers (e.g. Stockholm, Gothenburg, Malmö) suffer from an acute shortage of housing, and lack of student accommodation at university sites. One reason given for the low level of construction in Sweden was that the present production cost makes it almost impossible to build rental housing and make a profit. Interviews with municipalities (Boverket, 2003) indicate that many of them (over 80%) believe that higher production cost is one of the major obstacles in housing construction.

Large cities are often associated with higher living expenses for workers and thus commensurate with higher wages. Shortage of easily constructible land, constrained construction-site accessibility that could increase material delivery costs as well as demand for on-site specific construction equipments and techniques due to close proximity of other buildings may also raise the level of building cost in many major cities. Thus, it is reasonable to assume that, in normal circumstances, large cities will experience higher construction costs as compared to small or medium sized cities. Thus, the central question in this research project is not to analyse differences in construction costs between various regions, but instead to focus on differences in the *increases in production costs* that have been observed in the various regions in Sweden in recent years.

In order to address the reasons behind this disparity among the regions, it is imperative to identify the factors that could influence costs and their effect on the various construction cost components. Constituents of construction costs are numerous and the impact of individual components on the total construction costs is much related to the prevailing economic conditions, supplier structure and the size of the market.

Furthermore, the uniqueness of building projects as a product with distinct location, ownership, and amenities together with a construction team that changes regularly, demands that both project-specific factors as well as the environment in which the project is carried out must be considered in the analysis. The levels of competition and construction activity do not only influence the availability of the input sources and their prices but it could also influence the behaviour of construction parties in terms of relationship and transaction costs.

It is also important to elucidate the distinction between costs and price, which is ostensibly one of the sources of disagreements of what makes up construction costs. What is considered cost by one of the actors in the building process might be regarded as price for another actor.

The objective of this paper is threefold.

- To describe some of the conceptual mix-ups in the construction cost debate such as cost and price as well as various types of costs in relation to the components of construction cost structure.
- To discuss factors that could have impact on the level of the cost components and examine how these factors could cause contrasting regional cost escalations.
- To put forward a model of possible causes of the observed construction cost escalation among the regions.

The paper is organized as follows: The distinction between cost and price in relation to different stages of the building process will be reviewed in the second section. There the meanings of price and cost are described followed by a brief discussion of how price-cost is treated in different supplier structures. Review of factors that are considered as construction costs and factors that influence construction costs are examined in sections three and four respectively. A framework that will be used in later parts of the research project is presented in section four. Section five focuses on the implications of the ascribed factors on the regional cost differences. The final section contains concluding comments.

2. The Cost – price distinction

Before we embark on examining construction cost constituents and factors that affect them, it is noteworthy to point out that a lot of literature on construction there is an unclear distinction between the words price and cost. The two words became synonymous and a source of confusion in construction contexts such as i.e. cost estimating, pricing, building cost or building price. Unambiguous definition of construction costs not only helps to identify relevant elements of construction costs and who incurred those costs but also facilitates the identification of factors that affect construction costs. For instance, whether the land cost is a part of the construction costs or a separate item is very essential in determining not only who incurred these costs (developer or contractor) but also its influences on the total production costs especially when the contractor also acts as a developer.

Fleming (1965) draws a distinction between building prices and building costs by referring to the building prices as the market price for building work payable by a client and the building costs as the costs incurred by a contractor in carrying out work. Building price reflects variation in profits whilst building cost does not. Another way to describe the relation between the concepts is to say that building costs can be estimated and described in two ways. One is the price charged for the finished building - building price according to Fleming - and the other is the cost of the resources to create it (Ferry et al, 1999) - building cost according to Fleming. The seller's price is a buyer's cost, such that the contractor's price is the client's cost while the subcontractor's price is the contractor's cost.

Duncan (1996) contends that care should be taken to distinguish cost estimating from pricing when a project is performed under a contract. He argues that pricing is the business decision that uses cost estimate as one of many considerations. But when the contractor also acts as a developer, or when a developer sells the finished project to the final user, land prices and other developer's overhead costs are included in the transaction and often are called price rather than cost. Bowen and Edwards (1985) describe a situation where the price and cost differentiation is crucial. They contend that price always reflects some consideration of profits while the term cost does not always do this.

In the empirical part of this research, rental apartment projects are the centre of attention and in these projects developers use independent contractors who charge construction cost plus some profit margin. In such a case construction price is the logical concept to use. The developer's overhead is also not easy to identity, as a number of overheads within an organization have to be divided between projects. Since our intention is to investigate the construction cost increases in the various regions of Sweden where many contractors also act as developers, the use of the words *cost* and *price* will depend upon the market structure and the specific question asked. The next section will start by trying to identify components of the construction cost/price that are charged by the contractor to the developer.

3. Construction costs categories and components

3.1 Cost categories

Having discussed the difference between price and cost in the previous section, further clarification of the word "cost" itself is indeed necessary in order to be able to identify whether a specific cost element is quantity, location, or time dependent. In accounting circles, the word "cost" is seldom used without qualifying adjectives and hence different kinds of cost must be clearly expelled out (Lock, 2003).

There are some costs that are simply recognizable and self-explanatory that relate to a specific item or product such as labour or material costs. Thus, they have been termed as *direct costs.* Other costs that are neither specific nor easily identifiable, i.e. overhead costs are often labelled as *indirect costs*. Carr (1989) define direct cost as the costs that are not counted if the activity has not been performed and indirect costs as the ones that would have occurred even if an activity had not been performed. Materials, labour, and equipment qualify as direct costs because of their physical traceability to the construction activity taken place while project and general overhead, and (perhaps) profits are indirect costs. Indirect costs are also those small costs that would be direct except that assigning them to activities is not economical (Carr,

1989). Ferry et al (1999) did not consider profit[1] as part of the contractor's costs. They see it as the difference between the builders' cost and the client's price. Akintoye and Skitmore (1991) regard the mark-up as a prior estimate of profitability.

Variable and *fixed* costs are two often-used terms in the construction literature that relate to direct and indirect costs respectively in an unclear way. While the distinction of direct and indirect costs depends much on traceability of specific cost to a particular activity, variable and fixed costs emphasise the rate at which different costs vary when the level of the work activity changes. Costs that remain virtually unchanged and continue to be incurred even though the workload might fluctuate between extreme limits are termed as fixed costs (Lock, 2003). Indirect costs usually represent the largest component of fixed costs. To the contrary, variable costs are typically confined to the direct costs and their rate of incurrence depends on the level of work activity. Stewart (1982) claims that fixed costs are only truly fixed over a given range of output because of the inflation that swells the operating and general overhead costs over time.

More broadly defined and less used construction cost terms are *hard* and *soft* costs. Geltner and Miller (2001) describe the former as direct costs of the physical components of the construction project such as land cost, labour, material and equipment, developer fees, construction management, and overhead costs. The soft costs included cost of design, legal, and financing.

Most of the components of construction costs are integrated in the above cost related sets of terms and some authors have tried to quantify them and put a figure on the different weights of these components in the total construction costs. Labour and materials costs have not only been prominently cited as components in the construction cost structure but they have also been tagged as the largest proportions in the total construction costs. Bertelsen and Nielsen (1997) mention that in Denmark the typical building costs for social housing schemes can be divided as follows; materials 50 percent, labour 30 percent, heavy equipment 5 percent, construction management and supervision absorbs the other 15 percent. The Construction commission (SBI:s Byggkommisionen 2002) reports that construction materials were approximately 40 percent of contractors' costs in multi-family housing projects though this figure could be lower due to discounts on bulk material. Construction materials account for over half of the final cost of housebuilding while the cost of labour account for less than third, and overheads and profit stand for the rest (Stone and Reiners, 1954).

Adams' (1975) study that examines residential construction industry in the early nineteenth century not only supports the importance of labour and material costs in the total construction costs scheme but it also highlights the ambiguity surrounding the inclusion of other elements in the construction costs structure. He mentions that a simple labour-material breakdown in

[1] Mark-up rather than profit is used when site overheads are excluded in the indirect costs (Tah et al, 1994)

1859 of all construction projects surveyed indicated that 56 percent of total costs were attributable to direct, on site, labour costs and 44 percent to materials. Beyond the labour-material structure of the construction costs, Adams (1975) counted overhead and profit in labour costs in the 1959-1962 figures (it is not clear whether he included it in the 1859 figures). However, Xiao and Proverbs (2002) in their comparative analysis of the performance of contractors in three countries used unit price that is composed of labour, materials, plant, overheads and profits as separate percentage components. Adams was surprised to find out that the 1959-1962 cost structures was similar to those of the early century in terms of the total breakdown of costs between labour and materials (52 and 47 percent respectively). His data show that there has been very little basic change in cost structure of residential building over a period of almost two centuries. He concluded that the cost structure of the industry has been stable for on site building over a long period of time.

Labour and materials costs alone would not provide an accurate picture of the movement of total construction costs (Adams, 1975). Wigren (1995) tries to separate construction costs changes into three main components; change *in factor prices, in quality, and in efficiency*. He uses a factor price index that measures price changes of all factors of production i.e. wages, prices of different kinds of building materials, transport costs, interest, value added tax, etc. However, the index was not constructed to measure regional cost changes.

Table 1: *Cost terms and comments*

Pairs of cost terms	**Emphasis is on:**	**Cost Items**
Direct and Indirect costs *Comment:* more comprehensive when other elements such as subcontractor's costs is included	Traceability and the ease of identifying items	Input sources, equipments, overheads and profits
Variable and fixed costs *Comment:* fixed or not fixed is matter of time due to inflation.	How the cost of input changes when the rate of activity changes.	Similar to direct and indirect costs but they are connected to them in unclear way.
Hard and soft costs *Comment:* very broad definition	Phase of the construction process and developer's costs.	Land cost and developers' fee is added as well as legal and administration fees.

As the above table demonstrates, various cost concepts encompass the many items in the construction cost structure. The problem is that some important factors such as subcontractors' costs are left out of the picture while the inclusion of others such as land cost re-introduces the debate of who is incurring what cost. In the next section, we will try to expand the direct and indirect cost elements in a way that would allow us to delineate the cost that is charged to developers by the contractors.

3.2 More detailed divisions into cost components

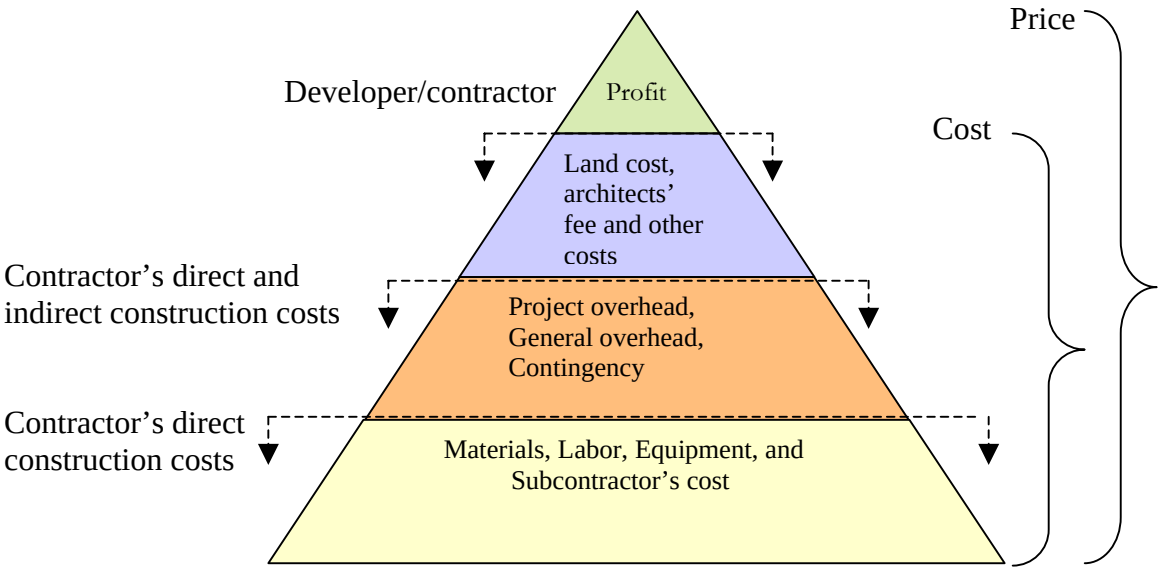
Many authors have expanded the cost structure beyond labour-material breakdown and have identified construction cost components with respect to which actor incurred the cost and how the costs have been accounted for. They also underline the uneasiness of describing construction cost elements with certainty. Meikle (2001) states that a contractor's construction costs are not generally known and describes them as an aggregate of the costs of materials, labour, and equipment to undertake the work and the contractor's finance, management and various site and office overheads. The contractor then charges these costs plus a margin profit to the developer. When the developer's cost is added then its called the total costs of the production factors (Jagren, 2003). The level of the project costs is dependent on whether the analysis is based on contractor or developer's estimation and the two estimations differ because of the extra costs incurred by the developer such as land cost, finance, etc. Berger (2004) argues that often when we say construction cost we mean total production costs while the term production cost refers to the sum of land cost and construction costs. Construction cost means cost for erecting buildings and construction components but excludes the land cost.

It is also difficult and subjective when one tries to differentiate direct and indirect cost elements from the tender price (Tah et al, 1994) but one can simply define these costs in terms of their tractability to the specific work. Tah et al (1994) note similar components of direct and indirect cost as Carr (1989) but they also include subcontractors' costs as part of the direct cost and allowances for risk as part of the indirect costs. Akintoye (2000) also considers subcontractor costs as a factor of production just like labour, material and equipment. He argues that it is often the case that subcontractors carry out more than 50% of the work of any particular project and hence the main contractors include subcontractors' prices in their estimation.

When the developer and the contractor are part of the same organization there is no overt price determination for the project (Hillebrandt, 2000) hence cost and price separation becomes hard since the required level of profits and various overheads are not easily determined. Indeed, this has been one of the sources of confusion in the distinction of the two words – cost and price - as we have discussed earlier. The profit of the contractor is counted at the developer's level for a vertically integrated firm. If the developer and the contractor were separate, then the contractor's direct and indirect cost plus his profit would be the cost charged by the contractor to the developer. Subsequently, the developer's cost plus the profit that the developer seeks will equal the price charged to the final owner if the final product is sold to a new owner. In the residential rental market the developer and owner are, however, often same entity.

The following figure depicts the cost and/or price structure of a building project when the developer and the contractor are the same.

Fig. 1: *Price/Cost structure of a generic building project*



This categorization of the final total construction costs is not much different from the total construction cost that is typically measured in the following two ways: The Input approach where the costs of all the components required to build a dwelling are summed up to give the total cost or the output models that are based around the final prices/costs of dwellings produced by construction companies (DTZ Research, 2004). The main difference between the input approach and the above pyramid of cost structure is that the input model, and similarly the input price index do not take into consideration the productivity and profit margins of the contractor.

Fleming (1966) asserts that one way to ascertain the constituents of price is through labour and materials cost indices that may or may not incorporate some allowance for changes in productivity, overheads, and profits. Interestingly, in relation to the discussion about costs and prices, Fleming emphasises that failure to allow for changes in profits means that the index will be insensitive to changes in market conditions and will be a measure of costs rather than prices.

Table 2: *A short Summary of the construction cost component*

Author	Components	Comments
Adams, R. (1965)	Labour and material as well as overhead and profits.	Includes profits and overhead cost in the labour cost
Carr (1989)	Direct costs: labour, material, and equipment. Indirect costs; project overhead, general overhead, and profit	Did not include subcontractor's costs in the direct/indirect costs of the contractor. Considers project overhead as indirect costs.
Tah et al (1994) and Akintoye (2000)	Similar as Carr (1989) plus subcontractor's costs and risk allowance as indirect cost component.	Define mark-up as indirect costs without site overhead.
Jagren (2003)	Material, labour, equipment, transportation utility, electrical power, and overhead costs.	Emphasize the difference between total production costs and construction costs.

Cost components that are identified by the above listed authors are not necessarily an exhaustive cost structure. However, it is evident that the constituents of construction cost have changed over time; from Adams' simple labour-material break down to Jagrens' multi-itemized components. The significance of the inclusion of the different cost elements in the cost structure pertains to the scope of our analysis which is identifying factors that could be associated with cost increase differences among the regions. The direct and indirect costs components stated by Tah et al (1994) and Akintoye (2000) seems to be suitable in our analysis since it is neither too broad to include elements that have some trivial regional cost differences, such as electrical power, nor too concise to limit labour-material cost structure. Most of the major components i.e. labour, materials, subcontractor's costs, overheads, and profits can be found in their cost structure.

4. Factors influencing construction costs: A framework

Factors that could influence or determine the magnitude of construction costs are numerous. Chan and Park (2005) state that cost is affected by a large numbers of factors because of the fact that construction is a multidisciplinary industry and its work involve many parties such as the owner and various professionals, contractors and suppliers. Thus, a project cost not only

depends on a single factor but a cluster of variables that are related to the characteristics of the project and to the construction team as well as the market conditions.

Generally, construction cost increases for the developer can arise in two situations (Donner, 2000). The first is when unexpected events or actions occur that forces costs to increase for the project as a whole and where the risk is already allocated in advance. Ferry et al (1999) describes this form of risk allocation as contingencies and it is an amount the contractor is instructed to add to his tender as a cushion to absorb unforeseen extras. Though an adequate amount of risk allowance is estimated to be around 5% of the above-the-line cost for projects that does not entail excessive degree of risk (Lock, 2003). Performance on previous projects and the level of market competition dictate how much allowance to allocate for covering unforeseen conditions. This situation is often caused by factors that are beyond contractors or developers' control such as inflation. The second situation comes up when an unexpected event occurs but where the risk allocation is not specified in advance and the extra costs will depend on the bargaining power and anticipation of other party's behaviour.

4.1 Cost overruns and cost escalations

One may need to take up the question of whether a cost increase during a project can be categorized as cost overrun or a cost escalation. Basically, a distinction between the two terms is crucial in order to understand whether the cost increase experienced by a specific project is attributable to cost overruns that are particular to that project or that it could be characterized as cost escalation, which is a situation when costs change over time for similar projects in a region.

