State "Currencies" and the Transition to the U.S. Dollar: Clarifying Some Confusions

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Abstract

If they could be believed, Farley W. Grubb's recent papers on the early U.S. monetary system would be important contributions. This article shows, however, that Grubb's papers should not be believed. Grubb's key assumption, that the medium of exchange can be inferred from the unit of account, is erroneous, rendering his data analyses nugatory. Moreover, after 1781 most Americans eschewed government paper money in favor of full bodied coins and convertible bank liabilities. Bankers did not foist the Constitutional clause banning state emissions onto an unsuspecting public (*JEL* N110, N210, N410, E590).

Paper

In two recent articles, Farley W. Grubb presents a revisionist view of early American monetary history that, *if correct*, would have far-reaching implications (Grubb 2003a, b). The monetary arrangements ushered in by the Constitution, Grubb contends, were inferior to those already in existence. Rent-seeking bankers unable to compete with state-issued paper money in the marketplace dictated the new arrangements, not selfless founding fathers. Accepting Grubb's view would alter our understanding of the early American economy, the Constitution, the efficacy of early U.S. monetary arrangements, and the desirability of modern currency unions that draw inspiration from the American experience. Close analysis of the historical record, however, shows that Grubb's most controversial propositions are baseless.

Like Grubb, we focus on Pennsylvania, which enjoyed a relatively successful experience with paper money during both the colonial and Confederation eras (Mary M. Schweitzer, 1989). Broadening our inquiry to include less successful episodes largely neglected by Grubb, such as Rhode Island, Georgia, and North Carolina, would raise a host of additional objections.[1] To present our objections to Grubb's papers clearly, in Part I we summarize his argument in five propositions, refuting each in its turn. Our interpretation of the historical record is strikingly different from Grubb's. We argue that when

colonial issues of paper money held their value well, it was because there existed a concomitant circulation of full-bodied specie coins valued in local currency according to a fixed rule, and the public's faith in paper money was so great that they accepted it interchangeably with specie on those terms. We go on to argue that in the confederation period, the aforementioned faith now shattered, state-issued bills of credit were far less successful and bank notes and deposits were far more successful than Grubb depicts. We contradict Grubb's narrative claims about the Constitutional convention and his conclusion that the ban on state-issued bills of credit was little more than special-interest legislation designed to aid failing banks. Finally, we present an alternative explanation of the inflation of the mid-1790s, and argue that Grubb's explanation – the transition to the dollar – collapses when the chronology of events is correctly understood.

In Part II, we scrutinize the econometric evidence Grubb introduces to support his claim that there was a fundamental break in the behavior of prices in the mid-1790s, and argue that the evidence he presents fails to convincingly establish such a break even occurred. In one instance, he declared observed differences in standard deviations statistically significant based on faulty distribution theory. In another, purchasing power parity was tested with an inappropriate exchange rate series. Most important, the dating of most of his structural break points are at best problematic and at worst contradicted by the very sources upon which he relies. In short, neither Grubb's econometrics nor his historical narrative are convincing.

I. Contending Views of Eighteenth-Century American Monetary Regimes

Proposition 1. The American colonies used paper money successfully for the most part. Colonial legislatures had close control over the quantity of money in circulation since there was no banking system (and therefore no money multiplier), and since the fiat nature of the bills freed them from the constraints imposed by a specie standard. Colonial governments, particularly Pennsylvania, used the "timely injection and then redemption" of money to achieve price stability and macroeconomic stabilization.

Colonial paper money had a mixed record. While successful in the middle colonies, its performance was worse in New England and the South: Grubb acknowledges only the highlights of its

myriad difficulties (John J. McCusker, 1978, pp. 133-6, 191-3, 215, 220). Colonial Pennsylvania's paper money held its value, but Grubb's claim (2003, p. 1779) that its success was due to the legislature's "timely injection and then redemption" of bills of credit is inaccurate. The legislature could not issue paper money without the consent of the proprietary governor, whose orders often obstructed new emissions. Even if the governor consented, the King's bureaucracy could block it. After 1764, the Currency Act also constrained the legislature, which almost constantly wrangled over paper money with the governor, the proprietor, and royal authorities, with the result that emissions were frequently delayed and often thwarted (Leslie V. Brock, 1975, pp. 353-91; Joseph A. Ernst, 1973, pp. 208-15, 305-8).

The imperatives of currency finance also conflicted with rational monetary policy (Elmer J. Ferguson, 1953, pp. 153-80). Pennsylvania had scant ability to borrow or quickly increase taxes. When embroiled in the French and Indian war, Pennsylvania had to print money, and, as Figure 1 shows, military spending drove monetary policy. The stock of bills of credit increased rapidly between 1755-1760, a time of great prosperity, and peaked in 1760 when British victories ended the land war in North America. During the 1760s, though the colony was mired in a deep recession, Pennsylvania fulfilled its commitment to call in the bills issued during the war (Egnal, 1988; Sachs 1957).

[Insert Figure 1 about here.]

What accounts for the stability of Pennsylvania's bills in the face of the large fluctuations in the quantity outstanding? Contrary to Grubb's claim, most colonial exchange rates did not float freely but rather remained tethered to the par of exchange (McCusker, 1978, pp. 21, 120; Ron W. Michener, 1987; Brock, 1992; Bennett T. McCallum, 1992). In the middle colonies, bills of credit remained readily convertible into specie at prevailing coin ratings, an example of which is reproduced as Figure 2.

[Insert Figure 2 about here.]

The convertibility mechanism was informal; no government agency stood ready to exchange bills of credit for specie on demand. But as "Eugenio" pointed out in a retrospective published in 1786, private persons unflinchingly exchanged bills for coins in the colonial period. Their willingness to do so "without

a moment's delay or a penny's diminution" meant that "the government had all the gold and silver in the community as effectually in their hands as if those precious metals had all been locked up in their treasury" (*New Jersey Gazette*, 30 January 1786). Pennsylvania enjoyed price stability because the concurrent circulation of full-bodied specie coins at rated values tied the value of the bills to a fixed par of exchange. Issuing too much paper money would have endangered the fixed par, but external constraints on the legislature's authority, Quaker pacifism, and the colony's strategic unimportance conjoined to prevent over-issue.[2] More militaristic, strategically vulnerable colonies like Massachusetts and South Carolina failed to limit their emissions enough to maintain their bills' convertibility.

Proposition 2: From the end of the Revolution until the mid-1790s, state-issued bills of credit reprised the success they had achieved in the colonial era. Pennsylvania's bills of credit were used in the vast majority of transactions until the constitutional ban on new emissions drove them from circulation in the mid-1790s.

Grubb (2003a) adduces a list of indentured servant transactions recorded in Philadelphia (Philadelphia, 1785-1804) and uses it to determine the unit of account in which the contracts were recorded. Contracts recorded in dollars only become commonplace towards the very end of the century. Earlier contracts were recorded in Pennsylvania pounds. The preponderance of Pennsylvania pounds well into the mid-1790s, Grubb believes, establishes some important facts about the period: Most transactions were made with state-issued bills of credit (which Grubb conflates with *pound-denominated* bills of credit[3]); market participants shunned both specie and the dollar-denominated notes and deposits of the Bank of North America; and – since price indices show scarcely any inflation – state-issued bills of credit must have held their value well.

We contend that the medium of exchange cannot be inferred from the unit of account. The textbook definition that money is a medium of exchange, unit of account, *and* store of value holds only after the adoption of the so-called "standard formula" in the nineteenth century (Thomas J. Sargent and Francois Velde, 2002, pp. 3, 313-315). Before then, multiple media of exchange circulated, their local

values expressed in terms of an abstract unit of account. The pound-denominated prices recorded in the Redemptioners' registry refer to Pennsylvania's unit of account, not its medium of exchange.

Each colony/state had its own 'money' or 'currency' which, as Charles M. Andrews (1918, p. 74) noted, "was not money at all, but only a method of reckoning values, a statement of the amount in shillings at which a Spanish dollar would be accepted in a given colony." In a brilliantly lucid account of the difference between media of exchange and units of account, John J. McCusker noted that the distinction was "an important one to remember, because goods were bought and sold by coin but *books were kept* and exchange transactions negotiated in moneys of account" (McCusker, 1978, pp. 3-6, 121, emphasis added).

Media of exchange were usually *not* denominated in pounds, and included such diverse means of payment as country produce; foreign coins such as Spanish dollars, pistareens, or guineas; paper money; book account transfers; or a combination thereof (A. Piatt Andrew, 1904, Michener, 2003). What made the use of so many media of exchange tenable was the existence of the local unit of account, an abstract measure of value by which local economic calculations were made. Published coin rating tables, such as that reproduced as Figure 3, were a key tool for converting values into the local unit of account. Banknotes and deposits denominated in dollars were converted to Pennsylvania pounds using the rating of the Spanish dollar; that is, each dollar was credited as 7 shillings (hereafter s.) and 6 pence (hereafter d.) Pennsylvania currency. With the aid of Figure 3, we can follow a concrete example. In November 1794 Philadelphia merchant Henry Drinker remitted to John Kinsey 2 gold coins from Portugal, an English guinea, and $80 in banknotes. Kinsey credited Drinker's account £37 15 s. Pennsylvania currency because the Portuguese gold coins (half johannes) were rated at £3 each, the guinea was rated at £1 15s., and $80 translated to £30 ($1 = 7 s. 6 d. or £0.375; 80*0.375 = 30) (Drinker 1794). This illustrates how accounts were kept in pounds even when transactions were made in specie and dollar-denominated banknotes.

[Insert Figure 3 about here.]

Literary evidence strongly supports the view that after May 1781 Pennsylvania's media of exchange consisted mostly of specie and bank liabilities. As an early (Anon., 1793) historian of the Revolution noted, in 1781 "a revolution in the currency of the United States took place. The paper bills of credit, emitted by Congress and individual States, by their recommendation, to carry on the war, suddenly disappeared and went out of circulation; gold and silver appeared, and became the circulating medium." Confirmation abounds in Philadelphians' letters:

- In August 1781, President Joseph Reed wrote that "At this time all dealings, and commerce of every kind, are carried on in gold and silver; [state-issued] paper having, in its turn, become a merchandise, and kept for some time at four or five to one" (William B. Reed 1847, vol. 2, p. 295).
- In March 1782, Robert Livingston wrote that "The only money now in general circulation is specie and notes from the American banks, which have the same credit as silver" (Francis Wharton, 1889, vol. 5, p. 212).
- "Dollars form our general Circulation," Robert Morris wrote Thomas Jefferson in May 1784, although "they are not any where the Money of Account" (Ferguson et al, 1973-2000, vol. 9, p. 299).
- On 24 March 1784, Francois Barbe-Marbois wrote the French Marine Minister, Marquis de Castries, that "There is no paper money in circulation" (Elizabeth M. Nuxoll, 2003).
- In April 1787, Ben Franklin indicated that there is "a great deal of real Money in the Country, and [the Bank of North America] in good credit" (Albert H. Smyth, 1907, vol. 9, p. 561.)
- On 25 November 1789, William Bingham wrote "At present Gold & Silver Supply almost universally the representative Medium of Exchange" (Harold Syrett and Jacob E. Cooke, 1961-1987, vol. 5, p. 551).
- On 3 December 1792, a Pennsylvania state senate committee noted that "The practice of making payments by checks or bank notes, [was] now ... general in [Philadelphia]" (*Pennsylvania Senate*

Journal, 3 December 1792).

