Emerging Financial Markets and Early U.S. Growth

by

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Abstract

Studies of early U.S. growth traditionally have emphasized real-sector explanations for an acceleration that by many accounts became detectable between 1815 and 1840. Interestingly, the establishment of the nation's basic financial structure predated by three decades the canals, railroads, and widespread use of water and steam-powered machinery that are thought to have triggered modernization. We argue that this innovative and expanding financial system, by providing debt and equity financing to businesses and governments as new technologies emerged, was central to the nation's early growth and modernization. The analysis includes a set of multivariate time series models that relate measures of banking and equity market activity to measures of investment, imports and business incorporations from 1790 to 1850. The findings offer support for our hypothesis of "finance-led" growth in the U.S. case. By implication, the interest today in improving financial systems as a means of fostering sustainable growth is not misplaced.

Keywords: financial markets, securities markets, growth, early national period, VAR.

JEL categories: E44, G10, N11, N21

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I. Introduction

Traditional studies of the early U.S. economy (North 1961; David 1967; Engerman and Gallman 1983; Weiss 1994) have emphasized real explanations for what has come to be accepted as a gradual acceleration in the rate of output growth between 1790 and 1840. Such factors as increases in the productivity of labor, the adoption of manufacturing and transportation technologies, the expansion of foreign commerce, and the growth of cotton exports in particular or westward agricultural expansion in general are central to these accounts. Economic historians are becoming increasingly aware, however, that the emergence of the nation's modern financial structure predated canals, railroads, and the widespread use of water and steam-powered machinery by three or four decades. Within five years of the ratification of the Federal constitution, the nation had restructured its large revolutionary war debts, introduced the U.S. dollar as a convertible currency, formed both a banking system and a national bank with branches, established and linked securities markets in major cities, and gained the confidence of European investors who transferred capital to the United States.

As state governments proceeded to charter more than 800 new banks and securities markets grew over the next half century, the financial sector provided short- and long-term debt and equity financing to businesses and governments for purposes of economic expansion and the implementing of new technologies (Sylla 1998, 1999). Securities markets in New York, Boston, Philadelphia and other cities grew apace with the banking system throughout the period, promoting the mobilization of both domestic and foreign capital, and infusing the new financial claims with liquidity. Such financial development, having occurred on such a scale only in the seventeenth-century Dutch Republic and in eighteenth-century England, was rare in history. And nowhere did it occur as rapidly as in the young United States. The new republic, effectively bankrupt in the 1780s, over the next three decades arguably became history's most successful emerging market.

Despite this impressive record, the role of financial innovation and financial-system development in early U.S. growth is neglected by economic historians or regarded as a relatively unimportant element of the expansion of a largely agrarian economy. Further, growth studies have looked primarily at macroeconomic aggregates such as GNP, and its dominant agricultural as well as "non-agricultural" components. Focus on such broad aggregates tends to mask the role played by the financial system in the rapid development of the initially small commercial, manufacturing, and service sectors. More than agriculture, it was these sectors that began to expand rapidly after 1790. Eventually, we know, their rapid expansion came to dominate the U.S. economy's overall growth. Hence, if we pay little attention to these sectors' expansion until their impact on macroeconomic aggregates becomes detectable, we miss some crucial aspects of economic modernization. And we are likely to miss as well, or to minimize, the importance of the financial development that made this modernization possible.

Our paper investigates the hypothesis that U.S. economic growth and development were "finance led." In so doing, it offers a strong case in support of a general version of our hypothesis that has remained at the forefront of economic discourse since Gurley and Shaw (1955), Goldsmith (1969), McKinnon (1973) and Shaw (1973) first elucidated the channels through which a larger and more efficient financial superstructure might help to effect favorable macroeconomic outcomes. We begin by demonstrating that the United States, which at the time independence was achieved in the 1780s lacked nearly all the elements of a modern financial system, by the 1820s had a financial system in place that was innovative and perhaps the equal of any in the world. What one of us has termed "the Federalist financial revolution," led by Secretary of the Treasury Alexander Hamilton in the early 1790s, was at the heart of these developments (Sylla, 1998). History rightly credits Hamilton and his allies in the first Congresses with putting the new government's finances on a solid footing and

establishing its credit. Less appreciated is the articulated and rapidly expanding financial system that emerged along with the strengthening of the nation's public finances.