Cost escalation and cost overruns are often used interchangeably in the construction literature and pose some difficultness if one needs to know precisely the cause and the factors that are escalated. On one hand, cost escalation is usually attributed many factors pertaining to both the original cost estimate (Stewart, 1982) and to unforeseen overruns during construction, which indicates that cost overrun is one of the factors that are behind construction costs escalations. On the other hand, cost overruns among other factors are often caused by the escalation of the unit price of resources such as labour and materials.

Cost overrun, when the final cost of the project exceeds the original estimates (Avots, 1983), can be considered as an idiosyncratic or a unique cost increase. It is difficult to take a broad view of its occurrences in any specific city or region because of the uniqueness of the project in terms of architecture, geological, client quality requirements, and the efficiency of the actors in the building process, etc. Contractor-specific factors such as type of contract and context of contract contribute the magnitude of contractor's cost overburden when a cost overrun occurs (Akinci and Fischer, 1998). Some of the most referred anomalies in the construction costs are delay of project start or delay of completion that cause unexpected cost

increase, quality deficiency that could trigger disputes and repair costs, and cost increases due to factor prices or an unforeseen situation that could introduce extra costs. Koushki et al (2005) identified several factors that cause delays and cost increases in the construction of private residential projects in Kuwait. Changed orders, financial constraints and owner's lack of experience in construction were the main causes of time-delays while contractor-related problems, material-related problems and financial constraints were the main causes of cost-overruns.

A cost escalation is defined "as the increase in any element of project costs when the cost of that element is compared between two different periods" (Lock, 2003). Davey (2000) and Stewart (1982) present factors that could be attributed to cost escalation though they are difficult to be categorized as cost overruns or cost escalation. Davey (2000) states that cost escalation causes fall into five categories:

1. Changes to requirements often initiated by the costumer
2. Technology costs arising from eagerness to use latest technology,
3. Changing quotations
4. Impact of risk by adding allowances to prevent excessive costs and expected outcomes
5. Organizational stability as a result of project team or work breakdown.

The last three factors could be the result of changing market conditions where unit prices are rising; uncertain outcomes that increases the amount or risk allowance added to the estimated cost; and that mergers or takeovers between struggling and flourishing firms took place.

Meanwhile, Stewart (1982) attributes cost escalations to several factors that are either not controllable or that to a varying degree are manageable. They include the accuracy of original cost estimate, degree of government regulation and control, construction completion delays, number of design changes, and labour related matters such as their availability, skills, and increases in fringe benefits. He claims that generally cost escalation above the inflation rate is a combination of underestimating the amount of work that *would* be needed to undertake the project and overrunning the amount of work that it *should* have taken to do the job. Notice that the factors that Stewart mentions cover both cost overruns and cost escalations according to the definition above.

4.2 A Framework of influencing factors

Most of the significant factors affecting project costs are qualitative such as client priority on construction time, contractor's planning capability, procurement methods and market conditions including the level of construction activity (Elhag et al, 2005). Technological and project design, contractor's expertise and management ability, and the client's desired level of construction sophistication play an important role in determining the cost of the project. Gyourko and Saiz (2005) in their investigation on construction costs and the supply of

housing mention some potential factors that can explain differences in construction costs across U.S. housing markets. The extent of unionization within the construction sector, local wages, topography of the area, and local regulatory environment cause higher costs according to their study.

Construction cost increases seem to materialize after the commencement of the construction but the problem is deep-rooted during contract estimation and tendering stage. Wallström (1985) claims that according to Sjögren (1980), ninety-five percent of the final cost of the construction is fixed before even the construction phase started. Akinci and Fischer (1998) separate factors affecting cost estimates of project from those affecting final cost projects. Factors that affect cost estimates are estimator-specific factors, and design and project specific factors (vagueness in scope, design complexity, and project size). Factors that affect the total cost incurred at the end of project and that increase the gap between the actual cost and the estimated cost of a project are also gathered into two major groups: *Construction specific factors as well as economic* and *political environment-specific factors*. The former includes unknown geological conditions, weather conditions, and client- and subcontractor generated risk factors. Contractor-specific factors affect the allocation of risk between the owner and the contractor and specifically contract clauses may result in ambiguity and disputes that could decrease the cost effectiveness in a project (Akinci and Fischer, 1998).

Similarly, Akintoye (2000) presents twenty-four variables that affect the project cost estimation and he grouped them in seven areas. Some of them may also have an impact on the final construction costs. The seven factors are *Project complexity, technological requirements, project information, project team requirement, contract requirement, project duration, and market requirement.* Shash and Abdul-Hadi (1992) also presented thirty-seven factors affecting contractor's mark-up decision in Saudi Arabia. They found that the size of a project was the most heavily contemplated factor among these factors when contractors are deciding the mark-up for a project.

Other factors that have been mentioned as affecting the price of the project during construction are the quality and the constructability of the design, managements techniques employed by the contractor, location of the project, and macroeconomic conditions (Williams, 2003). Iyer and Jha (2005) in their analysis of factors affecting cost performance of Indian construction projects state that conflict among project participants, presence of poor project specific attributes, hostile socio economic relations and climatic conditions, aggressive competition at tender stage, and short bid preparation time adversely affect construction costs. They indicated that coordination among project participants was the most significant of all factors having maximum positive influence on cost performance.

In a follow-up study, Shash and Abdul-Hadi (1993) discussed how pre-qualification requirements might give contractors valuable information in evaluating the level of

competitiveness. They assert that if pre-qualification requirements limit the contractors who can bid for the project to certain class or grade, contractors may have the ability to reasonably estimate the number of bidders and their identity, which in turn can affect the level of their bids. Mochtar and Arditi (2001) state that this type of mark up decision assessment, that includes learning about competitors' identity and how many of them there are, may help the bidder to determine the severity of the competition and accordingly in setting the optimum mark-up that maximizes expected profit and the chance of winning the project. How the client designs the bid process may therefore be one factor that affects the price/cost.

In order to carefully analyze these numerous and non-easily quantifiable factors influencing construction costs, four groups of factors were formed based on the extent to which factors could be influenced by the construction actors especially contractors and clients (see Table 3).

Table 3: *four groups of factors influencing construction costs*

	Factors influencing construction costs: Examples
1. Project-specific factors	- Project size - Project complexity - Quality
2. Client and contractor-related factors	- Contractor type * - Client type ** - Procurement method - Contractor-client relationship
3. Competition and Market conditions	- Level of competition - Level of construction activity
4. Macroeconomic and political factors	- Inflation and interest rate - General labour market rules and other government regulations

* Large, medium or small
** For example public or private

By aggregating many factors influencing construction costs into four groupings, one can determine which type of factor or layer to focus on. In the next step a detailed analysis of a specific interesting areas could be made. This more structured approach will later be used in the analysis of construction cost escalation disparities among the regions.

The *project-specific* layer contains factors that are considered to be related to a particular project such as the size, the complexity and the required quality of the project. Here, client quality requirements and project characteristics are in the hands of the clients and they are

often subjected to pre-requisites that contractors must comply with. Furthermore, the size and complexity of the project affect the organizational structure of the contractor and the project work breakdown unit costs as well as duration of the project (Akintoye, 2000). Size of the contract is clearly a major determinant of the number of firms who can undertake the work (Hillebrandt, 2000). A large project requires more of all inputs than a small project and only some of the total contractors in the country have the capital, management, and other scarce inputs to carry out such a project. Besides, there is evidence that for main contractors labour expenditure required per unit of work decreases when the size of the contract increases (Stone and Reiner, 1985). According to the same source, the size of the contract does not appear to have any marked effect on the labour expenditure of subcontractors.

The size of the contract also affects the overhead percentage that contractors charge the developer. Contractors adjust the general or company overhead base to the nature of the contract, the size and complexity of the project, the contractor's need for work, and contractor's experience with the client or the number of contractors competing to win the project (Assaf et al, 2001). The adjustment may take the form of penetration strategy where contractor lowers the profit margin in order to outbid other competitors that are entrenched in the specific market (Mochtar and Arditi, 2001). Project-specific factors may favour certain contractors who have the capability to undertake the tendered project and thus limit the competition (this issue will be discussed later in other parts of the research).

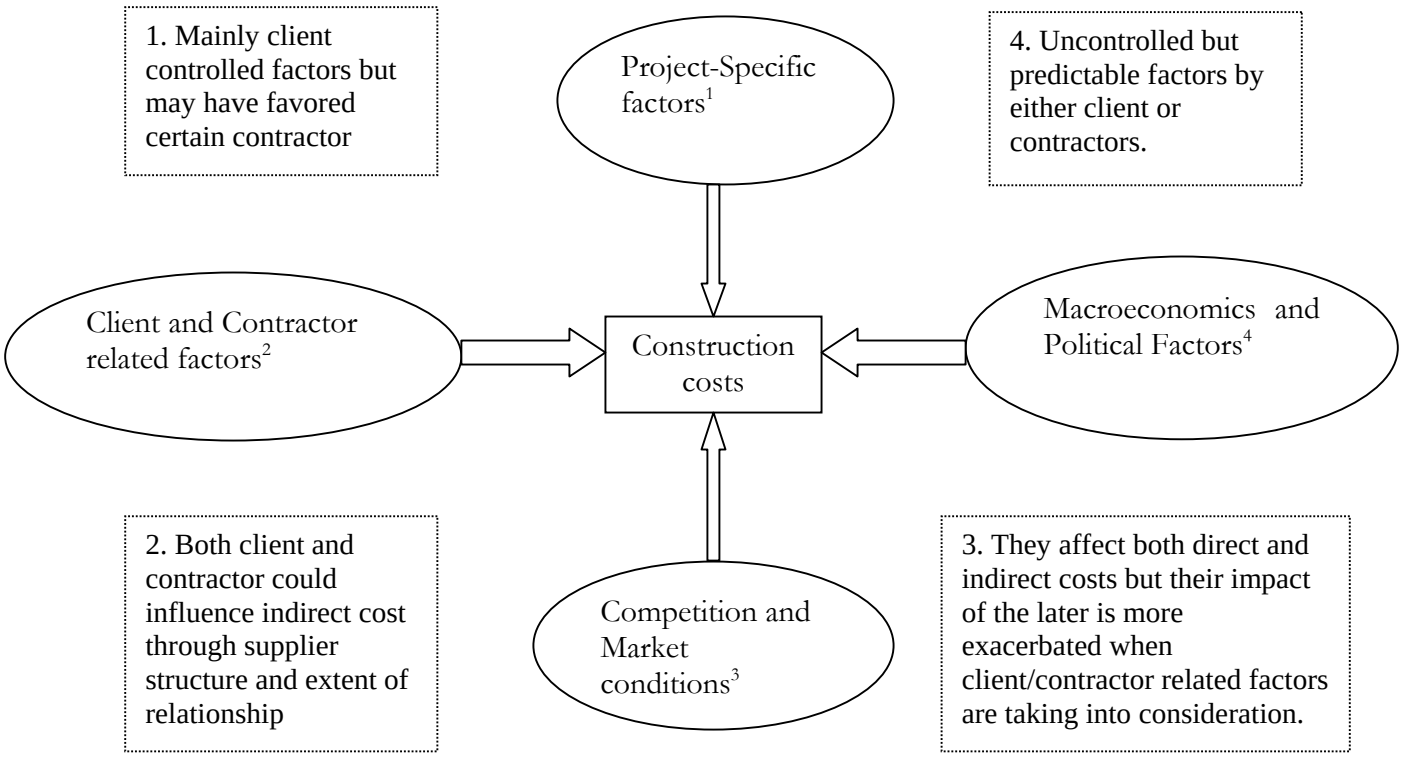
Factors in the *client and contractor related factors* layer are of a qualitative nature with the exception of the contractor type. Large contractors can maintain sizeable manpower and machinery and obtain discounted construction materials. Stone and Reiners (1954) draw a connection between contract size and the size of contractors. They state that only the largest firm normally undertakes the largest contracts, while both small and large firms undertake the small contracts. When a contractor believes that it possess a competitive advantage over the other bidders in terms of delivering the owner's most important requirements, the company tends to practice what Mochtar and Arditi (2001) termed as "skimming" where the bid offer is relatively higher than the figure a market normally would allow.

Risk allowances and mark-ups charged by contractors may depend on whether the client is a private or a public entity. Hendrickson and Au (2003) claim that contractors may tend to submit high bids for public projects in order to compensate for the bureaucratic and restrictive contract terms. Different procurement methods intend to fulfil different objectives; cost level certainty, completion time, quality work, etc. Municipal companies are subject to competition regulations and other constrains that favour certain contract form and procurements methods i.e. all-in-one or general contract and fix price. Contractor-client relationship, for example whether there exist long-run relationships or partnering relations between the parties can be important for what happens in changing economic conditions.

The competition and market condition layer comprises factors that are difficult to control by the contractor and client but that can have a huge impact on contractor's costs and mark-ups. An unstable construction market would make it difficult for contractors to decide on the optimal level of overhead costs that enables contractors to win and efficiently administer projects. Similarly, the intensity of competition that contractors confront affects their bidding strategies. More competition encourages many contractors to tender any contract and also makes it difficult for contractors to develop a clear and decisive strategy (Drew and Skitmore, 2001). This especially concerns the mark-up level that would allow a contractor to win the tender at a profit margin that is in line with the strategic position of the firm in that market (Akintoye, 2000).

Macroeconomic and political factors such as inflation and interest rate fluctuations as well as labour laws, general labour conflict and building regulations can impose heavy costs and delays in a building projects. Direct costs are affected by the unit price increases while the influence of these factors on indirect costs often is through overhead costs. Generally, overhead costs are calculated as a percentage of direct costs and thus are affected directly by the inflation of unit prices of labour, materials, etc. in addition to other cost increases caused by government regulations. Labour strikes often cause delays that not only result in loss of productivity but also could induce quality deficiencies stemming from hasty job completion of the contractor or subcontractor that could result into repair cost, and disputes. Below is a summary of the four layers showing the influencing factors and their impact on direct and indirect costs.

Figure 2: Layers of determining factors and comments



5. Regional construction costs disparities and possible sources

5.1 Literature review

After we have been able to identify relevant construction cost constituent and factors that affect them, the next step is to discuss possible explanations for cost increases in general and especially for the differences in cost increases between regions. The causes of cost escalation are many and complex, ranging from labour and material inflation to demand and market conditions not to mention government actions and other major events (Capano and Karshenas, 2003). Thus, the regional cost escalation differences could be explained by the inflationary occurrences, as well as escalations associated with, among other things, hot construction market activity, limited competition, and increased quality.

Escalations, which mainly include the increase in the amount of resources in actual or estimated, direct costs of labour and material (Stewart, 1982), are usually treated with provisions and some form of compensation that considers price level changes over time. Labour cost is one of the most contentious factors among all the factors that affect construction costs and the debate evolves around the role of labour changes, their level of skill and productivity, unionized or non-unionized, and labour and employment laws. Vermande and Mulligan (1999) argue that buildings are produced and consumed locally, and that the proportion of input products i.e. labour costs and the costs of raw materials (around 60% of the output) are only to a small degree involved in external trade. Meikle (2001) makes same argument that the construction price differences that existed in UK regions were attributed partially to the local resource costs (labour and material) and partially to differences in demand. Gibb (1999) states that in the labour market, craftsmen and labour-only subcontractors tend to operate within the limited geographic market areas, with only site management being more likely to work across regions. He concludes that labour and management issues that arise from specific building techniques are not relevant as a source of regional differentiation and that the same is true for many human relation issues that also are country wide (taxation, employment law, etc.).

In Sweden, a recent survey conducted by Bodsten (2006) indicates that the majority of the contractors and developers that were interviewed believe that labour wage differences (5-15 percent) exist among the regions in Sweden. The responses regarding the construction material prices were mixed but the majority of the developers believe that there is less than five percent regional price differences as compared to a majority of the contractors who believe that there is more than fifteen percent difference. Factors such as inflation and interest rate have huge impact on construction costs, especially the unit prices of all inputs, but their effects is national and are not confounded in a specific region.

Two other factors that often are mentioned in the construction costs debate are the quality of the buildings and labour productivity. Meikle (2001) asserts that neither qualitative nor productivity improvements contribute significantly to the long-term differences in price trends. Other authors consider quality changes as a major contributor to construction costs increase. Higher standard and improved quality of housing could be the cause of the higher construction cost in recent years in Sweden (Lind, 2003) though the construction cost of specific housing standard increased dramatically during the same period in some regions probably because of demand factors. Barlow and King (1992) also state that quality changes probably account for two-thirds of the cost increase in apartment construction in the early eighties. However, they also claim that a general rise in construction costs in metropolitan regions in late eighties was largely a result of overheating in the commercial sector. Gibb quotes from Ball (1996) that there is quite strong evidence that industrial and commercial building crowds out house building by competing away building inputs in the expanding regions.

An important factor that Bodsten (2006) speculates about is that vertically integrated contractors have some control on input materials such as concrete, asphalt, and gravel that could be used as price mechanism against small contractors when the latter wins the tender. This control method can be seen as a result of backward vertical integration where the firms that owns the input resources or have some sort of agreement with the suppliers of these inputs that compel suppliers to exclude selling the inputs to competitors or sell with higher prices which would make it unfeasible for competitors to use it. As the level of vertical integration, and the access to external or foreign suppliers can differ between regions, this can also affect regional construction cost. We will return to this issue later.

5.2 Data for analysing regional differences in cost increases

Projects differ in terms of location, size, complexity, and ownership. These unique characteristics coupled with local economic conditions and the levels of construction activities have bearing on construction costs. The actors in the building projects have diverse objectives i.e. contractors tend to maximise profits while the developers strive to minimise costs with time and quality constraints. These divergent goals and the immobility of buildings as well as the local market conditions and contractor/client type could definitely determine how the initial costs get estimated as well as the final level of construction costs. Contractors and clients have different latitude influencing these four groups of factors mentioned above.

Project-specific factors are dictated by project location differences and client requirements. These factors are mostly known before the tender is finalized and they are subjected to pre-requisite and thorough cost estimation process. In Sweden, municipal housing companies dominate the rental market in most cities and the project design and estimations are carried out by outside professionals. There could be a time lag between when documents are prepared

and when the final contactor is chosen. However, there is no evidence that different regions practice different estimation methods that could cause cost escalation of input sources such as labour and materials. With regard to quality and complexity of projects, Bodsten (2006) notes that the contractors and the developers interviewed do not believe that quality and construction techniques were important factors explaining construction cost differences among the Swedish regions.