- In September 1794, Alexander Fullerton wrote that "specie dollars are almost as plenty as the old Continental bills [had been], and nothing but Specie or bank bills by the Law of the United States are to pass, paper currency is entirely done away" (Fullerton, 1898).

Buttressing the literary evidence is the simple fact that Pennsylvania had retired almost all of its bills of credit long before the mid-1790s. Grubb's contention (2003b, p. 1783) that the timing of the disappearance of pounds as a unit of account is consistent with "the issue-redemption pattern of state currencies" is simply untrue; outstanding state-issued bills of credit amounted to only $0.28 per Pennsylvania capita at the end of 1791, $0.10 in 1792, and $0.06 in 1794.[4] By comparison, the average quantity of specie circulating in the United States from 1791 to 1794 was approximately $4.42 per capita, and the average quantity of banknotes was $2.52 per capita (Samuel Blodget, 1806/1964, p. 66). A. Barton Hepburn estimated banknotes plus specie in circulation in the United States at $3.00 per capita in 1790, rising to $7.77 per capita in 1795 (1915, p. 87). By 1794, 99.44 percent of the funds in the possession of the Pennsylvania state treasurer consisted of specie and convertible bank liabilities. Bills of credit made up the remaining 0.56 percent (Pennsylvania, 1795).

Proposition 3 State-issued bills of credit were so successful in the marketplace during the confederation era, that banks -- particularly the Bank of North America -- struggled unsuccessfully to get their notes and deposits into circulation. Modern scholars have uncritically accepted the anti-paper money rhetoric of Federalists, and the many would-be bankers among them, who unjustly condemned state-issued bills of credit and propagated the myth that they were a failure.

Though foes of paper money were guilty of overstating their case, the conclusion that state-issued bills of credit failed is no myth. Pennsylvania's colonial bills of credit held their value admirably – *until the Revolution*. Pennsylvania's rebel government gave holders of colonial-era bills an opportunity to exchange them for bills of the new government, bills that circulated one-for-one with rapidly depreciating Continentals. Colonial bills not exchanged by a certain date were worthless thereafter. Most people

shunned the opportunity to bet on Great Britain's defeat by trading colonial bills -- still valuable if the British won -- for rebel paper of dubious value. Few colonial bills were actually exchanged under this program, and Yorktown sealed their repudiation (*Pennsylvania Statutes at Large*, chaps. 791, 800, vol. 9, pp. 225-27, 250-53; Pennsylvania, 1790).

In March 1780, Congress officially devalued Continental dollars to one fortieth of their face or specie value. Some viewed the repudiation as a necessary expedient, but others saw it as a shocking breach of public faith (Albert S. Bolles, 1884/1969, vol. 1, pp. 135-6; Henry Phillips, 1865/1972, 2nd Ser., pp. 156-66). The "Forty-for-one" act made, in the words of one contemporary, "an impression on the minds of the people extremely unfavorable to paper credit in general" (*Maryland Gazette*, 21 September 1786). Continentals went on to become practically worthless, as did many early state emissions, including those Pennsylvania made in 1776 and 1777, which passed one-for-one with Continentals and shared the Continental's fate (Pennsylvania 1781, 1785). Despite solemn pledges, governments repudiated their paper money. Hardly more than a year passed before the demonstration was repeated.

Congress had hoped that the forty-for-one act would stabilize the value of Continental dollars until they could be called in by state taxes and retired. Henceforth, only the states would issue paper money (Worthington C. Ford et al, vol. 16, pp. 264-5, 1904-37). Accordingly, Pennsylvania made three emissions of state bills of credit in 1780 and 1781. Those emissions, "Island money" issued in March 1780 (*Pennsylvania Statutes at Large*, 1780, vol. 10, chapter 907, pp. 183-91), "dollar money" issued in June 1780 (*Pennsylvania Statutes at Large*, 1780, vol. 10, chapter 912, pp. 205-14), and the "bills of 1781" issued in April 1781 (*Pennsylvania Statutes at Large*, 1781, vol. 10, chapter 939, pp. 301-8) were crafted to reassure a disillusioned public. Yet despite their short terms, specific redemption provisions, and substantial tax funds, the public viewed the new issues with suspicion. They passed at a significant discount. The legislature responded by declaring "Island money" to be a legal tender at its face value (*Pennsylvania Statutes at Large*, vol. 10, chapter 924, pp. 249-51). Among the provisions of that draconian legal tender law was one that set the depreciation of the Continental at 75 to 1 with the state

bills. The law also stipulated that Pennsylvania's Supreme Executive Council was to periodically publish "the then rate of exchange between specie and continental money which exchange so published ... shall be the exchange between continental money and the state money hereby made a legal tender."

Although the attempt to outlaw the depreciation of the state-issued bills failed, the act did serve to fix the relative value of the state-issued bills and Continentals. By May 1781, $3 in state bills of credit were worth about $1 in specie, while $75 in Continentals were worth $1 in state bills of credit. Ergo, $225 in Continentals were worth about $1 in specie. Continentals continued to serve as the unit of account and, with state paper money, they were still the most common medium of exchange. On 27 April 1781 the New Jersey legislature altered the value it assigned to Continentals, abandoning the old 40 to 1 rule in favor of 150 to 1. On 2 May 1781, Pennsylvania's Supreme Executive Council, fearful that the state might be inundated with Continentals from New Jersey, abruptly raised the decreed exchange rate from 75 to 1 to 175 to 1. Because the decreed ratio became the lawful exchange between Continentals and state money, and because it took $3 in state-issued bills to purchase $1 in specie, market participants believed that the edict placed a new value on Continental dollars of 525 (3*175) to 1, a repudiation of 57 percent of the Continental's remaining value (Peletiah Webster, 1791, pp. 173-6).

It was one repudiation too many for the long-suffering public. Within a week, Continentals fell to 900 to 1. When merchants began to refuse the stuff altogether discontent turned into disorder. Angry sailors roamed Philadelphia's streets, hammering people with clubs. A mob donned cockade hats made of Continental dollars, and tarred and "feathered" a poor canine with the virtually worthless paper. Shrewder minds sallied forth from the rebel capital in an attempt to exchange Continentals for things of value before news of the collapse spread (Irving Brant, 1948, p. 116).

Those developments "so disgusted the minds of all men with paper bills of all sorts that [Pennsylvania] state money (tho' undoubtedly well funded) depreciated in less than a month to 6 and 7 to 1" (Webster, 1791, p. 175). Joseph Reed, president of the Supreme Executive Council, related what happened next: "At once, ... all dealings in paper ceased. Necessity forced out the gold and silver - a

fortunate trade opened at the same time to the Havanna [sic] for flour, all restrictions were taken off, and the Mexican dollars flowed in by the thousands ... and in a few days, specie became the universal medium, and so continues" (Reed, 1847, vol. 2, p. 295).

The Pennsylvania government never repudiated the emissions of the early 1780s. Slowly, as planned, taxes drew the bills into the state treasury, where they were eventually burned. Although, as Figure 4 shows, they were held as one of a number of speculative securities rather than as a medium of exchange, the bills appreciated from the nadir reached during the spring of 1781. In February 1785, they were valued at about 2.5 to 1 with specie (*Pennsylvania Archives*, 4th Series, vol. 3, p. 1006).
[Insert Figure 4 about here.]

The public was thoroughly disenchanted with paper money, making peacetime emissions precarious. George Washington, commenting on paper money proposed in Maryland, summed up the predicament: "So many people have suffered by former emissions," he wrote, "that, like a burnt child who dreads the fire, no person will touch it who can possibly avoid it" (William W. Abbot, 1997, vol. 5, pp. 38-9). When Pennsylvania authorized a new emission in 1785, it proceeded cautiously, issuing only £150,000, equal to only $1.06 per capita, far less than the $6.48 per capita colonial Pennsylvania had successfully circulated in 1760 (Brock, 1992, Table 6). It levied taxes designed to call in the bills at the rate of £20,000 a year, beginning immediately, a speedy retirement schedule by colonial standards (e.g. *Pennsylvania Statutes at Large*, vol. 6, p. 7, chap. 453). In deference to the loathing creditors had for private tender laws, the 1785 bills were made only a partial public tender.[5]

Initially, some refused the bills entirely, others accepted them only at a discount, and yet others accepted them at par. Observers disagreed whether the bills could be said to have depreciated or not, but the bills *did* circulate, and at rates close to their par value. Paper money advocates considered themselves vindicated, and even those who opposed the emission grudgingly admitted that their worst fears had so far failed to materialize (Kaminski, 1989, pp. 67, 79).

The public's faith in the new state-issued bills was fragile, however, and by June 1786, there was

no room to doubt that their value had begun to gyrate. Upon the news that New Jersey had authorized an emission of legal tender paper money, Pennsylvania's issue fell 15-20 percent in value. By September 1786, it had rebounded to 10 percent below par. For about a year, it continued "vibrating between a depreciation of 12 and 20 Per Cent" (Smith, 1976-2000, vol. 23, pp. 341, 539; James Morton Smith, 1995, p. 484). In February 1787, Alexander Hanson (1787, p. 19) wrote that the emission retained its value as well as it did because of its limited supply, and because it was accepted at face value in payment of taxes and duties. But as a stimulus to the economy, he considered it a failure: "No man in Philadelphia pretends to assert, that the circulating medium is at all increased by the emission of the bills of credit." Fear that new legal tender provisions might be enacted induced many people to hoard specie, making it scarce (Thomas M. Doerflinger, 1986, p. 272). Bills of credit were a poor substitute, constituting only "an additional article of merchandise, which indeed is sometimes bartered for other commodities" (Hanson, 1787, p. 19; Webster, 1791, p. 270n.).

On 14 July 1787, panic seized the Philadelphia market, and the bills stopped circulating entirely. The incident shook public confidence.[6] Only the threat of civil disorder forced the bills again into limited circulation. James Madison, who witnessed the ugly affair while attending the Constitutional Convention, wrote Jefferson that paper money had suffered "a wound which will not easily be healed" (Smith, 1995, p. 484).

Pennsylvania's bills of credit were indeed in trouble. "The sudden and unaccountable obstruction which the currency of the paper money of this State has lately met with," Benjamin Franklin told the legislature in the fall of 1787, "we earnestly recommend to your consideration as a matter of great importance" (*Pennsylvania Archives,* 4th ser., vol. 4, p. 19). The legislature responded by passing a law designed to accelerate the rate at which bills were redeemed and destroyed, by mandating that bills of credit issued through the loan office (£50,000 of the original £150,000) would no longer be returned to circulation when repaid to the loan office (*Pennsylvania Statutes at Large*, vol. 13, chapter 1328, p. 8-9).

Only the £20,000 originally due for destruction that year was actually sunk, however, and the

depreciation worsened (*Minutes of the General Assembly*, 12 November, 16 November 1787). In February 1788, Franklin told the legislature that "the continual depreciation of our paper money merits the most serious attention" (*Pennsylvania Archives,* 4th ser., vol. 4, p. 26). Soon after, the legislature noted that its bills were roughly 33 percent below par.[7] Lawmakers pondered what they might do to address the situation, but they had few options. Since any transparently cosmetic measure might further undermine public confidence, the legislature decided the best course was to soldier on according to the original plan (Pennsylvania, 1787-88, vol. 3, pp. 103-8). In September 1788 the year's allotment was burned, as scheduled (*Minutes of the General Assembly*, 19 September 1788).