Next, we make an empirical case for, and test the hypothesis of, finance-led U.S. growth. Although earlier work has presented evidence favoring this hypothesis for the latter half of the nineteenth century (Rousseau 1998; Rousseau and Wachtel 1998), limitations of the available data make it challenging to establish the case for the nation's early years. For example, until now an estimate of the U.S. money stock prior to 1820 has not been available, and the wealth of information contained in newspapers and other private sources about the extent and sophistication of U.S. securities markets in the antebellum era has only just begun to be uncovered (Sylla 1998; Sylla, Wilson, and Wright 1997; Atack and Rousseau 1999; Rousseau 1999; Wright 1999). Our paper synthesizes the progress made to date in collecting such quantitative information to offer a cohesive, if still sketchy, view of the U.S. financial system and how it compared with that of England.[1]

After presenting some of these quantities and describing their evolution, we explore the size and nature of dynamic interactions between activity in the real sector and the scope of financial-system development. The main statistical results derive from a set of multivariate time series models which include measures of activity in banks, the money market, and equity markets, as well as indicators of output, investment, imports and business incorporations from 1790 until 1850. Exogeneity tests examine whether growth in the financial variables led to increases in real activity, and impulse responses quantify the absolute and relative sizes of these effects. These tests address the fundamental

[1] Because the full dimensions of financial change in the early United States are only now becoming clear, comparisons with England are rare. In the 1830s, the American economist Henry Carey and the English banker James Gilbart debated the relative merits of the two countries' banking systems (see Sylla 1985). In the modern literature, for comparative discussions pertaining to later periods of the nineteenth century, see Davis (1966), Davis and Cull (1994), Davis and Gallman (forthcoming), and Michie (1987).

and still controversial issue of whether financial development merely proceeds along with, or follows, economic growth emanating from real-sector forces, or whether growth was "finance led."

II. The Emergence of U.S. Financial Markets, 1790-1850

By any standard, modern or otherwise, the speed and success with which a banking system and capital markets emerged in the United States as mobilizers of domestic and international resources after 1790 is nothing short of remarkable. In the 1780s, the Confederation government was burdened by huge debts left over from the Revolutionary War that, because it lacked taxing powers, it could not service or pay. Evidences of these debts–essentially junk bonds in default–traded for small fractions of par value in unorganized and illiquid markets. The states were in a similar position, but at least they had revenues to service their debts. The entire system of organized financial intermediation consisted of but three just-organized banks (one each in Philadelphia, New York and Boston) that supported local commercial interests and could not yet be considered a banking system. One of these institutions, the Bank of New York, failed repeatedly to obtain a state charter of incorporation from 1784, when it was organized, until 1791, when the New York legislature finally relented in fear that branches of the new federal Bank of the United States might co-opt state-sponsored banking. Another, Philadelphia's Bank of North America, had its 1782 Pennsylvania charter revoked in 1785, obtained a new one from Delaware in 1786, and then had the Pennsylvania charter re-instituted in 1787. The nation's money stock, if it could be described as such, consisted of foreign coins and specie, fiat paper moneys issued by each of the thirteen states with varying rates of exchange among them, and locally circulated notes and deposits of the three banks. Against this background, a sense of urgency arose among the nation’s leaders to put mechanisms in place for mobilizing the resources needed to link the nation’s land mass by means of economic infrastructure, to promote domestic and foreign trade, and to build a productive modern sector. The new Constitution hammered out at the Philadelphia convention of 1787 and

adopted by the required number of states in 1788 spoke to these issues.