Project-specific factors have more influence on direct cost than client-contractor related factors, which have bigger impact on indirect costs. It is reasonable to assume that the issues related to the direct costs are mainly dealt with locally. Import of materials and labour mobility may resolve shortages of resources. Thus, the indirect cost analysis will be addressed when client-contractor related factors are discussed.

Factors such as inflation and labour strikes that are included in the macroeconomic and political layer could affect unit prices of labour and material. There are few or no available input sources data in Sweden at the regional level except salary tabulations (see table 4).

Table 4: *Changes of labour earnings in both incentive and time wageworkers of several cities 1997-2004.*

	Earnings	**Incentive wage**	**Time wage**
Stockholm	25,9%	18,5%	22,1%
Malmö	13,2%	18,8%	13,8%
Göteborg	27,2%	23,6%	25,3%
Örebro	22,4%	19,0%	18,9%
Jönköping	26,2%	23,0%	22,4%
Linköping	39,4%	24,0%	27,4%
Umeå	21,8%	20,5%	19,2%

Source: Svenska Byggnadsarbetarförbundet

The table shows that there are no systematic differences of the labour salaries between Stockholm and four of the cities (Örebro, Jönköping, Linköping and Umeå) that will be part of the empirical study. The above table is used to indicate the relative lack of systematic differences in the labour salaries. However, the reliability and usefulness of the numbers on the table can also be questioned since salaries of plumbers and electricians are not included in the table, and because union or non-union classifications were not considered. The factor price index compiled by the Swedish Statistics Bureau (SCB) does not decompose cost components by regional level and also does not include profits and productivity measures which make it difficult, if not impossible, to undertake a meaningful comparison of unit price changes.

5.3 Focus in the empirical research

Three of the four factors among the client-contractor related factors described above apparently could be found in each region. Contractor and client type as well as procurement method do not differ greatly between metropolitan and small regions. The four large Swedish contractors operate in most of the regions and their clients on the residential projects are municipal companies that usually procure these projects with fixed price contracts. The common contract method is also either general or all-in-one contract form (see paper 3 for some recent trends).

Client-contractor relationship is the only factor in this layer that presumably influences construction costs through indirect cost components where a long run and strong past relationship between the parties could reduce transaction costs and the incentive to price according to current demand.

Client-contractor related factors are very susceptible to the level of competition and the intensity of construction activity. The level of competition and construction activity influences the cost of inputs and could also have an enormous impact on indirect costs. Competition level is a function of the number of contractors in the market as well as the size of the firms operating in that region. As we have mentioned earlier, a few large firms dominate Swedish housebuilding market and most of them are active as developers and contractors. A region with low competition and high demand of contractors' services may encourage opportunistic behaviour that could increase construction cost. The opposite situation of high competition and low demand could bolster clients' negotiation position to solicit lower construction costs. One of the hypotheses that this research is investigated is that a region with high concentration of vertically integrated firms would have higher construction costs and the empirical part of the research will try to test it by soliciting developers' views on this proposition.

Incongruence of objectives of the contractor and client as well as local market conditions and contractor/client related factors might determine how the initial costs get estimated and the level of final construction costs. The type and structure of client and contractor concurrently with the intensity of construction activities in various regions could influence the kind of relationship between the contracting parties and could result in a change in transaction costs. In order to procure specified project with clients' cost and quality desires and at the same time providing contractors with a reasonable profit margin, market and non-market contracting become the two possible strategies to rely upon.

The first strategy is when the parties in the building process hinge on market contracting in which arm's length contracts with the provision of every predictable outcome are practised. With human bounded rationality and complexity of building projects, unforeseen events and

variations are inevitable to encounter. This leads to confrontation and adversarial relationship that ultimately introduce higher construction and transaction costs as a result of repair cost due to any mis-specified or deficient quality, and monitoring cost in order to ensure that what is promised is delivered, as well as cost of litigations.

The second strategy is that of when construction parties transact with a non-market contracting strategy where trust and past working relationships as well as long-run relationships are the established rules of contracting. Contractors expect that clients will treat them fairly and not only provide satisfactory profits but will consider or even secure them prospect workload in exchange of lower or unreasonable non-escalating construction costs. Thus, a thorough investigation of the strength of the relationship between actors in the building process and the nature of supplier structure could provide an explanation of construction costs disparities observed among the regions.

The empirical part of this research will focus on how long-run relationship between contractors and developers (clients) in the presence of lower competition and higher construction activity could influence the construction costs. In other words, can the type of relationship between the parties explain at least part of the observed regional construction cost disparities?

Furthermore, it will be examined whether vertically integrated contractors can be another part of the explanation of the cost escalation differences among the regions. Respondents' perception of whether the vertically integrated contractors tender higher price is sought after. That could help us to conjecture the form of relationship and the direction of correlation among vertical integration, construction cost levels, and local externalities such as the level of competition and construction activity

6. Conclusions

This paper was intended to lay the foundation for an analysis of construction cost differences among the regions by synthesizing various cost concepts and shedding light on some of the confusions inherited from ambiguous cost related terminology. The harmonization of these concepts and cost categories as well as the clarification of important terms can be seen as step forward contribution that will smooth the progress of identifying the factors affecting the construction costs that could ultimately explain the cost escalation differences among the Swedish regions. A direct and indirect cost structure seems to include most of the cost components incurred by the various actors in the construction process and indeed enhances the distinction between cost and price in relation to supplier structure. The two words have similar meanings when a contractor also acts as a developer since various overheads and

profits then are inseparable from the cost structure. When they are separate entities, contractors price that includes construction costs plus his profit becomes the developer's costs.

Factors that affect construction cost levels were grouped into four layers

1. Project-specific factors
2. Client-contractor related factors
3. Competition and market conditions
4. Macroeconomic and political factors

The first is Project-specific factors such as size, quality, and complexity of the project that can be unique for the particular project and are dictated by the individual client requirements. The second is client-contractor related factors that could influence indirect costs through supplier structure and extent of relationship. This layer comprises qualitative factors such are contractor and client type, procurement methods, and the client-contractor relationship. The third layer is competition and market conditions that mainly affect construction costs through the factors in the second layer. The final layer contains macroeconomic and political factors that are often uncontrollable but predictable occurrences and are not confined to specific projects in any region.

In the following empirical research the focus in on regional differences in changes in production costs. Factors in layer four could then be disregarded. As the comparison will focus on rather similar rental housing there is also reason to believe that factors in layer one are of small importance. Factors in layer two and three will then remain as the most interesting areas. It has been argued that these layers can be related in the sense the structure of the contractor-client relationship have an impact on how the level of activity on the market will affect costs. The motive for focusing on regional differences in the supply structure is of course also that this is an area that has so far not been analyzed in the Swedish research about differences in cost levels and in cost changes over time.

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Paper 2

Long run relationships, Vertical Integration, and International competition:

Can they contribute to explaining regional construction cost differences?

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Stockholm 2006

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Long run relationships, Vertical Integration, and International competition:

Can they contribute to explaining regional construction cost differences?[♣]

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Abstract

The existence of opportunistic behavior by contractors or sub-contractors in the bidding process encouraged by the governance structure of construction companies as well as the kind of relationship that exist between contractors and clients is thought to have some bearing on the rising construction cost observed in some regions of Sweden. Three hypotheses were formulated concerning the impact that long run relationship between contractors and developers, vertically integrated firms, and the increase of international competition could have on the construction cost increase. The hypotheses were tested by collecting data from a number of projects from six cities in different regions. The semi-structured survey produced inconclusive results. Long run and collaborative relationship was prevalent in small region though respondents in this region did not see a strong connection between construction costs increase levels and the kind of observed relationship. In the Stockholm region short-term relationships were mostly prevalent. Vertical integration and foreign competition impacts on construction costs were not significant in either region.

Keywords: Construction costs, vertical integration, long run relationship, competition

[♣] I am thankful to all the participants of the survey for their contribution and the assistance of Professor Mats Wilhelmsson in analyzing the data.

1. Introduction

Swedish housing construction costs have risen more than the rate of inflation during the last decade. The effect of the construction costs escalation was not evenly felt in all regions and there was also an imbalance of housing stocks in various regions (Atterhög and Lind, 2004). Some regions of the country i.e. metropolitan regions (Stockholm, Gothenburg, and Malmo) experienced soaring construction costs whilst smaller regions had lower construction cost increases (Lind, 2003). The supply of new residential apartments stagnated at the same time as the constructions costs were high, particularly in the metropolitan regions where housing demand was stronger.

There is a large volume of literature dealing with the problems of the high construction cost but only few studies tackle this issue within the context of changing economic conditions and governance structure of construction firms. In order to unearth the roots of construction cost escalating disparities between large and small regions, one can focus solely on the components of construction costs – direct and indirect costs - and anticipate that unit price (labour, materials, and equipments) and overhead costs differences that exist between the regions will explain the observed divergences. The unit price variations between the large and small regions can persist as long as trading of the materials and labour movement are uneconomical. In the absence of any institutional restrictions such as labour regulations and tariffs, construction workers and materials will be constantly and freely transferred from low to higher economic rent places of these resources. Inflation is one general factor that influences the unit prices of construction input resources and only a national measurement of inflation occurrence exist in Sweden but not regional. Thus, a systematic comparative study of regional construction unit prices may be difficult if not impossible.

Another alternative is to examine other factors such as supplier structure and client-contractor relationship as well as competition and expect that some overhead and transaction costs associated with them would explain the differences of cost escalation between the regions. The organization structure of the construction industry as well as competition and level of construction activities encourage opportunistic behavior and market driven attitudes that are detrimental to the development of long-run relationships between the parties and consequently increases construction costs due to the excessive transaction costs.

Many authors agree about the need for new working philosophies and techniques such as those already adopted and refined in other industries. Exploitation of different economic theories coupled with greater understanding of the social behavior has introduced many concepts such as partnering, strategic alliance, relationship marketing, lean production, joint ventures, and globalization of the industry (Latham, 1994; Bresnen and Marshall, 2000). The center of these new ideas is to improve and nurture the relationship between actors in the industry by reducing conflicts, enhancing the quality of the product or service, and ultimately reducing the cost. London and Kenley (2001) stress that improved relationship and integration of key stakeholders are critical to deal with what is perceived as industry's underperformance,

inefficient, fragmented, and wasteful. These two key concepts - relationship and integration – will be the base of our analysis of factors causing regional construction cost escalation disparities.

Against this backdrop, three hypotheses about the implications of supplier structure, the degree of working relationship between contracting parties, and the level of foreign competition on construction costs were put forward.

- *Hypothesis 1*: A long run relationship between contractor and client tends to a lower cost increase during the boom.

- *Hypothesis 2*: If the contractor on the rental housing market is also active as developer on the same market, the construction costs tend to be higher.

- *Hypothesis 3*: If it is easier for foreign suppliers to enter the market, then cost increase will be lower

The aims of this paper are twofold. First, it is intended to ascertain factors that developers perceive to be crucial to the construction cost increases. Second, it tries to evaluate respondent views on factors influencing construction costs based on these hypotheses; long run relationship (henceforth LRR), vertical integration and foreign competition by testing their statistical validity.

The rest of the paper is organized as the following: Section two covers literature review and some brief discussion of the research issues. Methodology and project descriptions are described in section three. Section four contains the presentation and analysis of results of the questionnaire. What the respondents perceive as the causes of construction costs disparities among the regions, especially the responses related to long run relationship between client and contractor, vertical integration, and foreign competitions are treated in this section. Other important factors that were raised in the survey and the summary can be found respectively in the last two sections of this paper.

2. Background: Theory and literature review

2.1 Long Run Relationship

The cyclicality of the construction industry, especially the house building sector plays a big role in determining the longevity of the relationship that exist between contractors and clients, or between contractors and their sub-contractors. A sector study carried out by the NIB Capital Bank (2002) exemplifies how small and medium sized construction companies might

suffer most from the cyclicality and how long-term relationship might provide a solution to fluctuations in demand.

One can argue that relationship and integration are two opposite strategies not complementary ones, if we assume that London and Kenley (2001) imply physical integration of key stakeholders not integration in the sense of cooperation. First, the need for long-term relationship diminishes if the actors in the construction process are integrated and have unified management. Second, in the absence of integrated actors, long or short-term relationship becomes the alternative strategy to successfully undertake building projects because of the nature of the construction industry that is characterized to be a project-based activity where the relationship lasts during the undertaken project. In other words, project collaborating dominated the working relationship between the parties rather than strategic collaborating that could have lasted longer. Thus, the direct or indirect benefits experienced by the players in the industry cannot be long lasting due to the nature of construction industry and varying economic conditions.

A feature of the construction industry that brings to the fore the concept of relationship is the extensive use of subcontracting. Eccles (1981) states two prominent characteristics of the construction industry that resonate the relationship prevalence between construction actors; the organization of the production work force into a variety of trades and the practice of subcontracting parts of the project to other contractors and subcontractors. Subcontracting can develop a set of stable relationships between the general contractor and special trade subcontractors, called a quasi-firm that is in some way intermediate to market and hierarchy (Costantino et al, 2001). Good past relationship with a contractor was among other factors found to have the greatest effect on lowering of the subcontractor's bid to general contractors (Uher and Runeson, 1985). On a project basis this relationship takes the form of classical contracting, but as parties cooperate over the years the same relationship takes the form of relational contracting.

The first hypothesis being investigated focuses on the idea that when the parties are interested in keeping a long-run relationship they will not use the short-run opportunities to increase/decrease the price when the business cycle changes.

2.2 Vertical integration

There is a large amount of literature and research about vertical integration and its application in different industries such as Cable Television industry (Chipty, 2001), Gas supply(Gilbert and Hastings, 2001; Hastings, 2004), Pulp and Paper industry (Ohanian, 1994). Some of the theories developed from these literature i.e. Market Foreclosure, Double Marginalization, and Raising rival's cost are among others applicable to the construction industry especially the developer/contractor type of organization pattern that is common in Sweden and elsewhere. Traditional approaches to vertical integration have tended to focus on vertical integration as a response to preexisting market power problems or as a strategic move to create or enhance

market power in upstream or downstream markets (Joskow, 2003). Most of the studies of vertical integration were modeled under the typical upstream- downstream relationship or structure necessitated by the cost of intermediate goods needed to produce a final products. However, that is not always the case in the construction industry because it has some particular characteristics, which make it substantially different from other industries, specially manufacturing. The main distinctive feature of construction is the nature of the final product, characterized by its uniqueness, immobility, and variety (Gonzalez-Diaz et. al, 2001).

In spite of limited theoretical support of vertical integration and its applicability on construction firms, it could be speculated that the structure of residential construction firms influence the construction costs. These firms are often vertically integrated in the sense that they act both as contractors and as developers on their own in the same market. The basis for this speculation is that many construction projects are so big that only a few large firms can undertake them - firms that usually are vertically integrated in the sense described above. Swedish vertically integrated firms, which have strong financial capability to undertake numerous large developments (Swedish Industry, 2004), may tender a higher price for a new rental or condominium projects. On one hand, winning that contract safeguards the prices of other similar properties owned by the integrated firm. On the other hand, not winning the tendered contract will not exempt them developing rental units or condominiums of their own and still be competitive in the market. They can then divert those resources e.g. machinery and equipment to other projects undertaken by the firm without incurring too much loss of productivity. Their strong financial position also allows them to survive even if they lose a few customers by raising opportunistically the construction costs. The second hypothesis for this paper is based on the idea that this type of vertical integration might have gone further in larger regions and that this contributes to the cost increases there.

2.3 International competition

The presence of foreign contractors and subcontractors may not only increase the competition and lessen the dependency of fewer actors in the deliverance of building projects but it also enhances the availability of construction workers as well as cost-efficient construction materials. According to Bergström (2001), the cost of construction materials, which constitute approximately one-third of total construction costs have shown price increases over and above other industrial products, with price rises even during periods of low demand. One of the reasons is that construction trade is concentrated to a small number of large companies i.e. one company accounts for more than 50% of total sales of cement, reinforcement steel, and plasterboard. Srejber (2001), in her speech, echoes the concerns of low competition in the construction material sector. She claims that the sector is characterized by a high company concentration with considerable entry barriers and weak import competition. Swedish Competition Authority report also states that the share of construction material imports remains low while concentration in this sector is high. The report stresses the need for closer examination in the price and cost differences of construction materials that exist between Sweden and EU. It concludes that the competitive pressure that a higher level of imports

would engender is being checked by special national rules and the voluntary type approval of construction products.

The benefits of foreign supplier competition can be found in many studies. Xiao and Proverbs (2002) note that the presence of many prominent foreign contractors such as Skanska (Sweden), AMEC (UK) and many others in the US domestic construction is one of the reasons that USA experienced the lowest construction cost compared to UK and Japan. They contend that increased competition drives down the construction cost. The effects of foreign suppliers and contractors are multidimensional. Lind (2003) accentuates four ways that foreign competition (globalization) could affect the housing construction are.

- Increases the supply of construction material or ready-in-use components.
- Enables foreign contractors to expand their activity to other countries
- Allows foreign developers to come in to the market
- Enables construction workers to come in to the market

Porter (1980) proposes a five-force model - entry, threat of substitution, bargaining power of buyers, bargaining power of suppliers, and rivalry among current competitors - that are the base for any industry's competitiveness and its profitability. In the Swedish housing sector, it is has been noted that competition between the firms is very low and no threat of new entrants or foreign suppliers is noticed. Thus foreign competition could at least bring more firms, labor, materials etc, and change that trend by re-shaping some of these forces and ultimately reducing the construction costs.

The third hypothesis presented above starts from the beliefs that there might be regional differences in how easy it is for foreign firms to enter the market and that this can be one determinant of regional differences in cost increases.