By that time, bills of credit were a nuisance. Because bills were a tender in payment of state taxes at face value, citizens paid their taxes with depreciated bills whenever they could, reducing the state's real tax revenue. Bills were not equally available throughout the state, begetting complaints that the real tax burden was inequitably distributed among the people. Tax collectors who received specie were said to be pocketing it and turning in less-valuable bills to the state (Phillips, 1865/1972, 1st Ser., pp. 34-5; *Pennsylvania Gazette*, 17 September 1788). Government contractors stopped accepting bills of credit at their face value: the state had to allow for depreciation, or pay in specie (*Pennsylvania Archives*, 1st Ser. vol. 11, p. 417). Judges complained that payment in depreciated bills amounted to an unconstitutional reduction in their salaries (Pennsylvania, 1787-88, vol. 3, p. 22). Public creditors, adversely affected by the fiscal crisis, petitioned the legislature proposing the bills be made a legal tender in payment of fees and local taxes as well as state taxes, but the legislature, eager to put the failed paper money experiment behind it, refused to enact such a measure. (Allan Nevins, 1924, p. 522; *Minutes of the General Assembly*, 9 September, 2 October 1788).[8]

The state's bills of credit, which had never circulated much outside Philadelphia, now stopped circulating altogether (Hanson, 1787, p. 19; Nevins, 1924, p. 522*; Pennsylvania Gazette*, 17 September 1788; *Minutes of the General Assembly*, 17 February 1789). As Figure 5 illustrates, Pennsylvania paper money joined the ranks of speculative securities where it was bought and sold along with loan office certificates and other Revolutionary War debt.

[Insert Figure 5 about here.]

Grubb (2003b, pp. 1783-5) points to the stability of Pennsylvania prices in arguing that Pennsylvania's paper money was successful after the Revolution. His price index is based on commodity prices reported "in the prevailing currency of the time," which Grubb mistakenly takes to be paper money (Anne Bezanson, 1936, p.2). At least two newspapers used to create the index, *The Federal Gazette* and *The Universal Asylum*, included the price of Pennsylvania's state bills alongside their commodity price quotations, showing they could not have been quoting prices using bills as the numeraire (Bezanson, 1936, xxiv, 268-70). If prices were quoted in specie, as we contend, they cannot be used to draw conclusions about the value of paper money.

The Bank of North America, the nation's first joint stock commercial bank, was not the weak, ineffectual institution that Grubb portrays:

- Grubb (2003b, p. 1787) writes "Market participants seemed to prefer state currency to Morris's banknotes. (Schweitzer, 1989, p. 321; Grubb, 2002c). Hamilton remarked 'Your Notes though in Credit with the Merchants by way of remittance do not enter far into ordinary circulation . . .' (Bouton, 1996, p. 107) Morris remarked that his banknotes were 'constantly returned upon me for payment [in specie] instead of being absorbed by the taxes' (Ver Steeg, 1976, p. 119)."

In the early 1780s, Morris circulated private IOUs, known as "Morris notes," drawn on his own credit which were altogether distinct from the bank's notes. Both Morris's and Hamilton's comments concern Morris's private notes, not those of the bank. Hamilton wrote Morris (Ferguson et al, 1973-2000, vol. 6, p. 540) that "the bank notes pass pretty currently as Cash with a manifest preference to your

Notes." The citation to Schweitzer is unconvincing because she relied on one of Grubb's unpublished working papers (Schweitzer, 1989, p. 321 n.26).

- Grubb (2003b, p. 1787) writes "In 1789 [the Bank of North America] issued notes in denominations of 1/90th of a dollar. This odd denomination makes sense when it is noted that 1/90th of a dollar equals one pence in Pennsylvania pounds – a further indication that the bank was struggling to get its banknotes to displace Pennsylvania pounds in the marketplace."

That the bank emitted small denomination notes denominated in Pennsylvania pence indicates nothing more than that dividing the dollar into ninetieths, not hundredths, was still the prevailing practice in the 1780s. Decimalized currency was a newfangled contrivance that had not yet been commonly adopted. The bank's bylaws, enacted in 1782, stipulated "that the Books and Writings of the Bank shall be kept in Mexican dollars and Ninetieth Parts thereof" (Ferguson et al, 1973-2000, vol. 7, p. 811).

- "Foreigners," Grubb (2003b, p. 1787) asserts, "refused to invest in the bank's stock."

Opponents of the bank accused it of *attracting foreign investment*. "Foreigners will doubtless be more and more induced to become stockholders," the bank's foes charged, "until the time may arrive when this enormous engine of power may become subject to foreign influence." When the second subscription of bank stock was completed in 1786, Pennsylvanians had purchased 59.1 percent, other Americans had purchased 27.8 percent, and Europeans had acquired 13.1 percent (*Pennsylvania Gazette*, 30 March 1785; George David Rappaport, 1996, pp. 182-4).

- "Only Connecticut, however, accepted BNA banknotes for payment of its taxes" (Grubb, 2003b, p. 1787).

Lawrence Lewis (1882, p. 43) mentioned that Connecticut passed a law making banknotes acceptable in payment of taxes, but Grubb incorrectly concludes that *only* Connecticut did so. Other states passed similar laws (Ferguson et al, 1973-2000, vol. 2, pp. 181-2, n. 6). Also, it is presumptuous to assume that without such a law tax collectors would, by default, refuse to accept banknotes. In eighteenth century America, it was difficult to induce people to pay taxes at all. A tax collector or state treasurer

would have to be extraordinarily obstinate to refuse banknotes. At worst they would have to exchange the notes for specie before coming to account.

- Grubb (2003b, p. 1788) quotes both the president and the founder of the bank apparently confessing their incompetence. "In 1784, Thomas Willing, the president of the BNA, wrote to would-be bankers in Massachusetts, 'the business was as much a novelty to us . . . as it can possibly be to you. It was a pathless wilderness, ground, but little known to this side the Atlantick . . . All was to us a mystery' (Norman Scott Brien Gras, 1937, pp. 209-10) To the Pennsylvania legislature, Morris admitted that the 'circulation and amount of bank paper is but little understood' (Hans Louis Eicholz, 1992, p. 266)."

Willing's letter was not a confession of incompetence, but rather an account of how the bank overcame early difficulties. The bank's business was so well-managed, Willing boasted, "as would not disgrace the Books of some of the older establishments of this kind in Europe, & I flatter myself th[a]t in time, it will rival the first of them" (Gras, 1937, p. 211). As for the statement attributed to Morris, he never said it. William Findley, the bank's most prominent foe, was the one who did.[9]

- Grubb (2003a) writes that "Coincident with this new issue of Pennsylvania pounds, the six-month dividend declared on the BNA's stock collapsed from 9.5 percent in mid-1784 to 3 percent by mid-1785, where it stayed until 1791. . . Not until Pennsylvania pounds had disappeared from circulation did it recover to a steady return of 6 percent. Morris clearly associated competition from Pennsylvania's state currency with the initial dividend collapse in the bank's stock value, and associated the removal of this competition with the subsequent revival of the value of BNA's stock . . . Other possible events cannot explain the timing of these changes in the BNA's stock value."

As Grubb correctly notes, the bank resumed paying hefty dividends in 1791. Grubb's chronology, developed in detail in Grubb (2003a), maintains that Pennsylvania pounds were the dominant medium of exchange until displaced some time *after* 1794. It is therefore inconsistent for him to argue that the

dividend did not recover "until Pennsylvania pounds had disappeared from circulation."

Nor is this the only difficulty. That Morris associated the dividend fluctuations to competition with state-issued bills is an unsubstantiated assertion. The passage from an unpublished dissertation cited in support of the contention is itself based on a passage from a letter Morris wrote Jefferson on 11 June 1781, *before the bank had even been established*, in which Morris encouraged Jefferson and Jefferson's friends to subscribe, promising them that the bank's stock would offer a large and certain income (Ferguson et al, 1973-2000, vol. 1, p. 142).

Contrary to Grubb's claims, the bank quickly gained the public's confidence. A few days after the bank opened, Philadelphia accountant John Wilson informed Joseph Pemberton: "The bank was opened on Monday and several Havana vessels lately arriving a considerable sum of money was paid in this week, about eighty thousand dollars. … The merchants seemed disposed to favor and countenance it that it proves fairer to succeed than anything of the kind that has yet been attempted" (Wilson 1782; Rappaport 1976). A few days after that, John Hansen told Philip Thomas that after some farmers successfully tested the notes' convertibility, most people "went off with the notes well Satisfyed of their being equal in Value to Gold and silver" (Smith et al, 1976-2000, vol. 18, p. 283).

The novelty of the bank, and the frequent disappointments the public had suffered in engagements respecting paper money, led to some initial skepticism. But as Pelatiah Webster remarked, "the *fidelity* of the Directors, and the *perfect punctuality of all payments* at the bank, soon got the better of this diffidence, and the bank gained an almost universal *credit* and *confidence* among the people, even among its professed and bitterest enemies" (Webster, 1791, p. 447). By 1784, Bank of North America notes circulated at par at least as far away as Annapolis, Maryland; market participants understood the ease with which banknotes could make distant payments (Smith et al, 1976-2000, vol. 21, pp. 572-3). Philadelphians also quickly came to appreciate the convenience of checkable deposits (Wilson 1782).

We do not have to rely solely on the testimony of Pennsylvanians because representatives of foreign powers reported home on the bank's progress. On 20 April 1782, just months after the bank began

business, Spain's unofficial representative in Philadelphia, Don Francisco Rendon, told his superiors that the bank's notes were freely accepted at par partly because it discounted only good paper at short maturity and partly because Morris's agents, including his tax collectors, freely redeemed the notes at full specie value (Ferguson et al, 1973-2000, vol. 4, p. 616). In 1783, Francois Barbe-Marbois assessed the state of the bank for the Marquis de Castries, France's Marine Minister. "The bank is administered very wisely, and is a great resource for commerce – the public has complete faith in it." Even British investors, who had at first displayed no interest in the bank, now clamored for its shares.[10]

The bank's enemies grudgingly concurred, complaining of the bank's strength, not its weakness. "The great profits of the bank . . ." they railed, "already far exceed the profits of European banks" (*Pennsylvania Gazette*, 30 March 1785). During the assembly debate leading up to the revocation of the bank's charter, they argued that investing money in the bank was so profitable that it was impossible for farmers to get loans at the legal interest rate of 6 percent per annum, and that capital was being drawn away from internal improvements (Rappaport, 1996, pp. 188-9).

The bank did suffer a temporary setback in the mid-1780s, but it was not due to competition with paper money. By March 1784, an external drain of specie forced the bank to contract its note issue and drastically reduce its discounting. The consequences were predictable. "The bank will make less profits now than in the past," Barbe-Marbois informed Castries. "The Bank do very little discounts at present, & I think they have no prospect of making such large dividends in the future as they have done," John Chaloner wrote Hamilton. Nonetheless, the bank continued to redeem its notes on demand, at par, in specie (Syrett and Cooke, 1961-1987, vol. 3, pp. 524-7; Doerflinger, 1986, p. 301; Nuxoll 2003).[11]

The bank then faced its most serious crisis. In 1785 political support for paper money emanated from the Constitutionalist party, which represented rural and agricultural interests and controlled the legislature. Convinced that "the paper money of the state cannot exist with the bank," the Constitutionalists turned to the political system in order to destroy the bank and guarantee the survival of paper money (Carey, 1786, pp. 24-5; Webster, 1791, pp. 448-9). On 13 September 1785, the

Constitutionalist majority in the legislature revoked the bank's state charter and repealed the law against counterfeiting banknotes (*Pennsylvania Statutes at Large*, chap. 1178, vol. 12, pp. 57-8). The legislature's undisguised hostility towards the bank unnerved investors, and its act left unsettled whether the bank retained its status as an incorporated body. If the courts ruled that the federal charter issued by the Continental Congress did not remain in force, shareholders would be subject to unlimited liability (Janet Wilson, 1942; Syrett and Cooke, 1961-1987, vol. 3, pp. 625-6). That was a far more serious blow than the emission of paper money. As historian George Rappaport put it: "As everyone anticipated, the loss of the charter at the height of a major business contraction endangered the bank. It was widely believed that the corporation would have to close" (Rappaport, 1996, p. 199). The bank, however, persevered. Surveying the state of the bank in February 1786, Pelatiah Webster (1791, p. 449) proclaimed it to be in "good condition," while admitting that "its energy and extent of operation has been indeed somewhat lessened."