Hamilton, as the new federal government's Treasury Secretary in 1789, became the architect of the nation's financial strategy. Congress implemented the federal taxation allowed by the Constitution and Hamilton built the system of revenue collection. That system became the basis for a restructuring of old Confederation and assumed state debts via fresh issues of federal securities which paid interest quarterly in hard money. These features raised the value of the new securities to domestic investors and their appeal to foreign investors. Hamilton next persuaded Congress to charter a Bank of the United States, a mixed (publicly and privately owned) corporation whose shares the private investors could purchase by tendering the new federal debt. The Bank helped to achieve the dual purposes of raising the nation's credit standing and establishing a more uniform currency. Finally, Hamilton drew up the plans for the dollar, defined in terms of both gold and silver, as the nation's monetary unit and base, and called for establishing a federal mint to make U.S. coins.

Hamilton's plans, formulated and adopted in a two-year burst of activity from 1789 to 1791, worked. By 1792, the new 6 percent securities sold at or above par, the national bank was fully subscribed, and state governments began to retire their fiat currencies, which were replaced by a monetary base of specie dollars and bank note and deposit liabilities convertible to the specie base. The financial revolution launched with these measures was to continue vigorously for decades and stands among the most sweeping in history, comparable to what England a century and the Dutch Republic two centuries earlier had achieved at a more leisurely pace.

A. The Rise of State Banking

Starting with only three banks in 1789, 28 new banks obtained state charters in the 1790s, and another 73 were chartered in the decade that followed (Fenstermaker, 1965a, p. 13). The profitability of these early banks, for which annual dividends of more than 8 percent were commonplace, sparked a

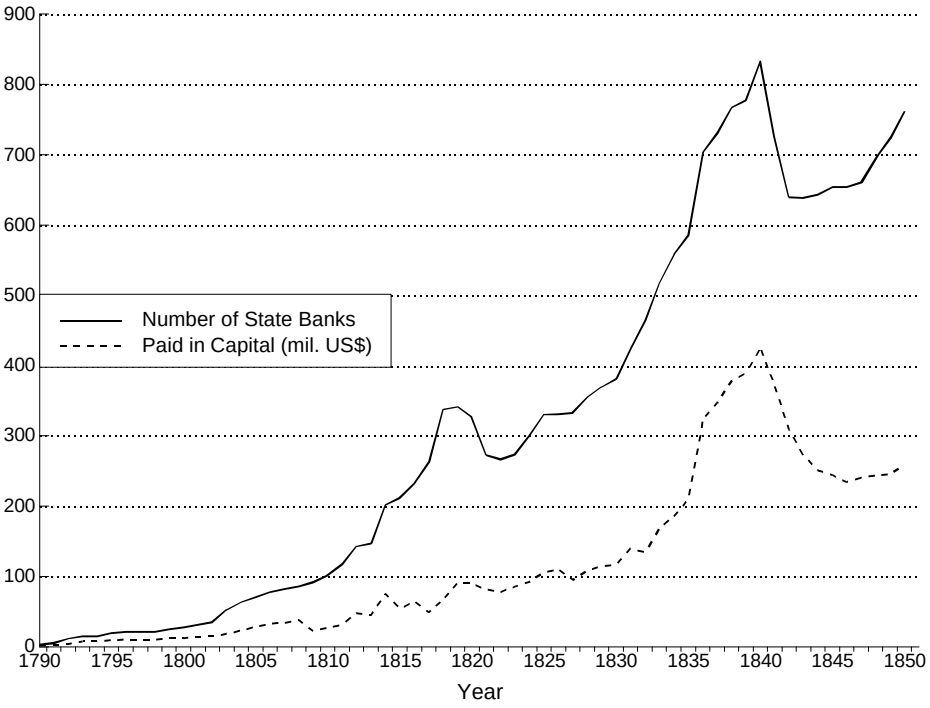

Figure I. The Rise of State Banking, 1790-1850.

rapid expansion that reached a high-water mark of 834 state banks by 1840. Then, after a brief decline, the number of state banks nearly doubled again by 1860. Figure I shows the evolution of the number of chartered banks and our estimates of their paid-in capital before 1850.[2] Like the rise in the number of banks, the increase in capital from a mere $3 million in 1790 to $426 million by 1840 reflects their growing role in mobilizing resources and providing credit and other financial services.