3. Methodology and project descriptions

Vermande and Van Mulligen (1999) describe three approaches for comparing costs of building of a hypothetical international project and they are: Standardized identical buildings, Standard building with local modifications and, Functionally similar building. The first two approaches seem to be theoretically possible but practically difficult to carry out due to the differences that exist in architecture, standards, availability of projects, etc. The third approach of typical, functionally similar buildings is suitable in our *regional comparative study*.

In Sweden, the three main owners of residential apartments are municipal housing companies, private real estate companies, and tenant-owner associations. All rented housing is built with some form of financial public support (Lujanen, 2004). Thus certain information related to production costs and project specifics are reported to a government authority. Information of condominium projects, especially cost related ones, are not easily available since the majority of the contractors who carried out the construction work are also developers and thus in the final transaction is included not only the construction costs but land cost as well as profits. There are also considerable price differences in condominiums because of amenities and luxuries associated with it. These two facts were enough to exclude condominiums in our survey and concentrate only on the rental projects.

Data collection from both contractors and developers would have been desirable but we chose our survey to be directed to only developers for the following reasons:

- First, construction companies consider construction costs as a sensitive and confidential subject since disclosing it could reveal the profit margins of the firm. Developers are not necessarily constrained to conceal the price charged by the contractors in order to keep secret their profit margins. Aside being buyer than seller, price of the undeveloped land is also included in their final value of the development.

- Secondly, a high degree of concentration of large construction firms in Sweden, especially in the big regions creates a situation where one contractor is working with many projects and thus limits the number of respondents relative to the number of developers that are available. It is true that developers may have also several projects undertaken by the same contractor but that is considered helpful in our investigation since it enables us to acquire more information regarding their relationship with the contractor.

A survey was carried out in Stockholm and five medium-sized cities that are deemed to represent regions for both escalating and non-escalating costs (Table 1).

***Table 1**: Surveyed projects*

City / Type of Developer	**Municipal**	**Private**	**Tenant-owner association**	**Number of respondent (both mail and interview)**
Stockholm	9	7	3	12
Västerås	4	1	-	4
Örebro	6	1	-	6
Linköping	2	4	2	2
Jönköping	2	-	-	2
Umeå	8	3	-	7
Grand total	**31**	**16**	**5**	**33**

Projects that were built between 1998 and 2003 are considered in the survey since that period encompasses both high and low construction activities. Only projects that contain more than 20 units and that were equipped with elevator were chosen in order to have functionally similar buildings. The fact that the sample contains only one metropolitan city and several medium-small cities and the selected projects are not weighted according to the size of regions or cities reduces the appropriateness of evaluating one city against another especially Stockholm versus every and each city. Thus, a collective comparison between these cities and Stockholm will be conducted. Furthermore, having many municipal respondents and few private ones from both regions makes it difficult to compare the two regions along developer-type and hence reduces the comparability of the two regions in that perspective, but still some differences will be mentioned.

Questionnaires were addressed to the project mangers. Each questionnaire contained thirty-seven questions based on factors that were identified from the literature and informal discussions with professionals. Closed questions and Likert scaled-response format questions that elicit structured response from the project managers were employed in this six-part questionnaire.

The first two parts of the survey were intended to get hold of the company and project details as well as respondent retrospectives on this specific project, especially the cost aspect. Project mangers were asked about the level of construction costs of the specific project (high, average, and low) as compared to the final project cost. They were also asked to compare the construction costs of the project with other similar projects in the region. The rational behind these two different cost related questions is to differentiate between cost overruns that are unique to an individual project due to project location and client requirements and cost escalations that are mostly general to similar projects in a region. Form of contract relates to whether single contractor carries out the whole project and have one-to-one relationship with the developer or if more than one main contractor is involved in the process. The latter does not only increase the number of participants of the project but also requires developer competency to act as a main contractor or the hiring of professional consultant instead. Four forms of contract were identified from the literature; divided, general, coordinated and all-in one contract.

The third part of the survey contains questions that could reveal the type of relationship between the developer and contractor. The duration and the magnititude of the relationship between contracting parties were crucial in our study of construction costs. Thus, respondents were asked several questions that solicit how often these two parties have worked together in the past, as that may be indicative of the type of relationship. Other questions were how long the contractor and client have had this working relationship and the share of workload from the client that has been given to a specific contractor based on their working relationship. Managers were asked to describe the degree of strength of relationship and the existence of factors that might have harmed their relationship with the contractor such as disputes arising from technical deficiencies, delays, and unexpected cost increase.

Participation of foreign firms (main contractors or subcontractors) that could have impact both on labour and product market in the Swedish housing construction sector was the focus of the fourth part of the survey. Though developers do not deal directly with subcontractors and material suppliers, respondents were still asked to indicate their knowledge of any foreign contractor/subcontractor and the level of imported construction materials used in their projects. Participation of foreign firms in the bidding stage and even willingness to participate were also equally important in the investigation and thus questions in that regard were included in this part of the survey.

There are other possible approaches of determining whether the relationship was short or long in lieu of asking respondents directly whether they have had long or short-term relationship with contractors. The fifth part was related to the developer's selection criterion when choosing a contractor. The tendering phase is one of the most crucial stages in the construction process. There are factors, i.e. level of competitions, level of construction activity, size of the project, strength of working relationship between the parties, etc. that play a big role in deciding which contractor get invited or considered and which ultimately get selected. In this part, respondents have been presented with two types of questions.

One type of questions in which respondents have to choose one of the Likert scale responses from developer's selection criteria i.e. the number of projects and years worked together, share of developers' workload undertaken by the contractor (size of the projects), prior repeated work commitment, was intended to reveal the significance of past relationship in the selection process. These factors are not exhaustive as a selection criterion, but they seem to measure same underlying construct – dependability – where long-term relationship is developed and reciprocity between the contractual parties ensues. Strength of relationship can have an impact on the transaction costs and risk allocations between the parties, which causes higher/lower construction costs.

The second type of questions in this part was of a ranking type and was intended to enable respondents to rank seven pre-determined factors. The factors are; previous working relationship, past project performance, technical superiority, financial strength, foreign or national contractor, lowest bidding price, and the location of the contractor. Here, the emphasis is client requirements and procurement regulations rather than prior relationship.

The final part of the questionnaire concerned the general opinion of the respondent on issues such as long-term relationship, competition, and supplier structure. Their familiarity of these subjects and their perception of how these factors affect construction costs were sought in this part. Effects of increased foreign main contractors/subcontractors and imported material were solicited as well as the impact on long-term relationship on construction costs. One more important question was respondent's view of vertically integrated contractors´ bid in regard to construction costs. In addition to the survey and accompanied interview with developers, separate interviews with several professionals in the industry were carried out in order to find out their views on topics such as construction costs, competition, and supplier structure.

***Table 2**: Questionnaire summary*

	Short description of various parts
Part one and two	To get hold of company and project details as well as respondent's retrospectives on this specific project especially the cost aspect of contract form. Respondents were asked to compare the construction of the project with similar projects in the region and with the original budget of the project. Cost overruns and cost escalations are differentiated.
Part three	Attempts to reveal the type of relationship between the developer and contractor. The strength of the relationship and concurrencies of factors that might have harmed their relationship with the contractor i.e. quality deficiency, cost increase, and delays were sought after.
Part four	The degree of foreign contractors and subcontractors participation and the level of imported material usage in the projects were the focus of this part.
Part five	Intended to ascertain developer's selection criteria of contractors and how various factors get weighted in the tendering process. It was also aimed to check, among other things, developer's behavior toward rewarding or penalizing contractors based on prior project performance.
Part six	The final part was concerned the general opinion of the respondent on issues such as long-term relationship, international competition, and supplier structure (vertically integration). Their familiarity of these subjects and their perception of how these factors affect construction costs were sought in this part.

From a quantitative point of view, 63% response rate of the preliminary survey (33 out of 52) seems very high compared with the typical 20-30% postal questionnaire surveys of the construction industry. Only ten questionnaires were answered fully and properly while the rest of respondents preferred to complete the questionnaire during the interview.

4. Presentation and analysis of results

4.1 Regional construction cost levels

A meaningful analysis of the survey answers is constrained by the size of the sample and the quality of the responses and thus mainly descriptive and limited analytical discussions will be conducted. Apart from the information gathered through the interviews and questionnaires, the three hypotheses that we have formulated above were tested and will be discussed in relation to what is deemed to be the facts prevailing in these regions and what are the believes of the respondents.

The two regions do not only differ in the level of construction costs of the surveyed projects (compared to similar projects in respective region) but they also differ in the number of projects that have experienced cost overruns and exceeded their original budget. Construction cost of all the projects from small cities except one project were reported to be within the average construction costs of their regions (Table 3). Several projects from small regions however, have reported to exceed the original budget when respondents were asked about the level of the construction cost of the same project with respect to its original budget. Only one project in small regions has encountered higher construction costs than similar projects in the region but the number of projects that exceeded their estimated budget was one third of the surveyed projects in the small regions.

Table 3*: Construction cost and Relative construction cost levels (in brackets) by Region Type*

		Region Type	
		Big region	**Small region**
CCs level	**Low**	2 (1)	1 (1)
	Average (within budget)	6 (2)	19 (13)
	High	4 (9)	1 (7)

For several projects in Stockholm it was reported that construction cost of their project were higher than the average construction costs of the region. A good number of projects have experienced somewhat higher or much higher construction costs compared to the original estimated cost due to different causes. Construction costs of some projects in both regions were reported to be high because of its location dependency (i.e. Hammerby sjöstad - delicate soils), strong demand for construction works at that time, high quality requirements, and design changes initiated by the owners.

Respondents along the region affiliation gave different accounts of what has caused the overruns. All the respondents from the small region claim that the construction costs were

higher because of the design changes initiated by the owner and not because of excessive costs inflicted by the contractor. Respondents in the Stockholm region have indicated that contractors were mainly responsible for the extra costs of the projects incurred by the owners except when labour disputes prolonged the completion time of the projects. They claim that contractors were opportunistically increasing the construction costs and capitalizing the higher demand of their services during the upbeat construction market.

As we have contended at the beginning of the paper, these typical factors of direct and indirect costs may not be enough to elucidate the cost escalation differences that exist between large and small regions. In the next couple of sections, we will explore other factors that could explain the cost disparities by evaluating the three hypotheses that we have put forward earlier in relation to the construction costs.

4.2 Long run relationship and construction costs

In this hypothesis, we postulate that if the actors in the construction process, especially contractors and developers, establish a good lasting working relationship, it may inhibit contractors or subcontractors' enticement to increase construction costs in hot markets.

Respondents were asked to give their opinion about the effect of LRR in construction costs by ticking one of the four options in that question (see question #33 in the Appendix). Most of the developers in the big region agree that LRR would decrease construction costs while the opinion of the developers from small region is evenly divided in the three response options (Table 4). Only one third of them agree that LRR decreases construction costs while two thirds either believe that LRR has no implications on construction costs or simply do not have opinion.

Table 4: *Long-Run relation (LRR) and Construction costs by Region Type*

		Long Run Relation (LRR) and CCs			
		Decrease costs	**Cost Un-affected**	**No opinion**	**Total**
Region Type	**Big region**	9	1	2	12
	Small region	7	8	6	21
	Total	16	9	8	33

In Stockholm, municipal companies did experience LRR with contractors but it was hardly characterized as a mutual good relation because project bulkiness and large contractor shortage always constrained developers' choices. Some private developers have specified that when they were not satisfied with the cost and quality of one project, it has affected their decisions working with that contractor in another project. Meanwhile, a developer (municipal), despite their dissatisfaction with the contractor on both the quality and cost, decided to do the opposite and work with the same contractor in another projects. The

response from the respondent when asked the rationale behind that decision appears to mirror what Bidder (1980) described as the client/contractor relationship mutual metaphor (Table 5).

Table 5*: Client/Contractor relationship: Mutual Metaphors.*

Topic	**Client's thoughts**	**Contractor's thoughts**
Clients	A dog's life	Our life blood or a necessary evil
Contractors	A necessary evil	A dog's life

First, few competitors offered their service of undertaking the second project and none of them tendered a lower price (competition regulatory policy) than the first contractor did. Basically, there was a shortage of contractors who were capable of undertaking that kind of workload financially and technically (~300MSEK project). One municipal company respondent has mentioned that some times political pressures to speed up project implementation constrains their search of viable contractor and forced them to accept higher estimated bids that could have been avoided had they had time to extend the tender period or delay the project until construction activity cools down. Second, they argued that knowing what kind of contractor that they are dealing with gave them an opportunity to envisage the desired outcome and hence device an appropriate tool to achieve it rather than starting a new adventure with another contract. Third, the relationship with the contractor is multi-dimensional and one has to look at the overall performance of the contractor, which has been satisfactory in all other areas except these increased construction cost that emanated from the poor quality.

Good working relationship did not only produce non-increasing construction costs (average or lower) for the developers but it also secures more projects for the contractor as some respondents expressed. A municipal company in a small region reported that a collaborative working relationship with the contractor resulted in lower construction costs for them and consequently more work for the contractor. A practice that is much related to the LRR is the prior commitment of repeated work with the contractor and all the respondents from small regions and two thirds of big regions rated this as an important factor. Respondent indicated that this practice is not a formal promise but rather an informal one where a contractor undertakes a project that is part of similar successive projects. The developer desires to maintain uniformity of the projects and the contractor needs a steady workload. It is win-win situation for both actors where accumulated information and skills acquired from one project gets utilized in subsequent project. One respondent stated that three more projects were rewarded to the same contractor after very successful delivery of an earlier project as result of LRR.

Private developers are not obliged to practice strict competitive tendering as Municipal companies do. For instance, open tender and lowest bid price must be practiced in the public procurement when choosing a contractor, which does not encourage municipal companies to

exploit the benefits of LRR. How do the municipal companies balance between competition required by the law and cooperation necessitated by the market? One municipal company practiced what some literature termed as “cooption” where the client tries to balance both the benefits of competition and cooperation. The respondent described a case where a losing contractor complained that a project was not rewarded on the basis of lowest bidding price policy and thus forced the tender to be re-opened. The lowest bid price was replaced with best offer strategy that has enabled the municipal developer to consider not only the price but also pervious working relationship and past project performance with the contractor.

Developers from the Stockholm region consider lowest price and financial strength more important than other factors in the tendering process. The firms in the big region have also seen technical superiority as crucial since lumpy projects and limited space to carry out construction that were very common in Stockholm region may require better coordination and control as well as specific techniques and equipments.

The test reported below shows that we could reject the null hypothesis (10 percent significance level) that there are no differences in developers’ opinions about whether long run relationship between clients and contractors affects construction costs (Table 6). Both the asymptotic and Exact Sig. are less than the 10 percent significance level and we reject the null hypothesis. In other words, we can conjure that the existence of long run relationship in the small regions may have helped to prevent opportunistic behavior between the parties though only one-third of developers in the small region acknowledged the benefits of LRR (Table 4). Developers in big regions also vehemently agree that LRR decreases construction costs but they also have reported higher construction costs.

Table 6*: Mann-Whitney U Test Statistics for regional views on hypothesis 1*

	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)	Exact Sig. (2-tailed)
LR relation and CCs	42,50	162,50	-2,167	,030	,040

Grouping Variable: Region Type

4.3 Vertical integration and construction costs

The research question is to substantiate any connection between vertical integration and higher construction costs increase. Is there a difference of opinions between the developers in large and small regions on whether a vertically integrated firm tenders higher price than non-integrated firm. The hypothesis was put in the form of question (question #37 in the appendix) that solicit respondents view of whether vertically integrated firms would tender higher construction costs during the bidding process than contractor that is not active as developer

An equal number of developers from both regions have indicated not having an opinion whether a vertically integrated contractor would tender higher construction costs than non-integrated firm (see Table 7). Moreover, some small region respondents have concerns when large contractors, who were also active as developers (vertically integrated), get involved in the rental market by constructing their own projects. Respondents were reluctant to speculate whether the effects of this full vertically integrated firm[1] but one respondent offered one possible motive that triggered already vertically integrated contractors to enter the rental market. Currently, two forms of subsidies - interest rate and investment - are available to all residential building projects but that will be changed in the near future. The subsidies are going to be limited to only rental apartment projects and large firms are anticipating these changes.

Table 7: *View of Vertically Integration and construction cost by Region Type*

		Vertically Integrated			
		Agree	**Disagree**	**No opinion**	**Total**
Region Type	**Big region**	1	5	6	12
	Small region	14	0	7	21
	Total	15	5	13	33

A Mann-Whitney U test shows that we can reject the null hypotheses (at 10 percent significance level) that state that there are the same views in both regions about whether vertically integrated contractors tender higher prices than non-integrated contractors (Table 8). In other words there is a difference of opinions between developers of large and small regions and indeed one can infer with cautious that vertically integrated contractors could influence construction costs.

Table 8*: Mann-Whitney U Test Statistics for regional differences in views of Hypothesis 2*

	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)	Exact Sig. (2-tailed)
VI and CCs	7,00	112,00	-3,844	,000	,000

Grouping Variable: Region Type

In some small regions municipal companies where highly dependent on the services of a few large contractors, and the dissatisfaction of employing divided or coordinated general

[1] We used the word "fully" with vertically integrated in order to emphasize the contractor is not only involved in the construction of multifamily housing (construction of condominiums and rental apartments) but that the contractor may also own rental buildings.

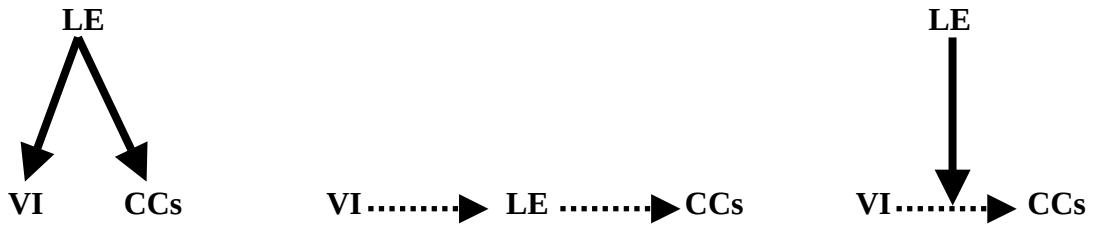
contracts is making their situation to be described as between a stone and hard rock. Large contractors have often chosen not to participate in a coordinated contract. One possible explanation given by the respondents was that the contractor's margin of profits might diminish with this procurement method because large contractors, including vertically integrated contractors make their profits from different sources such as labor, material, and land cost. Non-participation could also be the result of contractor's strategic decision of prioritizing other projects including their own projects.