The bank's allies took the revocation of the charter seriously and waged an aggressive campaign to sway public opinion, elect supporters to the legislature, and regain the charter. By March 1787, they had succeeded.[12] The bank, Ben Franklin wrote that May, "has stood all attacks, and went on well, notwithstanding the Assembly repealed its charter." Lauding the prudence of the bank's management, Franklin predicted that with its new charter in hand, he had "no doubt of its continuing to go on well." "Their notes," he reported, "are always paid on demand, and pass on all occasions as readily as silver, because they will always produce silver." Dividends, however, would not immediately increase, as "the surplus profit is reserved to face accidents" (Smyth, 1907, vol. 9, p. 587).

The bank's greatest struggles had been in the political arena and by March 1787, before the Constitutional convention had even begun, the political battle had been won. The quantitative evidence in Table 1shows that the economic battle had been won as well. Unfortunately, the bank's records for 1786-1790 are incomplete, so that only a partial compilation is possible. To put the numbers in perspective, for 1782-1785 the average note issue amounts to $1.24 per Pennsylvania capita and deposits to $1.68 per Pennsylvania capita. For 1791-1795, the corresponding averages are $1.31 (notes) and $1.79 (deposits).

In addition to being more stable in value and more accepted in the marketplace, the bank's notes and deposits were considerably more plentiful than Pennsylvania's state-issued bills over most of the period. [Insert Table 1 about here.]

Proposition 4: Most Pennsylvania delegates to the Constitutional convention were affiliated with the Bank of North America. Those delegates, "intent on usurping state and federal sovereign power over monetary matters to enhance their personal power and wealth," slipped the ban on state-issued bills of credit into the Constitution at the last minute. State conventions ratified the Constitution despite the fact the ban was neither justified nor popular.

By 1787, most Americans were understandably suspicious of state-issued paper money. Bills of credit, Philadelphia businessman Tench Coxe argued, gave "the *coup de grace* to public credit." "This is not merely a matter of justice between man and man," he noted, because paper money "dishonors our national character abroad" (Tench Coxe, 1794, pp. 31-2).[13] So general were these sentiments that even prominent Anti-Federalists disapproved of state bills and capricious state tender laws (Jackson T. Main, 1961, pp. 268-9; Herbert Storing, 1981, p. 42; Ferguson, 1983, p. 407).[14] No conspiracy theory is required to explain the presence of the ban in the Constitution.

In fact, bankers did not foist the clause on the American people. Grubb is correct in observing that many people associated with the bank served in the Pennsylvania delegation, and that the delegation disapproved of state bills of credit. But three of Grubb's (2003, p. 1789) contentions – (1) that the ban on state bills was the work of a small self-interested junto, (2) that the ban was inserted into a late draft of the Constitution by James Wilson, and (3) that the Pennsylvania delegation vigorously protected it against "all efforts to temper or remove [it]" – are not supported by the available evidence.[15]

Grubb's argument that the ban on paper money was the work of a small self-interested junto is based in part on what was *not said* at the Constitutional Convention. "State-issued paper money was never mentioned," Grubb (2003, p. 1789) contends, "in the many plans proposed at the constitutional convention from its beginning in May through early August." Later he writes "No statements about

banknotes, seigniorage, transactions costs, cross-state exchange rates, etc. were offered at the convention." This line of argument is undermined by the fact that the proceedings of the Constitutional Convention were very poorly documented, making it impossible to separate what was *not said* from what was *not recorded*.

Consider Grubb's contention that none of the plans discussed at the beginning of the convention proposed restricting state-issued paper money. Roger Sherman authored a document that incorporated a prohibition of state bills of credit, but the document's role in the Convention is unclear (Max Farrand, 1966, vol. 3, pp. 615-6). Historians also have only an imperfect notion of the provisions of Charles Pinckney's plan. All that has survived are James Wilson's sketchy notes outlining Pinckney's proposal (Farrand, 1966, vol. 3, appendix D; Jensen, 1976, vol. 1, pp. 245-7). While the notes do not mention state bills of credit, Pinckney spoke at length on 29 May, and much of what he said has not been preserved. He *could* have advocated the ban – at the South Carolina state ratifying convention Pinckney lauded the article abolishing state bills of credit as "the soul of the constitution" (Jonathan Elliot, 1836-1845, vol. 4, pp. 333-4).

Whether Pinckney proposed a restriction on the power of states to issue paper money on 29 May is a moot point because Edmund Randolph of Virginia certainly did. Citing "the havoc of paper money [which] had not been foreseen" when the Confederation was created, he argued that Congress ought to be able "to prevent emissions of bills of credit" (Wilbourn E. Benton, 1986, vol. 1, pp. 831, 834). The deliberation then turned to the larger issue, of which state bills of credit were merely one manifestation: how was the new federal government to prevent states from usurping its powers? On 8 June, Pinckney introduced, and Madison seconded, a proposal that the new national legislature would have a veto on all state laws it considered improper. Several delegates objected that the proposed veto power was unnecessarily broad. Elbridge Gerry argued that "the National Legislature with such a power might enslave the States," but was careful to note that "he had no objection to authorize a negative to paper money and similar measures." Sherman then suggested "the cases in which the negative ought to be

exercised, might be defined." The proposal to give the national legislature an unlimited veto power was then put to a vote and defeated (Benton, 1986, vol. 1, pp. 846, 853).

A committee, known as the committee of detail, was given the job of creating a draft of the Constitution. It reported on 6 August, and the articles restricting state sovereignty in that draft read as follows:

> No State shall coin money; nor grant letters of marque and reprisals; nor enter into any treaty, alliance, or confederation; nor grant any title of Nobility.
>
> No State, without the consent of the Legislature of the United States, shall emit bills of credit, or make any thing but specie a tender in payment of debts; nor lay imposts or duties on imports; nor keep troops or ships of war in time of peace; nor enter into any agreement or compact with another State, or with any foreign power; nor engage in any war, unless it shall be actually invaded by enemies, or the danger of invasion is so imminent, as not to admit of delay, until the Legislature of the United States can be consulted (Jensen, 1976, vol. 1, p. 268).

Those stipulations can be understood as an alternative to the unlimited veto power sought by Pinckney and Madison. States were to be prohibited outright from doing certain things, while other specific actions could only be taken with the prior approval of Congress. Grubb (2003, p. 1789) sees it in a different light. "Buried in the back of the Committee's last draft," he writes, "in Wilson's handwriting, appears for the first time a clause banning state-issued money." On this point, Grubb is simply mistaken. The restriction appears in the Committee's first draft, prepared by Edmund Randolph and John Rutledge, as well as in its final draft, prepared by James Wilson (Brant, 1950, pp. 116-7; Farrand, 1966, vol. 2, pp. 144, 169).

The clause was strengthened on 28 August, when it was decided that emitting bills of credit and declaring anything but specie a tender would be added to the list of activities absolutely prohibited to the states, rather than left among the activities that might be pursued with the consent of the national

legislature. The only objection preserved in the convention's records was Nathaniel Gorham's concern that "an absolute prohibition of paper money would rouse the most desperate opposition from its partizans." The amendment passed overwhelmingly, with only Virginia opposed, and Maryland divided (Benton, 1986, vol. 1, p. 1083). The only delegate to denounce the ban after the convention, Luther Martin, was affiliated with Maryland speculators who wished to use depreciated paper to pay for confiscated Tory estates they had purchased on credit from the state, and who feared a new federal government might insist that they pay their prewar debts to Britons with something more valuable than Continentals (Brant, 1950, pp. 65-6).

The convention had already eliminated, on 16 August, a clause in the draft Constitution that would have explicitly given the federal government the right to issue bills of credit. That vote seems to have stirred more controversy, since some delegates doubted the wisdom of tying the new government's hands. It was here that Madison voiced the belief that it might be sufficient to prohibit bills that were a legal tender, and was rebuked by Gouverneur Morris on the grounds that the moneyed interest would oppose the plan if paper emissions were not prohibited. Madison did not defend state bills of credit, as might be surmised from Grubb's account (2003b, p. 1790), but rather defended federal paper money. Madison was a foe of state paper – "nothing but evil springs from this imaginary money wherever it is tried," he wrote Jefferson, and after the convention he fretted that the Constitution's restraints on state paper money were insufficient (Smith, 1995, pp. 484, 500). Madison's view of federal money was different, which is entirely understandable given his nationalist leanings; he was only persuaded to vote to deprive the new federal government the explicit authority to issue bills when assured that it "would not disable the Government from the use of public notes as far as they could be safe and proper" (Benton, 1986, vol. 1, pp. 896-8).

The best proof of the popularity of the Constitutional ban on state bills comes not from the Constitutional Convention itself, but from the much more richly documented state ratifying conventions.[16] The Constitution's ban of state bills and tender laws was almost universally approved. According to

historian E. James Ferguson, "in all the published [ratifying convention] debates there is not a single defense of paper money in principle" and historian William Norton went so far as to argue that "paper money . . ., or rather the reaction from it, helped to secure the adoption of the federal constitution" (Main, 1961, pp. 268-9; Storing, 1981, p. 42; Ferguson, 1983, pp. 405, 407).

In Pennsylvania, the ratification debate fell along familiar factional lines. William Findley and other Constitutionalist party stalwarts were prominent anti-Federalists. At the state ratifying convention, Findley went no further in defending Pennsylvania's bills than to observe that "the states have redeemed their paper money better than Congress have done." When defeated at the convention, Findley and his allies took their opposition to the popular press, publishing a lengthy essay that protested ratification. Tellingly, the essay did not mention paper money (Jensen, 1976, vol. 2, pp. 506, 617-39). Pelatiah Webster, writing in a Federalist newspaper, pointed out that many who signed the essay were advocates of paper money, and he made the observation *in order to discredit the protest* (Jensen 1976, vol. 2, pp. 658-60). The Constitutionalist's failure to protest the ban lends credence to a statement made by Alexander Hanson in February 1787: "I am well assured, that at [Philadelphia] the idea of bills of credit serving for a circulating medium, or answering any valuable purposes, is relinquished by its warmest friends" (Hanson, 1787, p. 21).[17]

To cement his case that the Constitutional prohibition was a calculated stratagem of "merchant-bankers intent on usurping state and federal sovereign power over monetary matters to enhance their personal power and wealth," Grubb (2003, p. 1796) concludes with an apparently damning extract from one of Robert Morris's letters: "The present opert'y of improving our Fortunes ought not to be lost." But Morris penned those words in reference to his brother Tom in a 1776 letter to Silas Deane (*Collections of the New York Historical Society*, 1886, Deane Papers, vol. 1, p. 174).

Proposition 5: *The transition to the U.S. dollar occurred in the mid-1790s as state bills of credit were retired, the U.S. mint opened, and new banks opened issuing dollar-denominated banknotes. The new monetary regime was less successful than its predecessor. The price level rose abruptly as a result of the*

regime change. With the money supply now in the hands of a profusion of private banks operating under the external constraint of a specie standard, macro stabilization policy was no longer possible.