The state-chartered banks, like the federally chartered Bank of the United States, were corporations with limited liability, which is a major reason why they were able to attract so much capital investment. The early Americans did not invent the banking corporation, but as of 1790 the

[2] Our estimates of paid-in capital extend backward the series for 1837-1850 which appears in *Historical Statistics of the United States* (Bureau of the Census, 1975, series X587). This was done by using the total number of state banks to "blow up" the paid-in capital for reporting state banks in each year from 1803-1837 (Fenstermaker, 1965b, p. 406, and Fenstermaker 1965a, pp. 66-68) and then splicing the result to the Census series. Fluctuations in the authorized capital of all state banks for 1790-1802 (Fenstermaker, 1965a, p. 13) were then used to approximate the series through 1790.

world had seen few examples of it, and these were privileged monopolies such as the Bank of England. What the Americans did, uniquely when they did it, was charter so many banking corporations that they had to compete with one another rather than enjoy monopolistic privileges. From the 1790s to the middle of the nineteenth century, nowhere else in the world was the banking corporation as a competitive business enterprise developed to the extent that it was in the United States.[3] Only then, six or seven decades after the American innovation, did the old nations of the world begin to emulate the United States by allowing competitive corporate banking (Sylla 1985).

The significance of these developments is underscored by a comparison with England. Everyone knows as a stylized fact that England was the financial leader of the nineteenth century, with the pound sterling the world's leading currency, London and the Bank of England the center of the world's finances, and the London capital market intermediating the international flow of capital. What everyone does not know is that as early as 1825, the United States, with a population still smaller than that of England and Wales (11.1 versus 12.9 million), had roughly 2.4 times the banking capital of the latter (Sylla 1998, p.93).[4] This was not entirely the result of the financial revolution in the United States. English policy, and in particular the monopoly privileges of the Bank of England and the restriction of all other banks to unlimited-liability partnerships of six or fewer people, retarded banking development in that country until 1825, when the policy was altered to allow joint-stock banking with unlimited liability.

B. The Emergence of Securities Markets

The precocity of U.S. banking development was duplicated in the development of securities

[3] For keen insights on how the early U.S. corporate banks became competitive enterprises, see Schwartz (1947).

[4] Our estimate of the paid-in capital of state banks in 1825, portrayed in Figure I, is $106.9 million. This is somewhat higher than the estimate of Sylla (1998), which likely underestimated paid-in capital by using a conservative estimate of 0.6 for the ratio of paid-in to authorized capital.

markets. Following the debt refinancing of 1790 and the launching of the Bank of the United States a year later, securities markets sprang up virtually overnight in the major cities (Philadelphia, New York, Boston and Baltimore) to provide regularized trading opportunities for the new debt and equity claims. The "national market" securities, which then included the U.S. debt issues and Bank stock, were traded in each city, and were joined by steadily growing lists of "local" equity and debt securities. With the securities markets came a tendency for "overtrading" and speculation (Werner and Smith 1991) that even led to a market crash in early 1792. Yet the deepening of these markets ensured that ever more securities could be liquidated at prices that were more consistently fair than those which would have obtained in their absence. This leap in asset liquidity allowed investors, both domestic and foreign, to overcome their reluctance to hold American securities. By 1803, more than half of the U.S. government's debt and the stock of the Bank, and fully half of all American securities issued to that date were held by European investors (Sylla, Wilson, and Wright 1997, Sylla 1998).