Several explanations could be given why vertical integration was not a big issue in the Stockholm region. Higher overhead costs as a result of being vertically integrated coupled with high construction activities and fewer competitors may have exacerbated the construction costs in the big regions. The size of projects and limited easily constructible land that requires special techniques and equipments may have limited the number of qualified contractors. Thus, few capable contractors benefit from the low competition by choosing only the most profitable projects.

Small regions may have benefited from the presence of more medium and small construction firms that have not only increased competition but also contributed to the fostering of long run relationships with the developers. However, vertically integrated firms were also active in these cities and involved in the construction of both rental and condominium projects. According to Boverket (The National Board of Housing, Building and planning) and information gathered from regional contacts in HSB, at least two of the four biggest vertically integrated firms (SKANSKA, NCC, JM, and PEAB) were active in the condominium market of the cities considered in the survey.

Since vertically integrated firms operate in both regions with high and low cost increases, one may question the plausibility of the relationship between high construction costs increase and vertically integrated firms. It could be argued that the existences of some antecedent intervening variables such as degree of competition and construction activity level (termed here as Local externalities) influence the decisions taken by the vertically integrated firms. However, one cannot be sure whether construction cost increase resulted from the actions taken by the integrated firm with the intention of raising rival's cost or as result of local externalities. If we let VI stand for our vertically integrated firm, LE for the local externalities, and CCs for the construction costs (see Fig. 1), then the relationship between the three variables can take one of the following forms (Pickvance, 2001).

Figure 1: *Possible relations between VI, CCs, and LE (local externalities).*



a) Spurious relationship between VI and CCs

b) Local externalities interprets relationship between VI and CCs

c) LE specifies the relationship between VI and CCs

The first picture depicts a situation when local externalities have a very strong casual influence on both construction costs and the degree of vertical integration. The correlation between integrated firm and construction costs is entirely due to the effect of the degree of competition and construction activity level. The second picture illustrates a situation in which the vertically integrated firm influences the local externalities, which influences construction costs. Integrated firm indirectly has an impact on construction costs. The last picture shows that the local externalities determine the relationship between the integrated firm and construction costs.

4.3 International competition and construction costs

The respondents from both regions have shown some sort of agreement and lack of opinion concerning the effect of foreign contractor/subcontractor participation on construction costs. Most of the developers in Stockholm and more than half of developers from small region have agreed that foreign actors could reduce construction costs. Meanwhile a good number of developers from small region reported having no opinion about any effect of foreign agents (Table 9). Foreign subcontractor involvements responses were similar with foreign main contractor responses. Imported materials have drawn analogous response as foreign contractor involvement except that one more municipal and one more private developer in Stockholm expressed their disagreements on lower construction cost with increased import material and labour. Respondents emphasize that benefits of cheaper foreign construction material is offset by higher transportation costs while strong labor union also opposes overseas work forces.

Those developers who agree that more firms either from other regions of the country or abroad would reduce construction costs have tried to contact firms located outside the region, especially firms in small regions, but the financial and technological requirements discouraged these firms. Interviewers pointed out that the challenges and obstacles were very strong and forced even some local contractors to abandon their ambition of hiring foreign subcontractors. Two examples discussed were a Danish subcontractor that was considered by JM in an earlier Hammerby sjöstad project and the recent case of Lithuanian firm.

Furthermore, respondents of both regions have indicated that neither contractor's location nor the country origin of contractor is relevant during the tendering process.

Table 9: *View of effect of Foreign Main Contractor on construction cost by Region Type*

		Foreign Main Contractor				Total
		Strongly agree	**Agree**	**Disagree**	**No opinion**	
Region Type	**Big region**	0	8	4	0	12
	Small region	2	12	0	7	21
	Total	2	20	4	7	33

The hypothesis concerning that foreign contractor and subcontractor participation would decrease construction cost was statistically validated. The null hypothesis that there are no differences in developers' opinion about the impact of foreign supplier presence on construction costs was rejected at 10 percent significance level (Table 10). While all the respondents from Stockholm region have an opinion about the influences of foreign supplier on construction costs (8 agree and 4 disagree), developers from small region either have agreed with the statement (10 out of 17) or have no opinion at all.

Table 10*: Mann-Whitney U Test Statistics for regional differences in views about Hypothesis 3*

	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)	Exact Sig. (2-tailed)
Foreign main contractor and CCs	40,00	145,00	-2,782	,005	,009
Imported material and CCs	15,00	120,00	-3,474	,001	,000

Grouping Variable: Region Type

5. (Other) important factors according to the survey

In spite of emphasizing that construction costs is different from total production costs during the interview, most of the participants in the survey and the separate interviews insist that among other things land and various taxes cause construction costs to be high. As one professional respondent pointed out, higher land cost might be offset by higher density buildings and let developers earn enough profits, but it still increases total construction costs. Another professional argues that things are even more complicated in the contractor-developer situation because land price also is included in the final price and during these years of study the developer-contractor companies built many residential multi-family projects and most of these projects were condominiums. In his opinion the SCB (Statistics Sweden) may have used a lot of these projects when they were estimating the construction cost figures. His argument is that these companies had not only reported what it cost them to build as a contractor but also their costs as developer and that may be even the source of the cost-price confusion.

Other factors that were raised as the cause of construction cost disparities are competition and local market conditions and labour costs. It has been indicated that medium size construction companies with 50 or less employees are dominant in the residential construction market in non-metropolitan cities that makes competition among them highly noticeable. Respondents have noted that this reflects why developers in small-medium cities do not only consider the lowest price as the sole criteria for choosing contractor but also consider the relationship between parties, quality of product delivered, and reputation of the contractor.

In Stockholm, respondents believe that construction costs were higher in those years because of market conditions (high demand) that were favorable to the contractors. In other words, contractors have had the upper hand and selected only those projects that they could make extra profit from and developers were competing for the few contractors that were offering their services. Lucrative constructions of condominiums have also had a big impact on construction costs of residential apartments. Early 1990s condominiums were very profitable and that might have driven up the construction costs. The cost increases may have persisted and had spillover effect on other types of housing.

The influence of labor cost and the price of construction material on the construction costs were investigated and produced a mixture of views. Labour in big cities may cost more in order to compensate them for commuting expenses, high rents, etc. Several respondents believe that labour cost may be one factor that has the biggest impact on construction costs due to labour laws and salary structure in the sector. Several respondents believe that price differences of construction material in various regions of the country may be negligible. They also indicated that material products easily get transported within the country although they have different opinions on foreign materials. For instance, that cheaper prefabricated concrete

elements in Umeå got transported to Stockholm every Monday was one example given by an industry insider.

Two issues that are associated with cost increase were quality and completion time of the project. Factors contributing to delays or quality inferiority were not the focus of the survey but the occurrences of either anomaly were investigated. Four municipal projects in Stockholm have experienced delays and dissatisfaction with the quality of the projects. Though developers accepted that certain delays cannot be blamed on contractors and indicated their willingness to share the costs of the delays, they also pointed out that delays induce the contractor to hasten finishing the job that could result in deficient quality work. Nevertheless, most of the claims and disputes were solved through mutual agreements.

The survey also shows the extent to which metropolitan and small regions use different contract form and tendering process, which may have some implications on construction costs (Table 11). Most of the projects in small region were under the control of a single contractor with an all-in-one contract form and a reported average construction costs. Only one project under general contract was reported to have higher construction costs. Meanwhile, two thirds of projects in Stockholm used general contract form and four of them incurred higher construction costs.

Table 11: *Construction costs level and contract type in both regions*

Region Type		**Contract Form**			**Total**
		Divided contract	**General contract**	**All-in-one contract**	
Big region	**Low**	1	1	0	2
	Average	2	3	1	6
	High	0	4	0	4
	Total	3	8	1	12
Small region	**Low**	0	0	1	1
	Average	3	1	15	19
	High	0	1	0	1
	Total	3	2	16	21

Since the Divided/Coordinated contracts entails the participation of several contractors and subcontractors, respondents pointed out that this type of procurement can increase the construction costs in two aspects. First, sometimes substandard and deficient work becomes no ones fault and subsequent repair necessitates extra cost succumbed by the developer. Second, developers incur extra costs stemming from coordination and monitoring of the various actors and activities, not to mention the demand of greater competence from developers. Small region companies have indicated that employing the All-in-one contract procurement method with one or two large contractors over a period of time have provided an

opportunity to foster a long-term relationship and consequently less unjustifiable construction costs increases.

The interviews with small region municipal companies indicate shifting views of which procurement performs better than the other. For instance, those companies who already procured with general contract (GC) preferred either the use in All-in-one contract or coordinated general contract (CGC) method. A municipal company who already implemented each of these methods is now contemplating the use of partnering. The type of partnering the municipal company is intend to implement is project partnering that could be extended to long-term partnering strategy. Though partnering is not considered a form of contract but rather an attempt to establish non-adversarial working relationships among project participants through mutual commitment and open communication (Johansson and Åkerblom, 2004), the respondent claims that it provides an opportunity to avert the need of CGC while at the same time reduces opportunistic behaviors such as market driving cost increases. Nyström (2005) notes the two highest ranked motivation of client's use of partnering were getting more out of the project for the same amount of money and a better collaboration environment.

6. Conclusions

Semi-structured interviews and posted questionnaires yielded mixed results. In non-metropolitan region, long-term relationship between developer and contractor is a crucial strategy and incentive mechanism in securing repeated work for contractors and lower construction costs increase for the developers. Short-term relationship as well as normal and adversarial relationship was more prevalent in metropolitan region. The working relationship is also affected by the level of construction activity, project characteristics (size, complexity, etc.). Many developers did not recognize the effects of vertically integrated contractors on construction costs and hence the relevance of concentration levels of vertically integrated firms in any region became inconsequential.

The involvement of foreign contractors was not reported in any project considered in the study and the usage of imported materials was almost non-existent. However, some respondents believe that foreign suppliers' participation might increase competition especially construction materials and labour and thus alleviate the rising construction costs in big regions. Other respondents agree partially with that assessment but argue that cheaper construction materials are offset by higher transportation and maintenance costs.

Developers' responses about the effect of vertical integration and long run relationship on construction costs raised an interesting observation. Developers in the Stockholm region, where higher construction cost increases of the projects are observed and most of the projects are constructed by vertically integrated firms, have different perceptions than small region developers, who believe that vertically integrated firms tend to set higher prices. Meanwhile,

small region developers who reported to have lower construction cost increases and long run relationship with contractors indicated that they do not perceive that lower construction cost increases were a result of that relationship. Developers from Stockholm region (who mostly experienced non collaborative relationship with the contractors) believed more in the benefits of long run relationship compared to their counterparts in the small regions.

It is possible that developers from both regions responded to these questions (long run relationship benefits and vertically integrated firm's tendering behavior) from an expectation point of view rather than from the existing situation that they were operating in. In other words, the responses of small region developers were driven by concerns that the market power of a vertically integrated firm may lead to unfair pricing whilst the responses of Stockholm region developers were motivated by the desire of having long run relationship in the face of high competition and high construction activity that encourages market driven attitudes.

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Appendix: *Supplier structure and housing construction costs questionnaire*

Dear Sir/Madam,

The aim of this survey is to ascertain information that could enable us to understand the causes of residential construction cost increases in the different regions of the country. All information you provided in this questionnaire will be kept confidential and the research results will be shared with interested participants of this survey.

Part A: Company details

1. Company name
   ……
2. Name of the respondent and current position in this company?

   Name (Optional):…….

   Title:…….....
3. Which year was your company founded?
   ……
4. How many properties (apartment buildings) did your company own before 1998?

   ……
5. How did the number of properties (apartment buildings) change from 1998 until 2003?

   ……

Part B: Project details

6. Name of the project
   ……..
7. Location of the Project: Municipality_____City: _____
8. Number of Apartments: _____

9. Were you with this company during the construction of this project?

Yes [ ] No [ ]

10. If the answer of the above question is yes, what was your position at that time?

Title: _____

11. Project's starting Year ……. Completing year: ……

12. Name of the main contractor of this project.
……

13. What type of strategy could best describe the contract form of this project?

[ ] Divided contract (Delad entreprenad)
[ ] General contract (Generalentreprenad)
[ ] Coordinated General contract (Samordnad generalentreprenad)
[ ] All-in-one contract (Totalentreprenad)
[ ] Other

14. How many times have your company worked with this contractor before this project?……..

15. How many times have your company worked with this contractor after this project?…….

16. What is your estimate of the construction costs of this project (excluding land, fees etc.) compared to similar project in the region?

[ ] High [ ] Average [ ] Low

17. What is your estimate of the construction costs of this project compared with the original budget? (Please check the appropriate answer)

Less than original budget		**Within budget**	**Bigger than the original budget**	
Much lower	Somewhat lower		Somewhat higher	Much higher

18. Was the land built on this project owned by your company

[ ] Yes [ ] No

19. Concerning the project schedule would you consider that the project was: (Please check the appropriate answer)

Ahead of schedule		**Within schedule**	**Exceeded schedule**	
Much ahead	Somewhat ahead		Somewhat exceeded	Much exceeded

Part C: Relation to contractor

20. The working relationship that your company have had with the main contractor could be generally described as:

    [ ] Long-term [ ] Short term

21. How would you describe the working relationship between your company and the main contractor during this project?

    [ ] Collaborative [ ] Normal [ ] Adversarial

22. Was there any major dispute during this project due to:

    - Unforeseen changes that cause unexpected cost increase.

      [ ] Yes [ ] No

    - Quality or technical deficiencies.

      [ ] Yes [ ] No

    - Project start or completion delays.

      [ ] Yes [ ] No

    - [ ] Other

Part D: Foreign firms participation

23. Did any foreign firm participate in bidding for this project?

    [ ] Yes [ ] No

24. Did any foreign firm contact your company before the formal bidding and show some interest of undertaking this project?

    [ ] Yes [ ] No

25. Did any foreign subcontractor participate in the implementation of this project?

[ ] Yes [ ] No

26. Compared to similar projects in the region, the proportion of imported construction materials used in this project were:

[ ] Higher than normal [ ] Normal [ ] Less than Normal [ ] No opinion

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Part E: Selection criteria

27. When choosing a contractor, the number of projects carried out by the contractor on behalf of your company is:

[ ] Very important [ ] Important [ ] Un-important [ ] No opinion

28. The number of years the two parties have worked together is:

[ ] Very important [ ] Important [ ] Un-important [ ] No opinion

29. The share of workload (size of project) that has been rewarded the contractor is:

[ ] Very important [ ] Important [ ] Un-important [ ] No opinion

30. Prior commitment for repeated work with the contractor is:

[ ] Very important [ ] Important [ ] Un-important [ ] No opinion

31. Communication efficiency and conflict resolution capability of the contractor is:

[ ] Very important [ ] Important [ ] less important [ ] No opinion

32. Which of the following factors does your company give priority when tendering new project? Please rank them according to importance. (1 = most important and 7 = least important)

	Rank
Previous working relationship	
Previous project performance	
Technical superiority of the contractor	
Financial strength of the contractor	
Whether the contractor is foreign or national	
Lowest bidding price	
Location of the contractor	

Part F: General opinion

33. What in your opinion is the effect of long run relationship in construction costs?

    [ ] Increases costs [ ] Decreases costs [ ] Costs Un-affected [ ] No opinion

34. Do you think that more international (main) contractors in the Swedish housing construction market would lead to lower construction costs

    [ ] I strongly agree [ ] I agree [ ] I disagree [ ] I strongly disagree [ ] No opinion

35. Do you think that more international sub-contractors in the Swedish housing construction market would lead to lower construction costs

    [ ] I strongly agree [ ] I agree] I disagree [ ] I strongly disagree [ ] No opinion

36. Do you think that more use of imported construction material in the Swedish housing construction market would lead to lower construction costs

    [ ] I strongly agree [ ] I agree [ ] I disagree [ ] I strongly disagree [ ] No opinion

37. Some contractors are active in development of residential housing (Developer – Contractor) while others are solely contractors. Do you think that a contractor who is active as developer, not only build projects similar to this one but also own projects similar to yours, would tender higher construction costs during the bidding process than contractor that is not active as developer?

    [ ] I strongly agree [ ] I agree [ ] I disagree [ ] I strongly disagree [ ] No opinion

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Other comments:

Thank you very much for your co-operation

Paper 3

Efficiency of the residential building sector:
Theoretical analysis of some basic organization structure models

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Stockholm 2006

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Efficiency of the residential building sector:
Theoretical analysis of some basic organization structure models

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Abstract

The construction sector employ different forms of organizational structure that would allow it to achieve the desired efficiency and competitiveness. The structure of the construction firm does not only affect the performance of projects undertaken by the firm and the sub-market that the firm operates in, but it offers clients various forms of contracts that differ in terms of risk, flexibility, and costs. The Swedish building sector, which is heavily fragmented and lacks international competition, need an efficient process of delivering building projects. The proposed organization structure models presented in this paper emphasize the basis of the formation of various supplier structures that has existed or could exist in the Swedish residential sector. As a method of general evaluation of different organizational structures, three criteria were chosen as they are in line with the transaction cost approach: flexibility and risk allocation, competition, and competence. In response to competitive pressure, required competence and degree of flexibility necessitated by the changing economic environment, eight different organization patterns emerge with various degrees of separation and integration of major actors in the building sector.