Our own view of the early Federal monetary system is that of Lawrence Officer, who wrote that "the monetary system in the United States differed from that in the American colonies in only one *important* respect: by 1791 commercial banks (absent in the colonial period) had been established in Baltimore, Boston, New York, and Philadephia" (Officer, 1983, pp. 582, emphasis added). Grubb, on the other hand, sees at least five distinct facets to the "transition to the dollar."

1. Locally minted coins denominated in dollars and cents replaced foreign specie coins.
2. State-issued bills of credit ceased to be the predominant medium of exchange.
3. Dollar-denominated banknotes became an important medium of exchange.
4. Specie and notes convertible to specie became the medium of exchange, forcing policymakers to contend with the external constraints of a specie standard.
5. Dollars and cents replaced pounds, shillings, and pence as the unit of account.

In Grubb's account, these happened simultaneously, in the mid-1790s, and the result was a sudden once-and-for-all increase in the price level and an increase in the variability of the inflation rate. However, we do not agree that they occurred at the time and in the manner Grubb depicts, for the following reasons.

1. Though Grubb (2003a) implies that it produced large numbers of coins after 1794, the U.S. Mint in reality did not begin producing coins *en masse* until after the California gold strikes (United States Mint, 1794-1802; Hepburn, 1924, p. 52). Moreover, the circulation of the relatively few coins that the Mint did produce was "mostly confined to places in the vicinity of the Mint" before they were shipped abroad, leaving mostly foreign coins in domestic circulation (U.S. Senate, 1799-1801; Andrew, 1904, p. 327). As Figure 6 shows, those coins circulated under the Federal system in much the same way as they had in the colonial and confederation period, but with values rated in dollars. So the U.S. Mint can hardly account for higher prices and increased

variability of inflation rates after the mid-1790s.

[Insert Figure 6 about here.]

2. Pennsylvania's state-issued bills of credit had ceased to be a medium of exchange by late 1788, and did not even *exist* in any appreciable quantity in the 1790s. Their disappearance cannot account for an increase in prices in the mid-1790s.

3. Because of the leadership role of the Bank of North America, dollar-denominated notes and deposits were already a significant portion of the medium of exchange in Pennsylvania by 1783. As for the United States more generally, the dramatic increase in circulating banknotes occurred between 1790 and 1791. Grubb (2003b, p. 1791) cites Hepburn – who only gives estimates for five year intervals – to the effect that there was a six-fold increase in banknotes in circulation between 1790 and 1795. Blodget (1806/1964, p. 66) provides annual data, revealing that the increase in US banknotes occurred almost entirely in 1790-91, years before the abrupt increase in the price level that occurred in the mid-1790s.

4. Specie and notes convertible into specie had been the bulk of Pennsylvania's medium of exchange since colonial times, with the brief exception of the Revolution, so the sudden introduction of the external constraints associated with such a system did not occur in the mid-1790s either.

5. The rise of dollars and cents as the unit of account was a gradual process that began in the colonial period and was not completed until well into the nineteenth century.[18] When Grubb (2003a, Figure 1) shows the evolution of the unit of account recorded in Redemptioners A, he graphs a three-year weighted moving average, making it appear that the transition began in 1794 and was well underway by 1795, when prices abruptly increased. However, the unit of account in the raw data -- not published by Grubb -- reveals a different pattern (Philadelphia, 1785-1804). Table 2 makes clear that the transition to the dollar recorded in Redemptioners' A actually begins in the middle of 1796, *after the inflation rather than coincident with it.* To buttress his claim that

the inflation occurred coincident with the transition, Grubb (2003b, p. 1783, n.6) appeals to the medium of exchange cited in newspaper prices current: "As late as 1795 the main source behind the Philadelphia price index, the *Philadelphia Gazette and Universal Daily Advertiser*, quoted prices in Pennsylvania pounds." The *Philadelphia Gazette,* however, quoted prices in Pennsylvania pounds into 1796, then ceased reporting prices. When it resumed in 1798, prices were quoted in dollars (*Philadelphia Gazette*, 23 Jan. 1796 - 1798). The econometric consequences of revising the transition date will be described below.

[Insert Table 2 about here.]

Grubb's indictment of the post-1795 monetary system is based on analyzing data from six states, of which Pennsylvania is just one. However, three of the six states – Massachusetts, Virginia, and Maryland – are states where paper money disappeared from circulation in 1781 and no subsequent issues were made. There is no reason to believe that state-issued bills of credit ever returned to circulation in these states, that many bills were still outstanding in the late 1780s, or that prices were ever commonly quoted in them. Accordingly, there is no reason to believe that the disappearance of state-issued bills could have contributed to any regime change that might be detected in the mid-1790s.

David Lopez Jr. wrote Aaron Lopez from Boston, 9 August 1781, saying of Massachusetts bills of credit that "we see none worth mentioning in circulation and what little there is am told has been run up as high as from 6 to 8 for one" (*Collections of the Massachusetts Historical Society*, 7th Series, vol. 10, p. 143). On 7 July 1786 the Massachusetts assembly reported that £23,636 of the new emission – the only one Massachusetts made after the 40 for 1 act – remained outstanding. Even if it had circulated at par, that remnant amounts to only $0.24 per Massachusetts capita (Massachusetts 1786, pp. 63-4).[19]

Virginia's early emissions were so badly depreciated that the state passed a law in November 1781 dictating that old debts denominated in state currency contracted after December 1781 should be paid off in specie at the rate of $1 in specie for $1,000 in paper. The act's preamble declared that the paper money of the state was so greatly depreciated that it had become "absolutely necessary" to declare

that it "shall no longer pass current, except in payment of certain taxes calculated for the express purpose of calling in and redeeming the same" (Virginia, 1782, chapter 22, pp. 15-16). The paper bills thus repudiated did not include Virginia's emission under the 40 for 1 act, but a report to the House of Delegates, 28 December 1784, shows that at that time there remained but $154,571 of that money outstanding (equal to $0.26 per capita, at par), while the remaining repudiated issues, reduced one-thousandfold, came to £5,869 (equal to $0.03 per capita) (Virginia, 1784). Apparently, neither circulated. James Monroe informed John Sullivan on 16 August 1786 that the only paper circulating in Virginia consisted of some Continental indents (bonds issued to "pay" the coupons on yet other bonds) and "as to real paper money we have none of it and most earnestly hope we shall have none" (Smith et al., 1976-2000, vol. 23, p. 481).

Maryland emitted three varieties of paper money in 1780-81 – Continental state bills, black money, and red money. Red money, in particular, was designed with elaborate safeguards to prevent depreciation, yet all three varieties depreciated and ceased to circulate as a medium of exchange (*Maryland Gazette*, 2 December 1784). A report on state debt issued in 1788 reveals that £10,918 remained outstanding, less than $0.10 per Maryland capita at par (Maryland 1788; Newman, 1967, pp. 119-21).

Figures 1 and 2 are perhaps the most striking evidence in Grubb's paper (2003b, pp. 1782-3) for they show state price indices oscillating around a price level that appears to be substantially higher after the mid-1790s than before. If the increase in prices was not due to the transition to the dollar, what caused it?

If one takes our view that Pennsylvania and most other states had long been on a specie system -- one where devaluations were small and uncommon -- one would expect the long run behavior of prices in North America to be similar to that in Europe. That is exactly what historian David H. Fischer (1996, p. 121) documents – a long period of slow inflation between 1720 and 1820, more pronounced after 1790, that – ignoring Continentals and Assignats – looks much the same in England, France, and Pennsylvania.

The ratio of Pennsylvania prices to English prices in the post-Revolutionary era shows considerable oscillation, but no permanent discrete upward jump in the mid-1790s. In Figure 7, the dotted line for 1797-1811 tracks the behavior of nominal prices, while the solid line includes an adjustment converting English prices to a gold basis during the period of the paper pound.

[Insert Figure 7 about here.]

Examining the Philadelphia on London exchange rate is another way to judge whether the public became disenchanted with the money circulating in Pennsylvania in the mid-1790s. Under Grubb's hypothesis, one would expect to see an abrupt increase in the price of bills of exchange on London coincident with the increase in domestic prices shown in Table 2. However, the exchange rate, plotted in Figure 8, shows the exchange rate actually fell during the mid-1790s.

[Insert Figure 8 about here.]

Prices were elevated compared to prices in England during 1795-1796, but a supply shock and not a monetary disturbance seems the likely cause.[20] The Hessian Fly decimated wheat production in the Middle Atlantic states in 1794. Delaware and the Eastern Shore produced only half the normal crop, and Maryland but a third. Brooke Hunter (2001) claims that Pennsylvania wheat farms on average did not even return the seed sowed that season.

Higher wheat prices led to higher flour and bread prices. Higher bread prices, in turn, led to higher wages and other variable costs, which in turn put upward price pressure on manufactured goods (Donald Adams, 1986, p. 632). By March 1795, iron producers like Henry Drinker complained:

> The difference in making Iron between this and former years is very great. Added to a considerable rise in the wages of the various hands employed in this manufacture, the very high price of Horse feed, Bread, Meat & c. for the Workmen, make a difference of near, if not quite 50 Pr Cent in our Expences, so that the Business must be carried on with little or no benefit, or perhaps to a loss unless the former price of Pig Iron is advanced. … The Proprietors of our Furnaces will no doubt see the necessity of advancing their prices,

in which they will have the example of almost every other branch of Business (Drinker 1795).

II. Econometric Issues

We turn now to consider Grubb's econometric evidence, which consists of five tables of results characterizing the time series behavior of early colonial and state price indices in such a way as to suggest that prices behaved benignly before the mid-1790s, when colonial/state-issued paper money predominated, and badly thereafter, due to the transition to the dollar. There are two issues: whether a structural break in prices, assuming it exists, can be attributed to the transition to the dollar, and whether a structural break actually exists. Our view is that in most of the states studied (perhaps all?), there was no "transition to the dollar" coincident with the break; if a structural break occurred, some other factor must account for it. This makes the second issue, the determination of whether the structural break is genuine, somewhat moot. However, there are such serious difficulties with the final three tables in Grubb's AER paper that one cannot even confidently conclude that a break exists.

Grubb's Table 3 (2003b, p. 1793) tests for a structural break in the time series behavior of prices coincident with the transition to the dollar. According to his notes: "For U.S. states, D is a structural break variable representing the transition from prices quoted in state currency to prices quoted in the U.S. dollar. It is coded as one for years greater than 1792 in Massachusetts, 1794 for New York and Pennsylvania, and 1795 for Maryland, Virginia, and South Carolina, and zero otherwise." The dating of the structural break is of course crucial because placing the break in different years produces very different econometric results. At one point, Grubb writes (2003b, p. 1782) that the behavior of prices, as revealed in his Figure 1 and Figure 2, can be used to "identify when markets shifted from state currency to U.S. dollars."[21] Elsewhere though, he states that he dated the transitions by determining the date at which the unit of account changed. Only in the case of Pennsylvania, however, does he detail the source consulted to determine the date, and in Pennsylvania, his own sources suggest the transition ought to be placed in 1796, not 1794. When the equation is estimated using 1796 and not 1794, the t-statistic on the

structural break dummy falls from 5.59 to 1.29 (although an interaction term with the trend remains significant).

It is also difficult to see how Grubb settled on 1792 as the date of the transition in Massachusetts. Winifred B. Rothenberg's article (1979), his source for the data, says nothing about when the unit of account changed in Massachusetts, and since Rothenberg's price index was constructed using data gleaned from two dozen account books, a diary, and 350 probate inventories, Grubb could scarcely have relied on her original sources for his dating. The one secondary source cited by Grubb that *does* date changes in the unit of account is Cole (1938, p.115), which reports Boston wheat prices were still being quoted in shillings in 1798. Moreover, in 1795 Massachusetts passed a law dictating that dollars and cents would be the money of account after 1 September 1795, a measure that would have been unnecessary had the unit of account changed in 1792 (Massachusetts, 1795, chap. 18, pp. 452-3). Placing the Massachusetts structural break dummy in 1792, as Grubb does, results in a t-statistic of 3.59, but it drops to 2.68 with the dummy in 1793, 0.45 in 1794, -0.29 in 1795, -0.47 in 1796, and -0.81 in 1797.

Cole (1938) does not support Grubb's transition dates for Pennsylvania, New York, or South Carolina either. Philadelphia prices were almost all quoted in dollars as early as 1792. New York prices were quoted in pounds, shillings, and pence until 1796. Charleston prices were quoted in pounds, shillings and pence until 1803. (Cole has no data on Virginia or Maryland.) Using Cole's dating for Pennsylvania, New York and South Carolina reduces Pennsylvania and South Carolina's structural breaks to statistical insignificance, leaving only New York (where the date shifts only a year) as statistically significant. Thus Grubb's conclusions regarding the statistical significance of the structural break are sensitive to his choice of break years, and his choices are debatable.

Grubb's Table 4 (2003b, p. 1794) seeks to establish that the inflation rate was more variable after the mid-1790s than earlier. To this end, Grubb presents point estimates of standard deviations of the inflation rate, along with estimated standard errors for each state in each of the following three periods: 1750-1775, 1785-1792, and 1797-1811. The observed pair-wise differences in standard deviations across

periods are declared to be statistically significant in all cases but one.

The distribution theory underlying the claim of statistical significance, however, is flawed. The first, comparatively minor problem, is that the standard errors of the sample standard deviations are produced using a bootstrap method that assumes inflation rates are statistically independent over time. Grubb's Table 1 (2003b, p. 1784) is devoted to establishing the time series properties of the inflation rate, and he never finds prices to be a random walk, implying his bootstrap estimates of the standard errors are doubtful. As an example of the serious problem, note that Grubb reports the standard deviation of the Massachusetts exchange rate to be 0.0791 in 1785-1792, with a standard error of .0147, while in 1797-1811, the standard deviation is reported to be 0.0956, with a standard error of 0.0184. Those point estimates differ by only 0.0162, less than the standard error of the estimate for 1797-1811 *alone*. The difference, Grubb says, is statistically significant, although that is clearly impossible. Grubb misapplied a t-test designed for testing the difference of population means; consequently, all the comparisons in Table 4 are seriously biased towards rejection of the null.[22]

Grubb's Table 5 (2003b, p. 1795) is intended to demonstrate that after the mid-1790s estimates of a purchasing power parity relationship between each of the American states and England show purchasing power parity failing, in the sense that one cannot reject the presence of a unit root. As a general matter, accepting any null hypothesis does not prove the null hypothesis is true. That observation is especially apt in this instance, since the Dickey-Fuller test is known to have low power against alternatives near the unit circle, even in large sample sizes, and Grubb's sample sizes never exceed 17 observations. All the tests in this table, however, should be disregarded, because Grubb used an inappropriate exchange rate series. Grubb found his exchange rate data in Officer (1996), but Officer had processed the data in various ways, most notably by making sizable adjustments (Officer, 1996, p. 77, table 6.5) to correct the exchange rate for the inflation in England during the period of the paper pound (1797-1815). Such adjustments are inappropriate for a test of purchasing power parity, but Grubb failed to note them and back them out.[23]

Conclusions

We lay no claim to knowing everything about the colonial and early U.S. monetary system. But we do know that one cannot infer the medium of exchange from the unit of account, that by the late 1780s most Americans preferred convertible bank liabilities to fiat bills of credit, and that bankers did not use chicanery to ban state paper money emissions. We also know that Grubb's econometric techniques contain several serious flaws. The burden of proof always falls on the revisionist; Grubb has manifestly failed to meet it.

Figure 1: Pennsylvania Bills of Credit in Circulation, 1723-1774

Data Source: Brock (1992, Table 4 and Table 6).

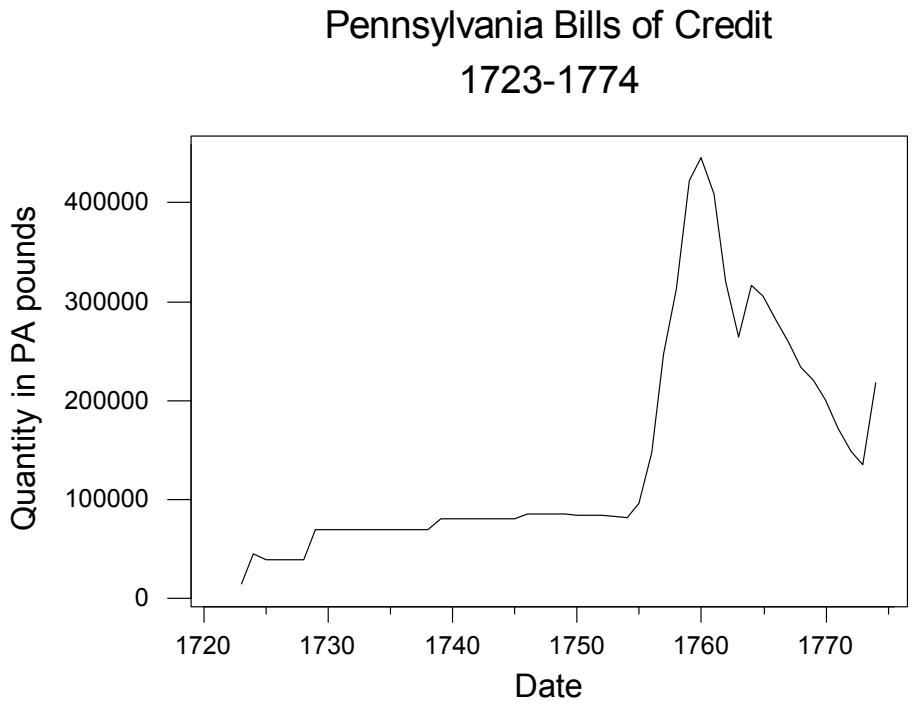
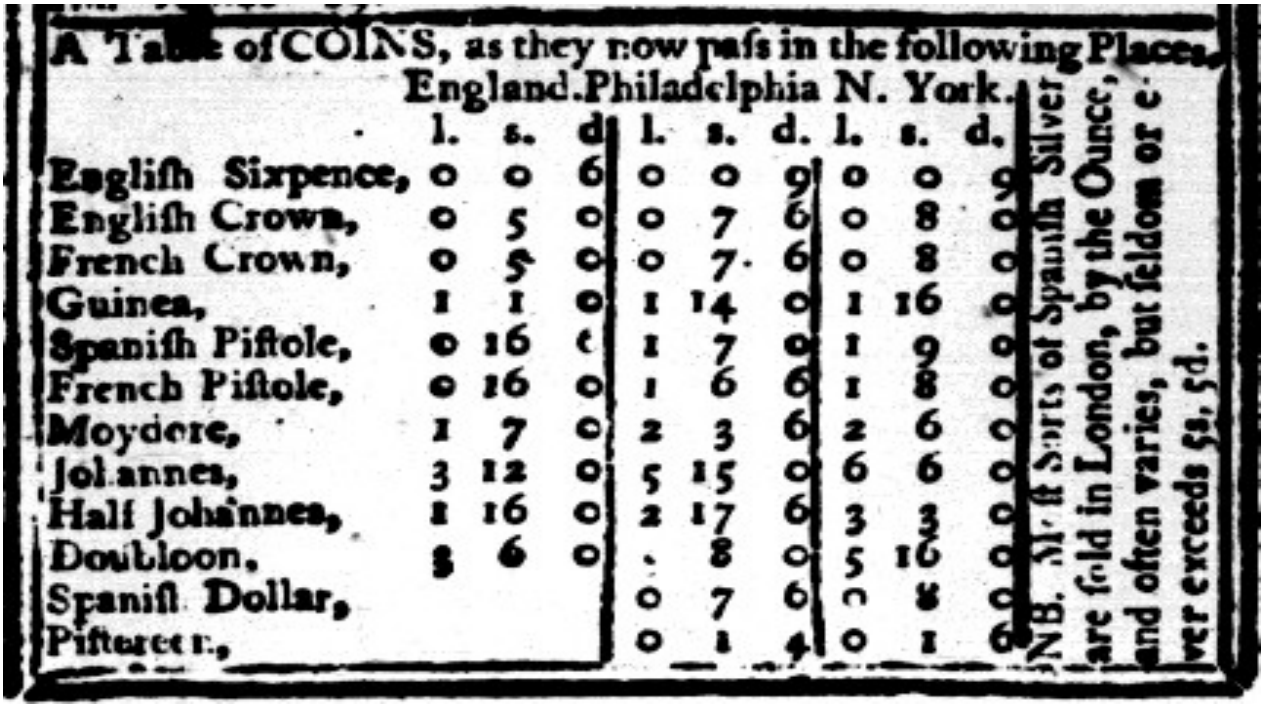


Figure 2: Coin Ratings in England, Philadelphia, and New York, 1759

Source: Abraham Weatherwise, *Father Abraham's almanack [on an entirely new plan.] For the year of our Lord, 1759.* Philadelphia: Printed by William Dunlop, 1758.



A Table of COINS, as they now pass in the following Places,

	England.			Philadelphia			N. York.		
	l.	s.	d.	l.	s.	d.	l.	s.	d.
English Sixpence,	0	0	6	0	0	9	0	0	[illegible]
English Crown,	0	5	0	0	7	6	0	8	[illegible]
French Crown,	0	5	0	0	7	6	0	8	[illegible]
Guinea,	1	1	0	1	14	0	1	16	[illegible]
Spanish Pistole,	0	16	0	1	7	0	1	9	[illegible]
French Pistole,	0	16	0	1	6	6	1	8	[illegible]
Moydore,	1	7	0	2	3	6	2	6	[illegible]
Johannes,	3	12	0	5	15	0	6	6	[illegible]
Half Johannes,	1	16	0	2	17	6	3	3	[illegible]
Doubloon,	3	6	0	[illegible]	8	0	5	16	[illegible]
Spanish Dollar,				0	7	6	0	[illegible]	[illegible]
Pistareen,				0	1	4	0	1	[illegible]

NB. All Sorts of Spanish Silver are sold in London, by the Ounce, and often varies, but seldom or ever exceeds 5s. 5d.

Figure 3: Coin Ratings in England, Philadelphia, and New York, 1787

Source: *The New Pennsylvania Almanack, for the Year of our Lord, 1787.* Pennsylvania: Printed by F. Bailey, J. Steele, and J. Bailey,1786.

A TABLE *of the* WEIGHT *and* VALUE *of* COINS, *as they now pass in* England, Pennsylvania, *and* New York.