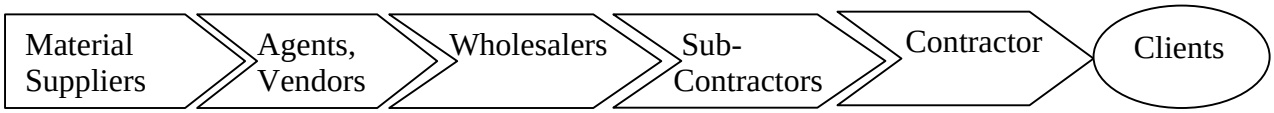
Keywords: Organization structure, vertical integration, long-term relationship, efficiency

1. Introduction

The building sector and civil engineering (infrastructure) sector together are often referred to as construction industry, and mostly large firms operate in both sectors (Ferry et al, 1999, Swedish Competition Authority, 2004). Construction firm acts as a broker of opportunities for projects and as an intermediary acquiring resources to undertake building projects (Lansley, 1994) that are characterized being immobile - highly dependent on location, and very diverse in terms of size, quality and client requirements. From a functional aspect, Tenah (1986) defines a construction company as a group of people sharing specialized knowledge to design, estimate, bid and procure, and obtain resources to complete a construction project. These functions definitely extend beyond the boundary of the construction organization itself and include the interwoven relationship with other general contractors, subcontractors, manufacturers, material suppliers and equipment distributors etc. (Tenah, 1986). Thus, the interaction of these entities and how they transact their services and products shapes the organizational structure of a project and ultimately determines the governance structure of the specific firm (Shirazi et al, 1996).

The need for an efficient process of delivering building projects is indeed indispensable in the Swedish building sector that is heavily fragmented and lacks instrument of control of the whole process compared to other industrial activities – from material suppliers to the supplier of finished project and other actors in between (SOU 2000:44, see fig. 1). The delivery of a construction project requires the creation of an effective mechanism, and hence contractual agreements between the successive parties are formulated in the absence of combined organization or single ownership that posses all the necessary capability of delivering the project.

Figure 1: *Value chain of construction (SOU 2000:44)*



A holistic approach of analyzing the housebuilding industry in relation to different possible organization patterns may enable us to understand bearers of risk and incentives, responsibility and control mechanism, and consequently it may shed light on construction cost determinants. The choice of this approach is motivated by the need of a study of construction organizations structure that focuses more on the nature of the relationships among the participants in the building process, rather than archetypical studies that often are based on the department groupings and management style of different organizations. These grouping are often based on common task, products, geography, and process (Grant, 2005). Though Grant mentions three basic organizational forms: functional, multidivisional and matrix structure which might not necessarily be suitable to describe the organization patterns imagined below, the interlinked activities that he defined as a process is anchored in the proposed organizational forms.

Winch (1989) argues that the prime object of construction management research should be the firm, and the project should be seen as a temporary coalition of these firms together with the client. In line with Winch's argument, we will focus more on the possible organization patterns of the firm - or group of firms - delivering the building project rather than project itself. The effect of both the structure of the organization (mechanistic or organic) and the method of contracting or procuring required resources, have on construction costs are also studied simultaneously.

The objective of this paper is to analyze various structures of the construction organization as a whole from various perspectives. In other words, the construction sector employ different forms of organizational structure that would allow it to achieve the desired efficiency and competitiveness. We attempt to utilize transaction cost theory in exploring construction sector structures and this should be seen as a first step in trying to understand changes in the sector from an efficiency perspective. In further analysis one can distinguish the two levels of transaction cost analysis that Robins (1987) states; to explain the prevailing institutional structure of society at some point in history and to explain the adoption of specific organizational form in response to conditions faced by any individual firm.

The paper is organized as follows. The second section tries to explain the approach and the criteria of evaluating different organization structures. The transaction cost approach in relation to various organization patterns will be discussed in this section. The first of five major possible organization forms, owner-developer-contractor (ODC) will be examined in the third section. The major players of the building process are integrated and market transactions are limited or non-existent. Advantages and disadvantages facing this type of colossal, isolated organization are appraised thoroughly since this form of enterprise forms the starting point of discussing other feasible organization patterns. The next three sections are basically an extension of the ODC pattern. They envisage a variety of organizational forms that could emerge when different actors in the construction sector interact and the prevailing structure is dictated by the competition and market transactions. Section seven covers the last organization pattern that is almost the converse of first model. In this organization pattern, there is no integration at any level and actors in the construction project transact in the market. The two final sections are intended to present some reflection based on the analysis of these basic models and summarize this central organization patterns respectively.

2. Method, approach and criteria

2.1 Transaction cost approach

The nature of residential construction sector with its uniqueness of each project and the infrequency of long-term relationship between developers and contractors as well as ever-

changing market and economic conditions seem to influence construction costs either directly or through other factors such as the level competition and construction activity. The existences of economic, organizational, and technical factors encourage or inhibit collaboration between contractual partners (Brensen and Marshall, 2000). Haksever et al (2001) state that firms with a short-term orientation rely on the efficiencies of market exchanges to maximize their profits in a transaction whereas firms with a long-term orientation rely on relational exchanges to maximize their profits over a series of transactions. Lansley (1994) accentuates the significance of the link between the firm and its environment especially issues as subcontracting, procurement method, horizontal and vertical integration and how transaction cost approach is useful in explaining these issues.

Williamson's (1975) transaction cost theory, which is one of the most profound concepts that have been used to explain the practice of different contractual forms and procurement methods, postulates that as uncertainty rises transactions will likely be handled in hierarchy rather than market. Transaction cost approach explicitly regards efficiency as a fundamental element in determining the nature of organizations (Ouchi, 1980). In response to ever-changing business and economic conditions, construction firms adopt different type of organizational structures that influence procurement methods and best economizes on the transaction costs of carrying out building projects. Winch (1989) contends that transaction costs tend to be higher in a situation where the environment is too complex to ascertain all possible outcomes and alternatives due to limited rational decisions or bounded rationality.

Transaction cost theory could be useful to:

- Identify the construction cost components that are more susceptible to specific type of transaction cost and factors that could cause transaction costs to be higher or lower.

- Recognize how various transaction costs are handled in the construction process and how it is transmitted to the project. What type of organizational structure is associated with what type of transaction costs can be identified with the aid of this theory.

Various organizational forms and contractual arrangement represent different solutions to the problems of coordination and motivation (Milgrom and Roberts, 1992). The structure of the construction firm does not only affect the performance of projects undertaken by the firm and sub-market that the firm operates in but it offers clients various form of contracts that differ in terms of risk, flexibility, and costs. Morris (1972) points out that the effectiveness of the construction process lies in the management of the dynamic interrelationship between various organizations found on a building project[1]. Briscoe et al (2004) note that an organization's business environment and the procurement route undertaken affect the level of supply chain integration that will affect future procurement decisions.

[1] Cited in Shirazi et.al (1996)

2.2 Criteria for evaluating organization structure

Different environments, which generate different scale of uncertainty, require varying degrees of separation of organizational units and different degrees of integration. Sunkuk (1997) claims that clear prediction of demand, technology, and social and economic climate changes are the necessary tools for expansion or changes in the organization. Differentiation and integration of construction organizations in relation to other construction actors have some bearing on how risk is allocated and how organizations respond to economic environment changes (degree of flexibility). Nahapiet and Nahapiet (1985) contend that contracts represent different organizational arrangements for defining and co-ordinating the contribution of parties involved in the building project. Reve and Levitt (1984) also state that each organization pattern or governance structure corresponds to a particular type of contract ranging from classical contracting in market governance (contingent-claims contracts) to relational contracting in organizational governance (employment contracts). Walker (1996) refers to Lawrence and Lorsch's study (1967), which states that there is no one best way to organize but rather that organization is a function of the nature of the task to be carried out and its environment.

This basic element of continued existence of the organization coupled with uniqueness of the finished construction projects and the individuality of each client necessitate the process of tendering and contracting in order to allocate risks through contractual mechanism mediated by specialist actors such consultants (Burrows and Seymour, 1983). Winch and Campagnac (1995) and Shirazi et al (1996) stress that a coalition of separate construction actors on a temporary basis work together to undertake construction project in order to meet their needs of making profit and the needs of client. The structure of the project coalition is a function of the contract between the parties (Winch and Campagnac, 1995) and the contract determines not only the relationship of the various design, construction, and advisory organizations with client but also their relationship with each other (Nahapiet and Nahapiet, 1985).

Such an impermanent coalition - temporary multi-organization (TMO) - where the focus is on reducing risk, allocating risk equitably, and the learning progress among all the parties in the TMO (Cherns and Bryant, 1984) could be short-lived. It is also possible that coalition members repeatedly work together and build long-term relationships. Thus, the contract between the parties may turn into a formality rather than a costly document in which each party tries meticulously to protect its interest at the expense of the other party. One interesting question is what makes or prevents temporary partnerships to evolve into permanent form of organization with all the essential objectives of the TMO.

The level of separation and integration of the players in the construction process can present many opportunities as well as challenges for each member of the construction project coalition. Grant (2005) claims that the lack of vertically integration in the construction industry partially reflects the need for flexibility in adjusting to cyclical patterns of demand and different requirements of each project. Integration of developer and contractor with

specialist contractor might increase the competence of the integrated organization, but it may also limit the flexibility of the amalgamated organization to adapt to economic changes. Contrary, a separate developer, contractor and specialist contractor may allow these actors to adopt competitively in the prevailing economic environment and lead to a better risk allocation but the required competence of each actor may increase in order to engage contracting process efficiently and autonomously. Reliance of consultants or other form of contracting could arise in the absence of the essential competence.

As a method of general evaluation of different organizational structures, three rather broad criteria that could be associated with organization patterns were chosen as they are in line with the transaction cost approach: flexibility and risk allocation, competition, and competence (see table 1).

Table 1: *Criteria for evaluating organization structure and their definitions*

Criteria	Definitions
Flexibility and Risk allocation	Degree and ease in which major construction project* parties handle uncertainties posed by changes in the economic environment and the level of demand. It measures organization's capability to adapt economic environment changes.
Competition	Degree to which each organizational unit or subunit is put under competitive pressure.
Competence	What kind of competence an organizational structure requires and the possibilities for the unit and subunits to continuously keep this competence. .

1. *Flexibility and Risk Allocation:* This refers to the degree to which an organization is capable to respond to a changing economic environment and the ease with which it efficiently can utilize its resources. Uncertain factors that different parties of construction projects face can be categorized as risk (Ahmed et al, 1999) and how risks are allocated plays a major role the final construction costs. Typical risks that contractors and owners often try to allocate or share by using various contractual conditions are delays, quality deficiencies, unit price increases, design changes, etc. These kinds of risks occur at the project level and the different parties involved in the project mitigate the risks through contract agreements or negotiations. How about the risk that construction firms face when major actors in the building process are integrated or differentiated to form various organization structures?

   Construction firms are often confronted with uncertainties that arise from workload fluctuations due to the general business cycle of construction activity and the amount and size of contracts rewarded. Workload dynamics may necessitate certain forms of

* The focus of our analysis is only the role of the owner/developer, contractor, and subcontractors (to a lesser extent) in the construction costs and thus we often refer them as major construction parties.

organization structure in order to handle not only risks stemming from business cycle but also successfully bidding and managing projects with the optimal resources allocation.

a. *Uncertainties from workload fluctuation due to the business cycle*: Eccles (1981) notes the fundamental questions that vertically integrated firms faces are the extent to which a firm is responsible producing all the required input resources for its output and how to organize the work and manage the relationship between other firms had the firm choose to obtain inputs from these firms. Smaller organizations are characterized by centralization of power for formulation of strategy and adaptability to respond economic changes (Shirazi et al, 1996). However, due to the limited resources in the face of non-integrating, smaller organizations may become inapt to undertake large project or could face input resources shortage during high construction activity that favours large firm. At the same token, large firms with abundant resources may inevitably face the reality of economic downturns where construction activity and demand are low and many firms struggle to utilize their resources efficiently.

b. *Uncertainties from workload fluctuation due to contract selection*: Since most of the construction work is obtained on the basis of tender (Gonzalez-Diaz et al, 2000) construction firms often face the daunting task of choosing the right projects that are likely to be rewarded. Firms tender a price that would not only allow them to win the specific contract but also provide them a margin of profit. Similarly, construction firms - big or small - have different capacity to undertake one or few contracts simultaneously and that itself creates a source of uncertainty. There are the times when a general contractor cannot keep a large number of labour specialists because of the great uncertainty about labour needs dictated by the time, location, and specialty (Eccles, 1981). The bulkiness of construction material affects the transportation costs and can result in regionalized market structure (Lowe, 1987) that reduces the flexibility to transfer materials where is needed the most. One of the major advantages of subcontracting is to reduce these uncertainties and pass much of the risk on the subcontractor, given that the subcontractor has other possibilities to handle these risks than the general contractor.

2. *Competition:* Are there competitive pressure on the parties in the construction organization? Construction firms cannot gain a sustained competitive advantage over others because competitive pressures force firms to be more-or-less similar in efficiency (Ball et al, 2000). If that is not the case, the result might be inefficiencies that induce the emergence of new organization pattern. Integration of various actors in the building process increases different means that an organization could earn profits. Barlow and King (1992), claim that the increased use of vertical integration in the building process is an alternative solution that has enabled firms in Sweden to

manipulate production costs. Formation of strategic alliance such as vertical integration would be an effective way of overcoming challenges presented by the increasingly domestic and international competitions (Raftery et al, 1998). Lowe (1987) argues that vertical integration involves the fusion of competitors and market concentration through vertical integration does not necessarily present any problem.

From an incentive perspective, Grant (2005) notes that vertical integration give rise to what are termed low-powered incentives due to the internal supplier-client relationship that is governed by the vertically integrated organization rather than market with its high-powered incentives. There is possibility that a vertically integrated organization - developer and contractor – tries to counteract this by allowing its divisions to practice external competition in order to create stronger performance incentives within the firm (Grant, 2005). For instance, a developer of residential rental apartments that is also part of vertically integrated firm may seek the service of another contractor rather than the contractor belonging same organization.

3. *Competence:* Different organizational patterns entail various degrees of competence in order to maintain any edge over an equally competitor actor. There could be several competence matters that could emerge from the formation of different organization patterns. One of them is the kind of competence those actors in the construction project of the different organization structures, especially developers, require for carrying out their tasks efficiently. A developer that is amalgamated with contractor or frequently active in the development of projects might accumulate the required skills and competence to efficiently carry out different phases of building projects with contractors and subcontractors. Contrary, an infrequent developer or non-integrated developer probably may be forced to recruit and invest human capital that enables the developer to achieve its goals. Otherwise, developer may tend to utilize professional services such as consultants to contract with contractors and subcontractors on its behalf.

The degree of competences of project management also varies with the type of contract and procurement methods that various organization structures practice. Coordinated general contractor may require more contacts, management, and negotiation skills than general contract where the main contractor is responsible both the design and construction of the project. Thus, the involvement and competence requisites of the project management (developer side) could be higher in the first contract form.

These criteria can be formulated as hypotheses about when there will be changes in the organizational structure. Such changes are likely if:

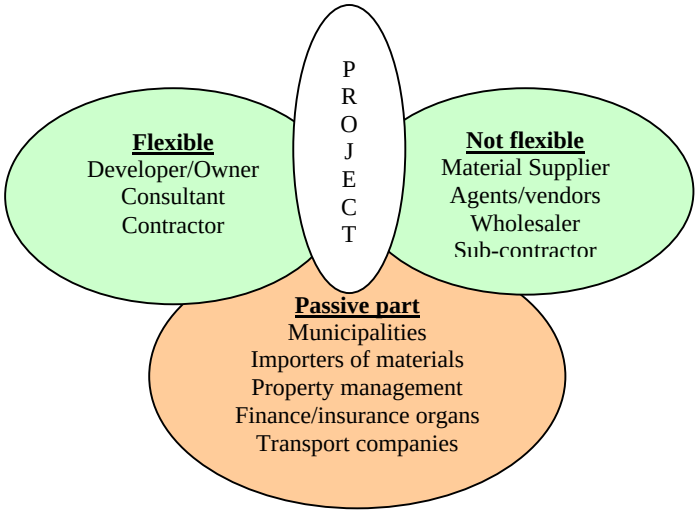
- When there are other forms that can manage risk better.
- When there are other forms that are more efficient because more units are put under competitive pressure.

- When the current organizational form need competences that are difficult to maintain in the organization compared to other organizational forms.

3. Organizational structures in the construction industry: introduction and base model

A housebuliding project is a multi-stage process where land is acquired by a developer, where a consultant or in-house professionals carries out design and estimation, and (usually) contractors erect actual buildings. Of course, there are other actors in the building process - subcontractors, manufactures and suppliers of materials, etc. but developers and contractors are generally the main actors in residential housing constructions and hence all other actors directly or indirectly work for them. The main organizational actors in a typical construction project are client, consultant, contractors, and subcontractors (Reve and Levitt, 1984). Lutz and Gabrielsson (2002) and SOU 2000:44 separate the actors of the building process in terms of flexibility and visibility (see fig. 2) though municipalities can be hardly considered invisible part in the sense of regulatory and zoning authority and land ownership. Municipalities represent one of the largest owner and customer group in the building sector (Salaj, 1985).

Figure 2: *Actors in the building process*



The above schematic picture of the value chain of construction that encompasses most of the relevant actors in a construction project seems to be good starting point of our analysis of possible organizational patterns in the building sector.

3.1 Owner/Developer Contractor (Base model)

Let us begin with an organization pattern that incorporates both what above is called the flexible and non-flexible parts of the construction chain as well as the passive part. For simplicity, we can ignore the passive part since municipalities can be considered as a developer/owner and the other actors play same role in the various organization patterns presented in this paper. Similarly, the only actor in the "not-flexible" part that is a matter of interest in our organizational variation is a sub-contractor. We are not assuming that material suppliers and other agents are not important in the construction process, indeed supplier issues are important in the backward integration discussions, but they are not in the focus of this paper and we simply consider their markets to be contestable.*

The owners of rental apartments and condominiums are different because the latter is termed owner-occupier indicating that the occupant is also the owner while the former, the owner and the occupant are different people. Since we are focusing only the residential rental markets, the owner is considered to be the organization or company that own the building project such as municipal or private company. The owner can also be a developer that not only own and manage rental properties but also are active as developer.

An organization that acts as developer/owner and has the capability to construct its own building with no or very small resources from outside emerges from the above setting. This is called an Owner-Developer-Contractor (fig. 3: ODC). The firm has the human asset capabilities as well as physical assets that are essential to undertake building projects from land development to planning and design phase to construction, and all the intermediate tasks in between. In other words, the large enterprise with centralized hierarchical organization allocates all its sources, products and services internally by administrative means rather than market. A hypothetical organization pattern that could fit the above characterization is a municipal company with input resource and capable to construct its building projects - a type of company that could be found in Sweden in the 1960s. The unique feature of such organization is that it carries all the risk, reaps all the benefits and that all the operational decisions are taking by the organization.