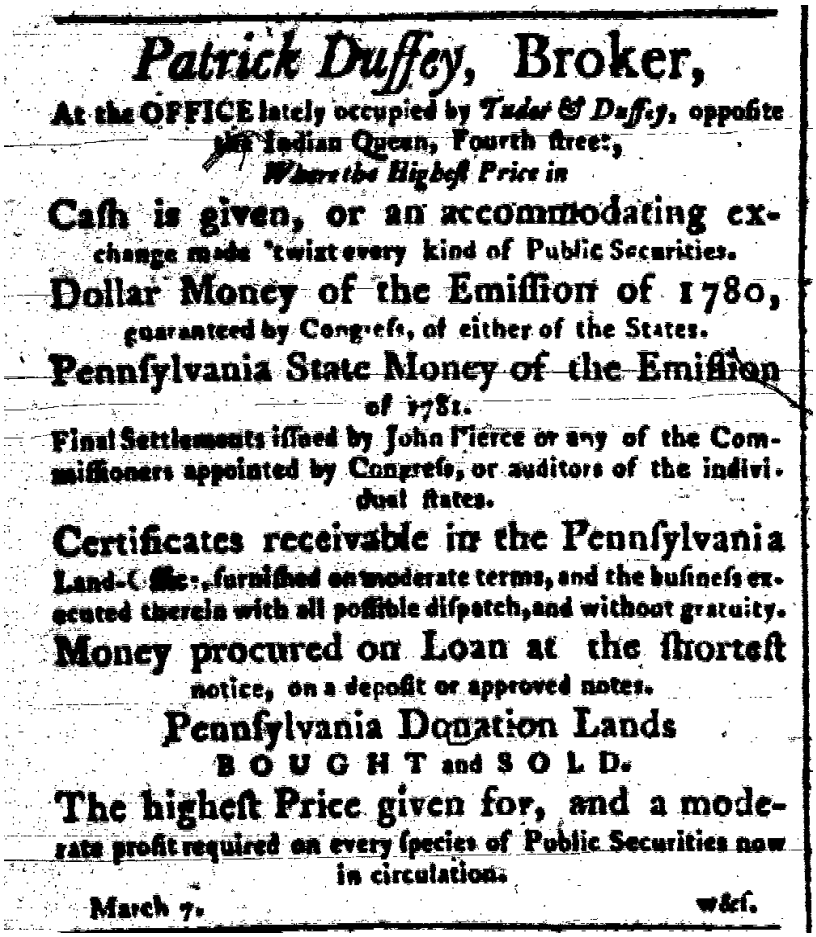
	Sterling.			*Philadel.*			*N. York.*			*Wt.*	
	l.	s.	d.	l.	s.	d.	l.	s.	d.	dt.	gr.
ENGLISH Guineas, at	1	1	0	1	15	0	1	17	4	5	6
French, ditto	1	1	0	1	14	6	1	16	4	5	5
Moidores - -	1	7	0	2	5	0	2	8	0	6	18
Johannes - -	3	12	0	6	0	0	6	8	0	18	0
Half, ditto -	1	16	0	3	0	0	3	4	0	9	0
French milled Piſtoles	0	16	0	1	7	0	1	8	0	4	4
Spaniſh, ditto	0	16	6	1	8	0	1	10	0	4	6
Doubloons -	3	6	0	5	12	0	6	0	0	17	0
Engliſh Crowns -	0	5	0	0	8	4	0	8	9	19	0
French, ditto -	0	5	0	0	8	4	0	8	9	19	0
* Spaniſh Dollars	0	4	6	0	7	6	0	8	0	17	6
Engliſh Sixpence -	0	0	6	0	0	10	0	0	10		

* *In Boſton, and Connecticut, Pieces of Eight paſs for ſix ſhillings, and gold by weight.*

Figure 4: Pennsylvania Revolutionary Issues of Paper Money as Speculative Securities, 1787

Notes: By 1787, less than £1000 of the "Island money" remained outstanding, which probably accounts for its not being mentioned in this advertisement.

Source: *The Independent gazetteer, or, The chronicle of freedom*, 14 July 1787



Patrick Duffey, Broker,

At the OFFICE lately occupied by *Tudor & Duffey*, opposite the Indian Queen, Fourth street,

Where the Highest Price in

Cash is given, or an accommodating exchange made 'twixt every kind of Public Securities.

Dollar Money of the Emission of 1780, guaranteed by Congress, of either of the States.

Pennsylvania State Money of the Emission of 1781.

Final Settlements issued by John Pierce or any of the Commissioners appointed by Congress, or auditors of the individual states.

Certificates receivable in the Pennsylvania Land-Office, furnished on moderate terms, and the business executed therein with all possible dispatch, and without gratuity.

Money procured on Loan at the shortest notice, on a deposit or approved notes.

Pennsylvania Donation Lands

BOUGHT and SOLD.

The highest Price given for, and a moderate profit required on every species of Public Securities now in circulation.

March 7. w&f.

Figure 5: Pennsylvania Paper Money as a Speculative Security, 1788-91

Sources: Top: *The Federal gazette, and Philadelphia evening post*, 5 December 1788; Bottom: The *Federal gazette and Philadelphia daily advertiser*, 16 February 1791.

WANTED TO PURCHASE,
PAPER MONEY, or ORDERS on the TREASURY.
Inquire of RICHARD FULLERTON.
Philadelphia, November 23th. d1w

CERTIFICATES,

PAPER Money, and all Kind of Public Securities bought and Sold, and the highest Prices given, by

Benj. Nones, Broker.

No. 14, North Front,
7 doors from the corner of Market street.

Figure 6: Coin Ratings in England and the United States, 1797

Source: *The Pennsylvania, New-Jersey, Delaware, Maryland, and Virginia Almanac, for the Year of our Lord, 1797*. Philadelphia: Printed and Sold by Stewart & Cochran, 1796.

A Table of the *Weight* and *Value* of *Coins*, as they pass in the respective States of the Union, with their *Sterling* and *Federal* Value.

Names of Coins.	Standard Weight	Sterling Money of Great Britain	New Hampshire, Massachusetts, Rhode-Island, Connecticut, and Virginia.	New York and North Carolina.	Pennsylvania, New Jersey, Delaware, and Maryland.	South Carolina and Georgia	Federal value Eagles	Federal value Dollars	Federal value Cents	Federal value Mills
(GOLD)*	dwt. gr.	£. s. d.	£. s. d.	£. s. d.	£. s. d.	£. s. d.	D.	D. d	c.	m
A Johannes,	18 0	3 12 0	4 16 0	6 8 0	6 0 0	4 0 0	1	6	0 0	0
An Half Johannes,	9 0	1 16 0	2 8 0	3 4 0	3 0 0	2 0 0		8	0 0	0
A Doubloon,	16 21	3 6 0	4 8 0	5 16 0	5 12 0	3 10 0	1	4	9 3	3
A Moidore,	6 18	1 7 0	1 16 0	2 8 0	2 5 0	1 8 0		6	0 0	0
An English Guinea,	5 6	1 1 0	1 8 0	1 17 0	1 15 0	1 1 9		4	6 6	7
A French Guinea,	5 5	1 1 0	1 7 6	1 16 0	1 14 6	1 1 5		4	6 0	0
A Spanish Pistole,	4 6	0 16 6	1 2 0	1 6 0	1 8 0	0 18 0		3	7 7	3
A French Pistole,	4 4	0 16 0	1 2 0	1 8 0	1 7 6	0 17 6		3	6 6	7
(SILVER.)										
An English or French Crown,	19 0	0 5 0	0 6 8	0 8 9	0 8 3	0 5 0		1	1 0	0
The Dollar of Spain, Sweden or Denmark,	17 6	0 4 6	0 6 0	0 8 0	0 7 6	0 4 8		1	0 0	0
An English Shilling,	3 18	0 1 0	0 1 4	0 1 9	0 1 8	0 1 0		0	2 2	2
A Pistareen,	3 11	0 0 10½	0 1 2	0 1 7	0 1 6	0 0 11		0	2 0	0

* All other gold Coins, of equal fineness, are valued at 89 Cents per Pennyweight, and all other silver Coins, of the same fineness, at 111 Cents per Ounce.

The standard for gold and silver, is eleven parts fine and one part alloy.

A table of the value of other foreign coins, &c. in Federal money D. d. c. m.

Pound Sterling,	4, 4 4 0
Pound of Ireland,	4, 1 0 0
Pagoda of India,	1, 9 4 0
Tale of China,	1 4 8 0
Milreis of Portugal,	1, 2 4 0
Rable of Russia,	0, 6 6 0
Rupee of Bengal,	0, 5 5 5

Florin or Guilder of the United Netherlands,	0, 3 9 0
Mark banco of Hamburgh,	0, 3 3 5
Livre Tournois of France,	0, 1 8 5
Real Plate of Spain,	0 1 0

Figure 7: Pennsylvania Prices Relative to Those in England, 1783-1811

Sources: For Pennsylvania Prices, Bezanson et al. (1936, p. 388). For British prices, Elizabeth Boody Schumpeter, "English Prices and Public Finance, 1660-1822." *Review of Economic Statistics*, February 1938, 20(1), p. 35. These are exactly the same data series used by Grubb (2003a, 2003b). The solid line converts post-1797 British prices to a gold basis using Lawrence H. Officer, "What Was the Gold Price Then?" Economic History Services, EH.Net, 2002. URL: http://www.eh.net/hmit/goldprice/

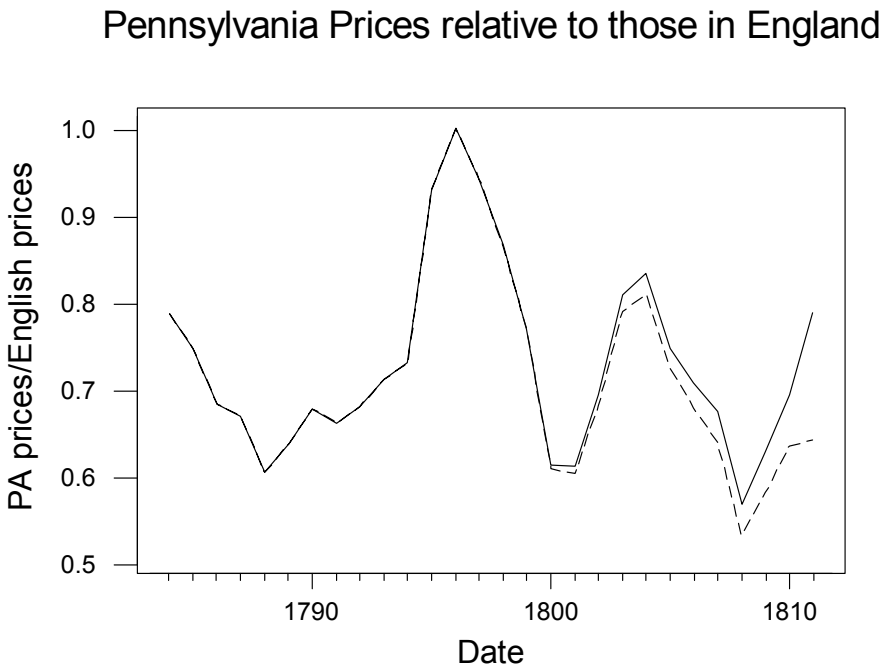


Figure 8: Exchange Rate: Philadelphia on London, 1783-1800

Sources: For 1783-90, data came from Bezanson (1951, p. 346). For 1791-1800, the authors gathered data on the price of 60 day bills on London from a variety of Philadelphia newspapers and private letters. A spreadsheet detailing the data and its sources is available on request from the authors . The series we constructed happens to be in close agreement with White's series on Baltimore exchange rates (House Document #117, 21st Congress, 1st Session, May 29, 1830, pp. 78-85).

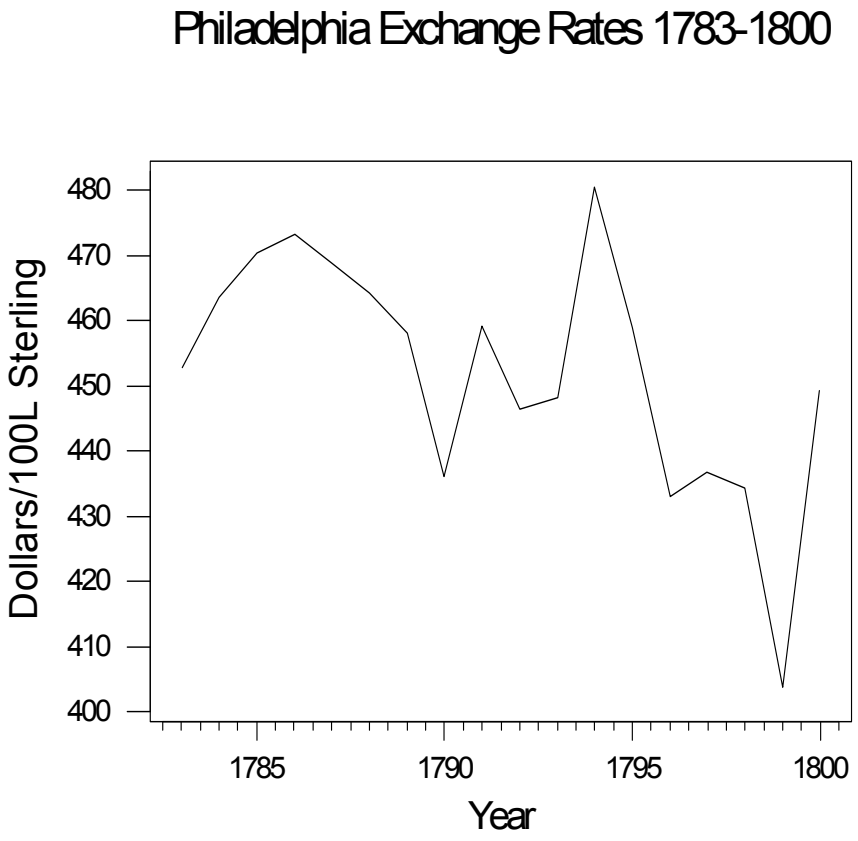


Table 1: Demand Liabilities of the Bank of North America, 1782-1785; 1791-1795

Sources: Bank of North America Records, Historical Society of Pennsylvania, Philadelphia, PA.

Notes: Deposits for 1782-1785 were deduced from Assets = Liabilities.

Year	Notes	Deposits	Year	Notes	Deposits
1782	672	117	1791	1000	1293
1783	456	1418	1792	531	953
1784	380	486	1793	468	680
1785	262	399	1794	543	766
(In thousands of dollars)			1795	558	531

Table 2: Unit of Account Used in Redemptioners' Book A, 1790-1799

Sources: Data on unit of account from "Book A of Redemptioners, 1785-1804," Unpublished manuscript, Historical Society of Pennsylvania, Philadelphia PA. The price index is from Bezanson et al. (1936, p. 388).

Year	Number of Observations	Price Index	Percent PA pounds	Percent Dollars	Percent Guineas
1790	39	84.3	93	0	7
1791	151	80.3	100	0	0
1792	270	83.3	99	0	1
1793	153	92	100	0	0
1794	200	99.7	100	0	0
1795	367	137	96	4	0
1796 (Jan-June)	119	157.2	92	8	0
1796 (July-Dec)	223	151.6	34	38	28
1797	108	139.8	36	42	22
1798	66	128.2	20	72	8
1799	41	123.3	10	83	7

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Endnotes

1.Each was issued as a full legal tender. By October 1789 Rhode Island's 1786 issue had depreciated to 15 to one (John P. Kaminski, 1989, p. 197). A letter from Edward Carrington to James Mercer, 1 September 1786, said of Rhode Island's paper money that "almost in the instant of its birth, it ceased to circulate, except in the payment of debts, for which it was made a Tender, and has convulsed the State nearly to a civil War" (Paul H. Smith et al, 1976-2000, vol. 23, p. 538). Georgia's issues fell to four or five to one (*Pennsylvania Gazette*, 30 April 1788). North Carolina's fell to two to one; according to historian James R. Morrill (1969, p. 98), it "did indeed bring about the pernicious consequences that hard money men predicted and bemoaned; specie was driven out of circulation; inflation occurred; no commercial purposes outside the state were served; foreign commerce was discouraged; creditors were injured; and despite a measure of relief to particular individuals, a sufficient, viable medium of exchange was not and could not be created."

2.McCallum (1992, p. 153) estimated that to endanger the fixed par, colonial Pennsylvania would have had to emit roughly £2 - £2.5 sterling per *white* capita ($8.68 - $10.84 per capita).

3. Grubb (2003a) argues that pound-denominated transactions must have been made with bills of credit, since banknotes were denominated in dollars; in fact, many of Pennsylvania's bills of credit were also denominated in dollars. Pennsylvania's 1785 issue was denominated in *both* pounds and dollars. The June 1780 issue of $1,495,000, denominated only in dollars, (incorrectly stated by Newman as $1,250,000) was almost as large as the *combined value* of the two pound-denominated issues ($1,564,000) made in 1780-81 (Pennsylvania, 1792; Eric P. Newman, 1967, pp. 261-65).

4.The sums include the three emissions of 1780-1781, and the emission of 1785. Earlier Revolutionary emissions had long since ceased to circulate, and had been repudiated along with the Continentals (Pennsylvania, 1791, 1792, 1795). All per capita estimates appearing in the paper are based on population data interpolated from United States Bureau of the Census (1970).

5.*Pennsylvania Statutes at Large*, vol. 11, pp. 480-85, chap. 1137. As Arthur P. Hall (1985, p. 65) points

out, the 1780 legal tender law applied ex-post facto to pre-existing contracts, although the assembly had pledged, shortly before, not to do such a thing. The assembly's capriciousness - demonstrated yet again by the repeal of the bank's "perpetual" charter - explains why this provision of the 1785 act did not put creditors at ease.

6.An "expression lately dropped from an eminent law character" spawned a rumor that the state supreme court contemplated declaring the bills a legal tender (*Pennsylvania Herald, and General Advertiser*, 21, 25 July 1787).

7.A monthly magazine, *The Universal Asylum, or Columbian Magazine*, which regularly quoted the prices of Pennsylvania and New Jersey bills of credit, allows us to track the demise of the bills closely. On 28 March 1788, bills of credit of the 1785 emission traded at £140 to £150 for £100 Pennsylvania money of account. (New Jersey's bills of credit were similarly depreciated.)

8.In 1791, the state borrowed *£60,000* from the Bank of North America, in part, to "render it unnecessary to pursue the injurious and impolitic expedient, of re-issuing such bills of credit as have been or shall be paid into the treasury" (*Pennsylvania Statutes at Large*, vol. 14, chap. 1554, pp. 62-6).

9.Grubb fell prey to ambiguous wording in Eicholz. The original source is Mathew Carey (1786, pp. 30, 73). Findley was paraphrasing Mr. Fitzsimons, a pro-bank legislator, who had said the bank's foes had levied charges against the bank without so much as knowing how much bank paper was in circulation.

10.Barbe-Marbois reported the bank's shares had sold out, and that $100,000 sent from England to purchase shares in the bank had arrived too late. Barbe-Marbois to Castries, 1 August, 23 September 1783, Archive Nationale, Paris, Affairs Etrangeres, B I Consular Correspondence, 945:360-361, 375, as cited in Nuxoll (2003).

11.Dividends, however, did not fall immediately, due to an unusual circumstance. "The dividend of eleven per cent," Franklin explained, "which was once made, was from a circumstance scarce avoidable. A new company was proposed; and prevented only by admitting a number of new partners. As many of the first set were averse to this, and chose to withdraw, it was necessary to settle their accounts; so all

were adjusted, the profits shared that had been accumulated, and the new and old proprietors jointly began on a new and equal footing" (Smyth, 1907, vol. 9, p. 587).

12.The new charter was more restrictive than the old. The new charter was for a term of fourteen years, and it limited the bank's capital to $2,000,000. Nonetheless, everyone involved in the controversy viewed the renewal as a great victory for the bank (*Pennsylvania Statutes at Large*, chap. 1278, vol. 12, pp. 412-16; Rappaport, 1996, pp. 199-221).

13. For example, in our foreign relations with England (Smyth, 1907, vol. 10, pp. 105-16).

14.Grubb actually quotes two prominent anti-federalists – George Mason and Richard Henry Lee of Virginia – denouncing state-issued paper money, but mistakenly implies that they were Federalists.

15.Merrill Jensen (1976, vol. 1, p. 237) wrote: "The delegates were almost as one in agreeing that states should be forbidden to issue paper money."

16.Grubb (2003b, p. 1790) says Georgia and South Carolina only agreed to the ban because "Acute panic caused by Indian warfare led them to vote for the constitution in hope of gaining aid from the rest of the union." The claim is plausible but unproven in the case of Georgia (Jensen, 1978, vol. 3, p. 210), and untrue in the case of South Carolina (John C. Ranney, 1946, p. 15).

17.Arthur P. Hall (1991, p. 98) also concluded that "state-issued bills of credit were in general disrepute when the Constitutional Convention convened in May of 1787." In Maryland, Virginia, and Massachusetts state legislatures were considering paper money emissions on the eve of the Constitutional convention, but none passed, probably because of a growing awareness that such measures were futile. Grubb (2003b, p. 1780) says the schemes were not adopted because the legislatures failed to act before the constitution blocked such emissions. The implication that the legislatures lacked the time to complete their deliberations is false, because the ban did not become binding when proposed at the constitutional convention in 1787, as Grubb (2003b, pp. 1778, 1791) apparently believes. Until the required ninth state ratified the document on 21 June 1788, states were unambiguously free to emit paper money. According to a Supreme Court decision (*Owings v. Speed*, 1820) such an act actually would have been permissible

any time before 4 March 1789.

18.Maryland issued dollar-denominated bills of credit as early as 1767 (Ernst, 1973, p. 165). The varying dates at which different states' commodity prices switch from being quoted in pounds to being quoted in dollars in Arthur H. Cole (1938) and the fact that Pennsylvania price quotations in Cole convert to dollars in 1792, while those in Redemptioners' book A do not begin to change until 1796 illustrate the gradual and uneven nature of the transition.

19.In 1781, Massachusetts issued Treasurer's certificates redeemable in Spanish milled dollars. Even if we classify those certificates as money, they do not affect the calculations for 1786.

20.See also Prager (1795), Drinker (1796), and William T. Hutchinson and Rachal Williams (1962-1983, vol. 15, 495). Madison explicitly absolved banks of responsibility for recent inflation, since they had discontinued discounting some time before.

21.Letting the data dictate the dating of a structural break can be an appropriate procedure, but when one does that, one cannot, as Grubb does, test the statistical significance of that break using a t test.

22.In an email, Grubb explained that the calculation was performed as outlined below. An argument might be made for the asymptotic normality of a statistic similar to this one, but one would have to omit n_1 and n_2 from the calculation.

$$t = \frac{(\overline{x}_1 - \overline{x}_2) - 0}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} = \frac{0.0165 - 0}{\sqrt{\frac{(.0147)^2}{8} + \frac{(.0184)^2}{15}}} = 2.34 > t_{\frac{\alpha}{2}}$$

23.The original exchange rate series, known as the "White-Baltimore" series, can be found in House Document #117, 21st Congress, 1st Session, May 29, 1830, pp. 78-85.