Figure 3: Owner-Developer-Contractor (ODC)

Such form of organization will obviously gain some benefits from integration but it will also inevitably encounter some problems stemming from competition, coordination and control problems associated with giant organization. D'Aveni and Ravenscraft (1994) find that economies of integration in such a structure can be offset by increased bureaucracy costs in

* Contestable market is one where firms can enter or exit a market freely.

the form of increased production costs due to insulation from market pressures and lack of incentives to manufacture lowest cost inputs. Some of the advantages related to that kind of organization form, from risk and incentive perspective could be identified.

- Higher degree of certainty in regard of time, quality, and cost of the projects resulted from internalizing procurement and development process.

- Less reliance on other firms to provide the desired inputs. Increased flexibility in the use of manpower and other input sources within the organization and ability to undertake concurrent projects especially in stable economy. Coordinating and scheduling costs may be lower if the firm is integrated and consequently steadier supply of raw materials could result in better control of production and delivery schedules as well as maintenance operations (Porter, 1998).

- Improved level of competitiveness in terms of capacity. Few firms are capable to carry out complex and lumpy projects.

- A single firm rather than many small parties with high risk of insolvency handles maintenance and guarantees for the parts of the project.

- Increased cooperation between various actors in the building process i.e. contractor and architect will be able to harmonize their respective tasks and share information that is vital for the reduction of construction costs. Had they been separate, tender system encourages neither side to co-operate to design a building that is economical as possible (Foster, C. 1964).

A large organization such as the one we have depicted in figure 3 will however face challenges in all the three dimensions that were presented earlier in this paper. Some of the challenges are:

- Increased risk exposure due to the absence of non-market arrangements with suppliers subcontractors, etc. that could place protective barriers between the firm and market i.e. shortage of labour and material. One extra project can be the difference between running full capacity or having a great deal of spare capacity (Wallström, 1985)

- Increased bureaucratic costs associated with a giant integrated organization and reduced benefits of specialization that firms could gain by doing what they do best (Baye, 2003). Vertical integration of many interdependent production activities creates complex control and coordination problems that could result managerial inefficiencies (D'Aveni and Illinitch, 1992). This means that some parts of the organization might be sheltered from competitive pressure. For decision makers, it

becomes difficult to control and evaluate different divisions when the number, size, and diversity of divisions in an organization increase.

- Under-utilization of the resources amassed by the firm especially if the economy is unstable. Higher dependence of the construction projects on local input sources reduces the transferability of resources such as labour and material from low demand region to high demand region.

Two types of risk that can be associated with the giant organization (owner-developer-contractor) are; market risk that this firm shares with both the development and construction businesses, namely the cyclicality of activities related to land development and construction projects; risk emanating from non-contracting out many resources and the subsequent higher fixed costs that could be transformed into variable costs. Large firm with abundant resources is able to deploy the necessary input resources for projects undertaken and avert any shortage of labour and material supply in upbeat markets. However, the downturn seasons present challenges for the large firm with accumulated resources unless subcontracting is practiced that would allow the firm to retain their core business and specialty.

Uncertainties of the development and construction markets are present simultaneously in this organization model as well as the risk that arises when the organization is not subcontracting. The opportunity to transform fixed costs to variable costs through subcontracting practices is absent in this model as mentioned above. Thus, this form of organization could be associated with lack of flexibility and ability to allocate risk. Later, we will examine several organization patterns that could emerge when each of these risks is mitigated.

The ODC organization type could improve the competition position of the firm and the competence of its entities. Organizations strive to get bigger by acquiring or merging with other firms in order to benefit the economies of scale or scope. Thus, one can assume that a vertically integrated organization with capital and manpower muscle has improved its competitive advantage. However, small firms and specialty subcontractors have advantage over large firms in many small jobs and repair works (Foster, 1964). Many of the competitive advantages of large firm – wealth, superior technical knowledge, and the scope of standard procedures may become ineffective for small projects and variety of situations encountered (Foster, 1964). Thus, an organization must be large enough to compete and at the same time smaller enough to specialize certain construction works. The main problem with the ODC-organization from the competition point of view is however the control problems mentioned above which means that various parts of the organization might not work efficiently because they are sheltered from competition.

The competence criterion, which measures the degree of competence that owners and developers required in each organization pattern is hard to single out the level of attained competence when developer is integrated with contractor. However, we can assume that at least the developer in the ODC situation does not need specific competence in order to enter

contract with other contractors. The central competence needed is that of running a large hierarchic organization.

Looking at the base model (ODC) organization model as a whole the following main points emerge in summary:

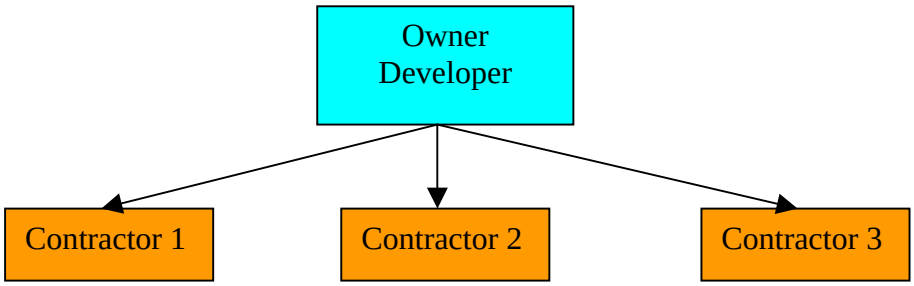
- It has little flexibility on a more unstable market
- Many parts of the large organization is sheltered from competitive pressure
- It needs high competence in the area of managing a large hierarchic organization.

4. Construction organization structure with major actors

4.1 Owner/Developer contracting with Contractor (OD-C)

One way to mitigate the market risk that the firm shares with both the development and construction businesses is to break up the organization or the firm into two separate entities and allow them to operate as independent commercial units that compete in their respective markets (figure 4a). The owner/developer can also sell the contractor part. In this pattern, the owner/developer has the ability to concentrate the land development process and procure the construction activities from the market. The break-up might reduce the bureaucratic costs of the giant organization and lessens the control and coordination problems but other transaction costs such as administrative costs of search, tendering, negotiation and contracting, and monitoring will obviously replace bureaucratic costs.

Figure 4a: *Owner-Developer and Contractor: OD-C*



The magnitude of these costs will depend on the nature of competition, level of construction activity, and the strength of relationship among the contracting parties. For instance, Contractor's mark-up would be higher if their workload is higher because they could afford not to win the contract. Similarly their mark-up would be higher if their competitors had a lot of work because their competitors would probably put in high bids too (Hillebrandt and Cannon, 1990). The disintegration of the owner/developer from contractor reduces the risk of having a large organization with excess capacity when the market turns down, but it creates

new risk if the market at the contractor level is not perfectly competitive. The new risk is that prices/costs increases during boom periods. In other words contractor market must be contestable for the developer to realize all the benefits of disintegration. When market forces are not fully at work and competition is limited to a small number of parties there is likely to be opportunistic exploitation of the situation and hence a rise in direct construction costs, and also in transactions costs (Winch, 1989).

Since the contractor still undertakes building projects with its own resources, risk exposure resulted from non-contracting out input resources and under-utilization of resources during economic downturns will still persist under this pattern. As the contractor can work for several developers, and perhaps more easily can move resources between regions, the possibility to reduce market risks in the downturns should however be higher in this model.

The OD-C organization pattern compels the owner/developer to possess greater contracting competence than its counterpart in the base model (ODC). Transactions between the contractor and developer take place in the market and developers must faces the challenges of crafting contractual agreements in terms of tendering, managing, monitoring, and evaluating them.

Long run relationship with specific contractor might reduce the need of superior competence of the developer but competition and construction activity levels often interfere the dyadic relationship between the parties. Short-term commercial benefits might dominate any fostered relationship and developers with minimum or less competence are forced to integrate with contractor or squeezed out of the business. Thus, there is competitive pressure on the developer side to investing more on human resources and/or accumulating skills by building frequently to acquire the aforesaid competence.

In summary, the *OD-C* model might replace the ODC model for two reasons:

- The independent contractor can handle market fluctuation better than the integrated ODC firm.
- The contractor is put under more competitive pressure as the developer can choose between different contractors. There could be a reduction of bureaucracy costs as result of splitting as well as efficiency due to transacting in arms-length with high-powered market incentives.

There are however also problems with the model:

- The contractor still is a large integrated organisation and there is probably only room for a limited number of such firms on the market. The developer might find that costs - the contractor’s price- increases rapidly when demand increases.
- The developer needs to have high skills in tendering, which might be problematic when the developer is not active on the market all the time.

4.2 Owner/Developer/Contractor contracting with sub-contractors (ODC-SCs)

There could be other reasons that integration between contractor and developer could materialize besides uncertainties in costs and transaction cost consideration (Harrigan, 1985). Vertical integration could result from strategic consideration of contractor to go into the development market with aim of gaining market power in the specific sector. Obviously, the integration could alleviate the competitive pressure and required competences faced by the merging entities before the integration but the benefits might get offset when subcontracting is not practiced. Furthermore, owner/developer that has experienced unfair pricing or unsatisfactory quality work from contractor may compel either to take safeguard measures that could increase the construction costs or to integrate with contractor in order to earn a profit margin that allows him to stay in the business.

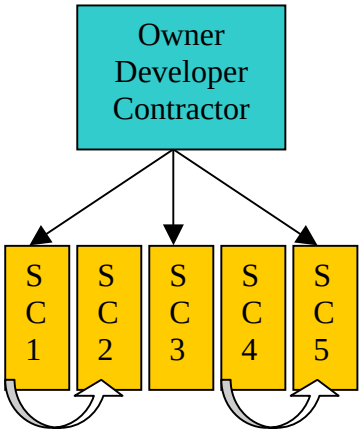
An alternative organization pattern that contains similar ODC entities as in the Base model but allows contractor to transact with different sub-contractors for their products and services is presented in figure 4b (ODC-SCs). Market risk as result of seasonality in the construction activities may lead to reluctance of contractors to undertake significant investment in plants and equipments as well as human assets and thus resort the use of subcontractors instead (Barker review, 2003). The organizational pattern that emerges is what Eccles (1981) termed "Quasifirm", which based on the existence of stable relationship between a general contractor and subcontractors. This organization pattern represents a mixture of hierarchy and market structure where owner/developer and contractor are still governed by administrative means whilst subcontractors transact with the firm competitively in the market.

Contrary to the previous organization pattern (fig. 4a), the ODC-SCs governance structure in fig. 4b offers more flexibility to meet the variability in the demand of resources needed to undertake projects. It also offers flexibility to cope with the variety in the demand of the construction work. Subcontracting to specialized firms, construction companies can avoid committing themselves significant investment in terms of labour and other assets. Thus, subcontracting allow construction companies secure numerical and functional flexibility (Velzen, 2005). Another benefit of subcontracting and the possible long-term relationship developed by the contracting parties is the reduction of the transaction costs associated with each successive project they undertake jointly. When subcontractor-contractor relationship is not developed, it could influence subcontractor's bidding strategy (Uher and Runeson, 1985).

Contractors' motivations to subcontract some of the work to specialty subcontracts are many and differ between property types (Costantino et al, 2001; Gonzalez-Diaz et al, 200). Reduction of overhead and construction costs stemming from lack of local market knowledge and the need of supervision are some of the benefits that contractors gain from subcontracting. Costantino et al (2001) note that contractors in commercial constructions use the subcontracting as a reduction of liability exposure, lower overhead cost, and protection against market volatility as well as way of countering the shorter construction time needed in the commercial sector. Inevitably, Subcontracting raises some concerns such as reduction of

general contractor's control over the construction process and quality work (Clarke, 1981)[3]. There is a possibility that functionally similar subcontractors (specialized contractors) offer their services to each other and hence the working relationship extends beyond the contractor and subcontractor. Subcontractors may contract informally with similar subcontractors if they don't have the necessary resources to perform their contractual obligation with the main contractor.

Figure 4b: *Owner-Developer-Contractor and Subcontractors (ODC-SCs)*



Subcontractor market competitiveness is indeed indispensable also in this organization pattern as the main contractors were in the previous pattern but it has some implications on the longitivity of the relationship between contractor and subcontractor. On one hand, intense competition among subcontractors may encourage contractors to resort to market transaction mechanism and indeed sacrifice enduring relationship with subcontractors (Sözen and Kayahan, 2001). On the other hand, presence of many equally competitors in the subcontractor market allows the contractors to obtain bidding price for projects before they reward the eventual subcontractor. Uher and Runeson (1985) state that 80 percent of subcontractors indicate that they have experienced difficulty with contractors who shop around before awarding the project to the subcontractor.

An important but rather neglected issue is how subcontractors can handle market risk. There are several possible answers. Subcontractors can of course work for different developers, and they might also be able to work in large regions. They can also informally cooperate with other subcontractors if they have excess supply or excess demand for specialists. They might also work with maintenance projects and directly for owner-occupiers on the housing market. Finally the bankruptcy costs might be lower for a small subcontractor.

Organization pattern in fig. 4b may appropriately describe the current Swedish condominium property market but not the rental sector where contractors have few or no property holdings. At present, contractors often build rental apartments and dispose them but that may not be the

[3] Cited in Usdiken et al (1988)

case if the already vertically integrated firms begin to own residential rental apartments as some of the respondents interviewed pointed out (more discussion in the empirical part).

In summary, the organization model just described (*ODC-SCs)* could benefit subcontracting by reducing risk of hoarding lot of skilled workers or stockpiling required input resources or both. The amalgamation of owner, developer, and contractor may provide competitive advantage in operating both the development and construction activities by establishing a degree of oligopolistic control over the housing market but it also increases the uncertainties inherited from operating both development and contracting markets. Nevertheless, the increased use of subcontracting provides the organization in fig. 4b greater control and flexibility (Barlow and King, 1992) that at least could reduce uncertainties arising from contracting market. Required competence of the developer could depend on whether external competition of services demanded by the developer is allowed. Finally the subcontractor might be able to handle risk rather good.

4.3 Owner/Developer – Contractor contracting with subcontractors (OD-C-SCs)

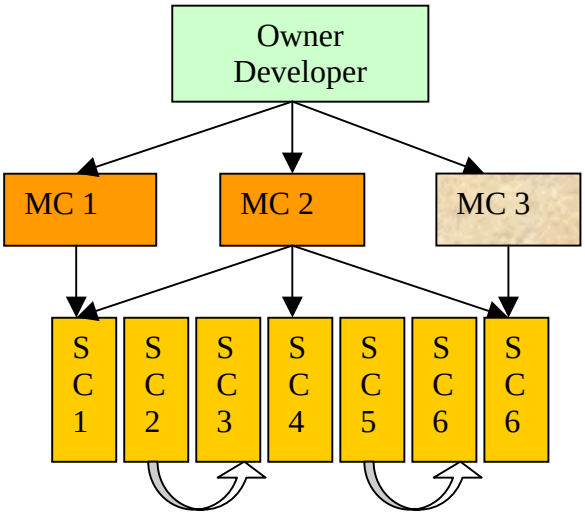
A fourth type of organization pattern is a variant of the two previous patterns where contractors are not only separated from the owner/developer but also are able to enter market arrangements with specialized subcontractors in order to minimize their exposure to market risk (fig. 4c). This can be seen as development of the OD-C model and reduce some of the problems in that model concerning market risk. In this organization structure, the developer transacts exclusively with the main contractor in arms-length contract rather than bureaucratic means and has no direct contracts with subcontractors. Developer's contract with contractor and making him bear some risk is one form of motivation to control and possibly reduce construction costs (Olsen and Osmundsen, 2005).

This form of organization is very common in the Swedish residential rental market where owner/developer contracts with contractors. Some contractors are also active as developers and participate same market with other contractors and developers (MC 3 in fig. 4c). The main contractor of the project employs other contractors that can undertake parts of the projects, which are technologically and/or resourcefully beyond the main contractor's capacity or they have comparatively superior local knowledge. Similarly subcontractors can delegate some of their works to other subcontractors.

There are probably many reasons that construction actors choose to integrate. Turner (1997) emphasize that depressed economic situations and reduction of general housing subsidies in the private rented sector forces municipal companies to be more efficient and more businesslike in order to be able to handle a harsher economic situation. It is not only the developers who are forced or motivated to integrate but contractors also could initiate the integration process. Contractor who wants to enter rental markets or build his own projects in order to maintain the productivity of its resources may integrate with developer or create a separate division that fulfils these objectives. The situation is more delicate when the

contractor is also active as a developer and has intention to influence construction costs by either raising cost level in order to make unprofitable for the developers or other competitors. Vertically integrated contractor-developer as well as non-vertically integrated contractors in this organization model acquire specialized knowledge that positions them on what Ouchi (1980) termed "first mover advantage" that enables them to bid more effectively on subsequent contracts and discourage other competitors to compete against them.

Figure 4c: *Owner-Developer and Contractor contracting with Subcontractors (OD-C-SCs)*



* The arrows just indicate the existence of relationship but not necessarily all the possible directions of interactions among the actors in the organization model.

In the absence of competitive pressure, developers are susceptible to experience opportunistic behaviour from contractors and are forced to employ a costly complex contract that will safeguard them against higher costs or poor quality. Hendrickson and Au (2003) accentuate a situation where owner/developer type shapes the process of the project procurement. They emphasize that competitive bidding requirements on public projects and the sheer weight of entrenched bureaucracy steers away some contractors to participate the bidding and those who bid tend to submit high bids in order to compensate for the restrictive contract terms.

In this situation, private developers could pursue one of the following alternatives while municipal and quasi-public developers (HSB, cooperatively owned company) are not so flexible to engage in the organization form that market conditions support due to time and political maneuvers needed for implementing another organization model.

1. To integrate with existing contractor or enter the construction business and become a contractor as well as developer to internalize the procurement of the project.

2. To engage directly with specialty contractors that would allow them increased use of individual subcontractors in the production.

Similar argument of having competitive contractor market is also applicable in this organization model but now the owner/developer and contractor have divergent objectives where the former is striving to acquire a specified product with the lowest possible price and the latter is profit maximization entity that is motivated to deliver that product with highest possible amount of money. Consequently, contracting parties face time and cost overruns, quality deficiencies, costly disputes and ultimately disruption of relationships among them (Rahman and Kumaraswamy, 2004). An alternative strategy to taper these two divergent objectives is to pursue one of the relational contracting such as partnering, long-term relationship and other collaborative working and better risk sharing arrangements (Rahman and Kumaraswamy, 2004). Harmon (2003) suggests that owner/developer and contractor are interdependent upon each other and have one congruent objective of having a project successfully delivered though the owner has the control of the resources and ultimately the power to influence the satisfaction of both parties.

In this organization model (OD-C-SCs in fig. 4c), the benefits as well as shortcomings of subcontracting might be similar to the preceding organization pattern. The differentiation between owner/developer and contractor presents the developer and opportunity to deal with other contracts and practice market deriving procurement. Nevertheless, the separation compels the developer to acquire the necessary competence to efficiently carry out the nuts and bolts of transaction process – from design and specification stage to tendering and procurement of the final product. There still might be a problem of lack of competition in the contractor market as in the OD-C model.

In summary, the organization model *OD-C-SCs* seem to provide greater flexibility and risk allocation of construction actors by allowing both market contracting and separation of construction activity to development and construction. Developers face competitive pressures to either integrate with non-vertically integrated firms, protect themselves against opportunistic market driven behaviors with painstaking contract, or gravitate towards direct subcontracting. The required competence of the developer in first scenario is already discussed in other similar models. However, the other two scenarios demand higher developer competence in order to tender, manage, monitor and evaluate the performance of contractors.

5. Construction organization structure without main contractor

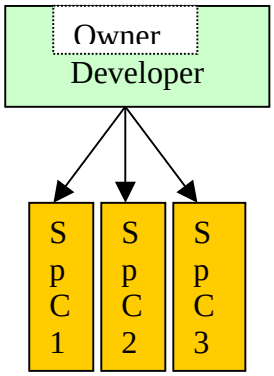
So far, developers have no direct contract with subcontractors in the previous governance forms. They are not the real beneficiaries of subcontracting while they are still not exempted any risk from the subcontractor's underperformance. The next two organization patterns represent governance structures that allow developers to reap the benefits of subcontracting either directly or through the employment of project leader or consultant (see fig. 5a and 5b respectively). Specialty contractor term is more suitable to use when we are describing the

organization models without main contractor where developers directly engage with subcontractors. The term subcontractor implies the presence of contractor that contracts out his obligation with the developer to a third party – namely the subcontractor.

5.1 Frequent owner/developer contracting with specialty contractors (OD-SpCs)

When a frequent developers act as owners of the building projects or only as developers, specialty contractors and developers get the opportunity to work repeatedly and build long-term relationship. Specialty contractors are not only participants of the new projects offered by the developer but also have the opportunity to carry out repair and renovation works of the old projects owned by the same developer. Thus, it means a reduction of the transaction costs (search cost, administrative and contracting costs, monitoring costs, etc.) for both parties. Learning by doing is an old philosophy that the owner/developer can benefit from. Developers may accumulate the skills and the experience needed to carry out future projects without the employment of an outside agents.

Figure 5a: *Owner-Developer and Subcontractors (OD-SpCs)*



In this organization model, the owner/developer's competence and the increased use of subcontracting for risk allocation might not suffice to compete against larger vertically integrated organizations carrying out major projects. Ball et al (2000) state that banks and insurance market may not be able to monitor contractor performance and rely on size as a proxy for competency and solvency. Thus, larger firms may have an advantage over smaller firms when it comes financing. The competition could be even tougher in big cites or a growing region where high concentration of large contractors is likely present. Often these owner/developers organization operate at the regional level and medium cities where the developer and few specialty contractors could develop a dyadic relationship rather than a market driven relationship.

The main advantage of this form compared to the OD-C or OD-C-S form is that the developer becomes independent from a usually big main contractor. If the competition on the main contractor market is weak, the developer might want to escape from both the OD-C and OD-C-S structure. The total competitive pressure might be higher in the OD-SpCs structure as

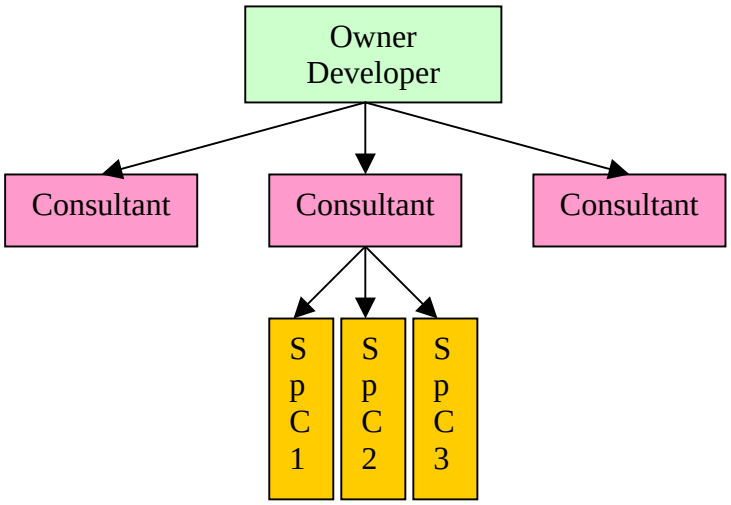
there might be more competition on the market for specialty contractors than on the market for main contractors. The model does however require large skills by the developer, not only in finding suitable specialty contractors, but also co-ordinating their work on the workplace.

In summary, the organization model *OD-SpCs* seem to provide greater flexibility and risk allocation of developer by allowing subcontracting all the needed work. These developers often employ specialty contractors not only new projects to construct but also to carry out maintenance of existing properties owned by the developers. Thus, they require to posses higher competence to coordinate efficiently various specialty contractors. The main problem is that the developer needs to be very knowledgeable and skilled in finding and contracting with the specialized contractors and coordinating their behavior. Developers in this model may also find it difficult to carry out larger projects as it might be more difficult to contract with and co-ordinate the specialty contractors is such a case. .

5.2 Non-frequent owner/developer contracting with consultants (OD-Cons-SCs)

The situation is somewhat different when the developer is not frequently developing building projects (discontinuous developer). On one hand, specialty contractors and developer may have not fostered a good working relationship and thus trust and harmony are in short supply and the developer might not have the skills to find the right specialty contractors and coordinate their work. On the other hand the developer might not want to use the OD-C or OD-C-S structure because of the lack of competition between the main contractors. In this situation, the hiring of project leader or consultant firm that could provide necessary skills of contracting is one possible alternative to procure the services and products of subcontractors (this procurement method is also called project management). In a competitive market at the consultant level, good working relationship would obviously serve the best interest of both the infrequent developer and the consultant. Discontinuous developers need to utilize the expertise and resources of the consultants that frequent developers could have endowed by virtue of building regularly.

Figure 5b: *Owner-Developer with Consultants (OD-Cons-SCs)*



In summary, the organization model *OD-Cons-SCs* provides greater flexibility and risk allocation of developer by allowing subcontracting all the needed work. However, the discontinue developer is oblige to employs consultant firm in order to fill the missing competence and lack of relationship with sub-contractors. Any competitive pressure stems from the contestability of consultants market. If there are lack of competition on that market it could drive up the price charged by the consultants and could compel the developer to acquire the needed competence by hiring skilled workers and management, or using any of the earlier models.

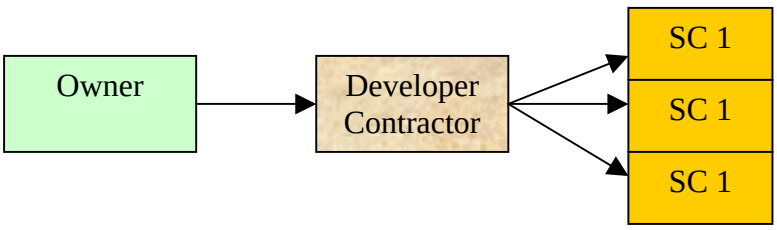
6. Separated Owner and Developer/Contractor contracting with Subcontractors (O-DC-SCs)

One more organization pattern is one that comprises an independent owner and a developer-contractor that could be described as a vertically integrated firm of contractor-developer contracting with an owner and subcontracting some of the work. This form of organization only differs the organization model in fig. 4b by splitting the owner and developer and the implication is that the owner's cost of the project (the production cost plus the developer/contractor profit margin) will be higher in the current model. Owner will still also be compelled to acquire the necessary competence in-house or resort outsourcing to specialized firms. Since, vertically integrated firms operating in a single market are numbered and owners competing their services could be numerous, an owner in this model face a daunting task of protecting unfair pricing by either:

- Having long-term relationship with a specific contractor that undertakes all or most of his projects and forego the benefits of competition. The expectation is that long-term relationship gains in terms of lower construction costs will outweigh the decrease of competition advantages. The practical implication of this strategy in relation to client type is discussed in organization model 4c.

- Procuring the project with meticulously writing contract that includes every foreseeable outcome. Apart from the impossibility of counting all possible events due to bounded rationality, construction costs may increase due to incurrence of other cost such as legal, administrative, monitoring, etc. Furthermore, this strategy encourages adversarial relationship between the contracting parties.

Figure 6: *Owner-Developer/contractor and Subcontractors (O-DC-SCs)*

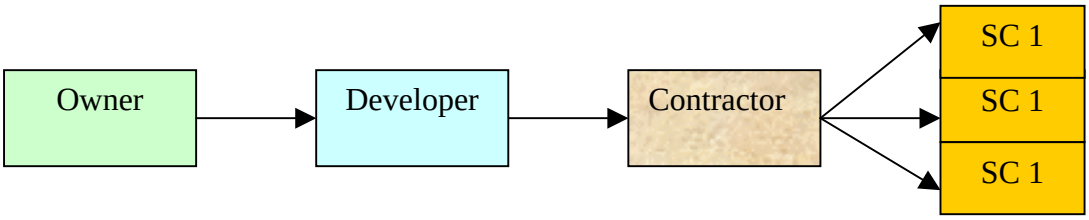


In summary, the organization model *O-DC-SCs* could benefit subcontracting by reducing risk of hoarding lot of skilled workers or stockpiling required input resources or both. The integration of developer and contractor may provide competitive advantage in operating both the development and construction activities but it also increases the uncertainties inherited from operating both development and contracting markets. The increased use of subcontracting provides this organization greater control and flexibility. Required competence of the developer could depend on whether external competition of services demanded by the developer is allowed. Owner in this organization model is compelled to have required competence.

7. Separated Owner, Developer, and Contractor contracting with Subcontractors (O-D-C-SCs)

Figure 7 depicts the final organization pattern that could possibly emerge when there is no integration in the supplier structure of construction projects and subcontracting is taken place. This type of organization pattern is the other extreme of the first organization model (fig. 3) where the three major actors in the building process were integrated and subcontracting was not considered. Now the actors are contracting through market and each one of them is compelled to either rely on its skills to allocate risk as much as possible or depend on prior good relationship with other party that could depress any opportunistic behavior.

Figure 7: Owner-Developer-Contractor and Subcontractors (O-D-C-SCs)



Many of the features of this organization model are similar to the preceding model but the separation of owner and developer increases the required competence of each one of them. Separation also introduces double marginalization problem where the owner is not only get charged the construction costs plus contractor's mark-up but he also is charged the profit of the developer.

In summary, the organization model *O-D-C-SCs* could benefit subcontracting by transferring risks that arises from fluctuation of demand to parties that can handle the best. The de-integration of developer and contractor may provide competitive advantage in competing both the development and construction activities but it also decreases the benefits of being larger to undertake sizeable projects. The increased use of subcontracting provides this organization greater control and flexibility. Required competence of the developer and owner is increased.

Table 2: Summary of the organization patterns

Organization pattern and entities	**Characteristics of the organization and assessment** Flexibility &Risk allocation|Competitive pressure|Required Competence
1) ODC (fig. 3)	Hierarchical and limited or no market interaction**,** higher degree of market risk and higher fixed costs due to joint activities and lack of market contracting. *Low* *High* *Mixed*[4]
2) OD-C (fig. 4a)	As the developer is not integrated and can choose between different contractors, contractor is under competitive pressure. Risk stemming from not subcontracting and under utilization of own resources reduces the efficiency of this model. Developer also needs to have high skill in tendering. *Mixed* *High* *High*
3) ODC-SCs (fig. 4b)	Subcontracting provides greater control and flexibility but uncertainties inherited from both development and contracting markets still exist. *Mixed* *High* *Low*
4) OD-C-SCs (fig. 4c)	This organization model provides greater flexibility and risk allocation of construction actors by allowing both separation of development and contracting activities as well as subcontracting. *High* *Mixed* *High*
5) OD-SpCs (fig. 5a)	The developer in this model needs to be very knowledgeable and skilled in contracting with SpCs and coordinating their behaviour. He may also find difficult to carry out larger projects that require high level of resources and coordination. *High* *Mixed* *High*
6) OD-Cons-SpCs (fig. 5b)	The model provides greater flexibility and risk allocation by subcontracting and employing consultants that fills the missing competence of the developer and the lack of relationship with subcontractors. In order this model to survive, contestability of consultant market is crucial *High* *Mixed* *Low*
7) O-DC-SCs (fig. 6)	Owner in this model is compelled to have required competence while the required competence of the developer could depend on whether the external competition of services demanded by the developer is allowed. Integration of developer and contractor provides competitive advantage. *High* *Low* *Mixed*
8) O-D-C-SCs (fig. 7)	Separation of developer and contractor may reduce uncertainties stemming in operating both markets but it may also decrease the benefits of being larger. *High* *High* *High*

[4] "*Mixed*" indicates that the factor in question could be either high or low depending on other conditions.

8. Stylized history and some reflections based on the analysis of the simple models

Ball (2003) describes housebuilding from an international prospective consisting a large number of relatively small firms with very low economic of scale, which helps both to make entry and exit from the industry relatively easy. In the Swedish building sector, that type of description of housebuilding may be partially appropriate if we do not consider other characteristics of the industry. Two characteristics that are associated with the Swedish building industry are:

1. Very fragmented with huge number of small companies and few large ones (Lutz and Gabrielsson, 2002). Acquisition and mergers in Swedish construction industry left three big construction contractors followed by small number of contractors that specialize in housing or in regional activities (Bröchner et al, 2002).

2. Composed of several sub-markets with high level of concentration and significant vertical and horizontal integration (Roseveare et al, 2004). Concentration is often due the entry barriers and vertical integration may represent an entry barrier and thereby contribute to high concentration (Swedish Competition Authority, 2004).

Vertical integration and oligopoly in the building sector reduce the competition in various forms. Big construction companies have wide fields of activity and are active in construction as a contractor and property development as a developer (Andersson 2000) in various regions. The dominance of few large firms in a market leads to oligopoly situation where the actions of one firm do have an effect on the overall market because of a distinguishing feature of oligopolistic market; the mutual interdependence among firms in the industry (Baye, 2003).

Various explanations have been given about the reasons that few large firms emerged and the existence of vertically integrated firms in general and particularly in the Swedish building industry. Vertical integration could arise as response to lower profit margins from projects that encourages construction firms to explore other areas of activity such as property development (Ofori and Chan, 2000). Barlow and King (1992) note that the oligopolistic nature of Swedish housebuilding is direct result of takeovers of small firms and mergers among the large firms in response to decline in the single housing productions and repair works since 1970s.

Huemer and Östergren (2000) characterize Swedish construction industry as one that traditionally has preferred to act according to local market requirements, risk-averse, and firm's action were strongly guided by its previous experience. They claim that the two largest construction companies in Sweden have previously implemented a multi-domestic strategy where each market is treated essentially in isolation and local knowledge and experience are utilized. Although Huemer and Östergren's study is mainly focused on the learning aspect of

the different strategies practice by organizations i.e. international versus national market, multi-domestic strategies adopted by the big contractors could explain the diverse contractual behavior among construction actors and the disparity of construction costs increase in the various regions. For instance, the regional office of a large contractor is independent from the head office in terms of the strategic relationship with the clients in that region.

9. Conclusions

The use of transaction cost theory as a tool for exploring different organization structures in the construction sector from an efficiency perspective makes it easier to predict how major actors in the building projects respond to economic and business challenges that is vital for their survival. It may explain why certain organization structure has dominated at some point in time and point out forces (competitive pressure, higher level of required competence, greater flexibility etc.) that make it necessary to bring another form of organization.

Five main organization models as well as several sub-variations were envisioned to prevail when major actors in the building process are allowed to integrate or separate in response to uncertainty and ever-changing construction business. Owner-developer-contractor model with no or very small outside subcontracting served as a base model for our analysis. This kind of model faces many challenges as well as opportunities ranging from increased risk exposure and bureaucratic costs to improved level of competitiveness in terms of capacity and less reliance on other firms to provide the desired inputs. A more unstable economy also causes under-utilization of the resources amassed by this type of firm where the transferability of labour and material from a low to a high demand region is not economical.

A separate owner, developer, and contractor structure with permitted subcontracting practices might provide risk reduction and greater flexibility. Risk is allocated to those who can handle it better. Actors are able to enter market arrangements that would allow them to minimize their exposure to market volatility. When major actors deal directly with specialty contractors or are subcontracting, it enables them to reduce overhead and construction costs stemming from uncertainties of workload and lack of local knowledge.

Other organization structure models are extensions of these two extreme models where consultant or project leader is added in to the arrangement. The use of consultants could arise from either the fact that developers were not the beneficiaries of any possible long run relationship with subcontractors, and thus want to reap the benefits of subcontracting, or that

these developers infrequently undertake projects and thus lack the resources and skills necessary to successfully carry out building projects.

A better understanding of the various organization structure models as well as the economic and market forces that determines their efficiency could not only help to enlighten construction cost increase differences among the Swedish regions, but it could assist to predict what kind of organization structure would emerge in the coming period. Will the dominating position of the big contractors be broken by the use of consultants and specialty contractors? Will the big contractors then respond by being even more active as developers themselves?

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