A rough measure of the size of securities markets is the number of claims listed therein. The early government documents that left behind a wealth of information about banks and their condition are, however, virtually silent on the topic of securities markets. Fortunately, the newspapers of the time contain the raw material from which a view of early U.S. securities markets will eventually come into focus. Figure II depicts the number of securities that appeared in the New York, Philadelphia and Boston newspapers on or around June 30 of each year from 1790 to 1850.[5] Table I includes the

[5] The sources of data for New York include the *New York Daily Advertiser*, the *New York Shipping and Commercial List*, and *New York Prices Current*. For Philadelphia, the sources include the *New York Shipping and Commercial List*, *Philadelphia Prices Current*, *Grotjan's Philadelphia Public Sale Report*, *Poulson's American Daily Advertiser*, and the *Gazette of the United States*. Listings for Boston were compiled from data in Martin (1873). Early newspaper listings of securities quotations appear to be samples rather than complete populations of the securities available for trading. The listings, it seems, captured the larger and more actively traded issues. Smaller issues, and issues of corporations located at some distance from the urban centers of securities trading, did not make it into the newspaper listings, even though they may have occasionally been traded in the urban centers.

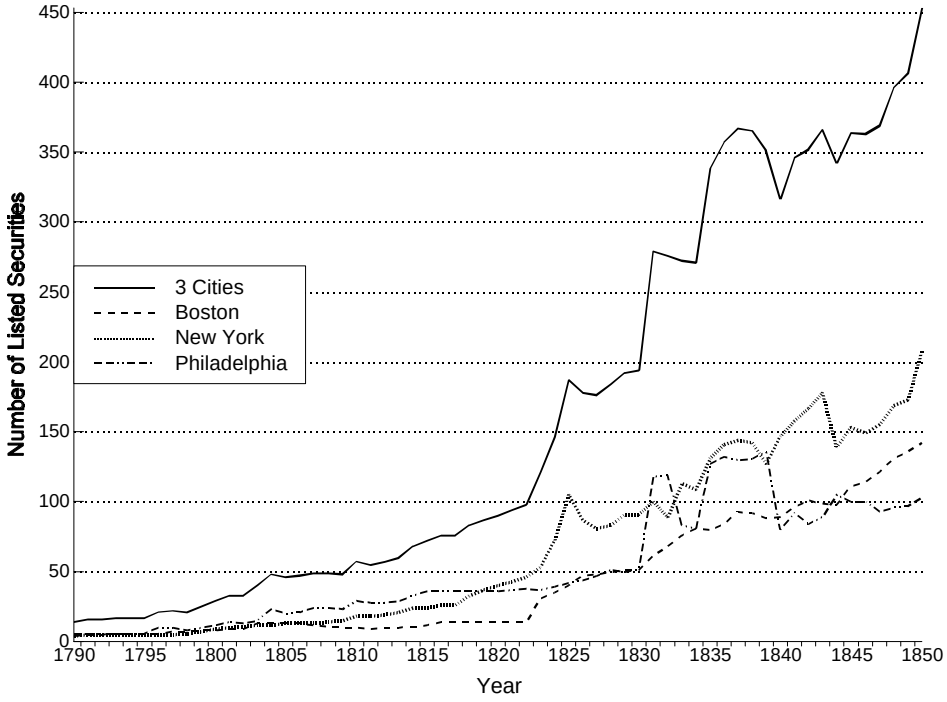

Figure II. Number of Listed Securities in Three Cities, 1790-1850.

Table I
Average Annual Growth Rates of Listed Securities by Decade, 1790-1860

Period	Total Listed	Governments	Financial	Transport
1790-1799	7.9%	4.6%	18.0%	0.0%
1800-1809	7.4	-1.1	11.6	18.0
1810-1819	4.8	9.0	4.1	0.2
1820-1829	8.5	4.2	8.9	18.7
1830-1839	6.0	6.5	3.8	18.0
1840-1849	3.8	11.6	0.3	7.4
1790-1849	6.4	5.8	7.7	10.4

The table includes securities listed in New York, Philadelphia and Boston.

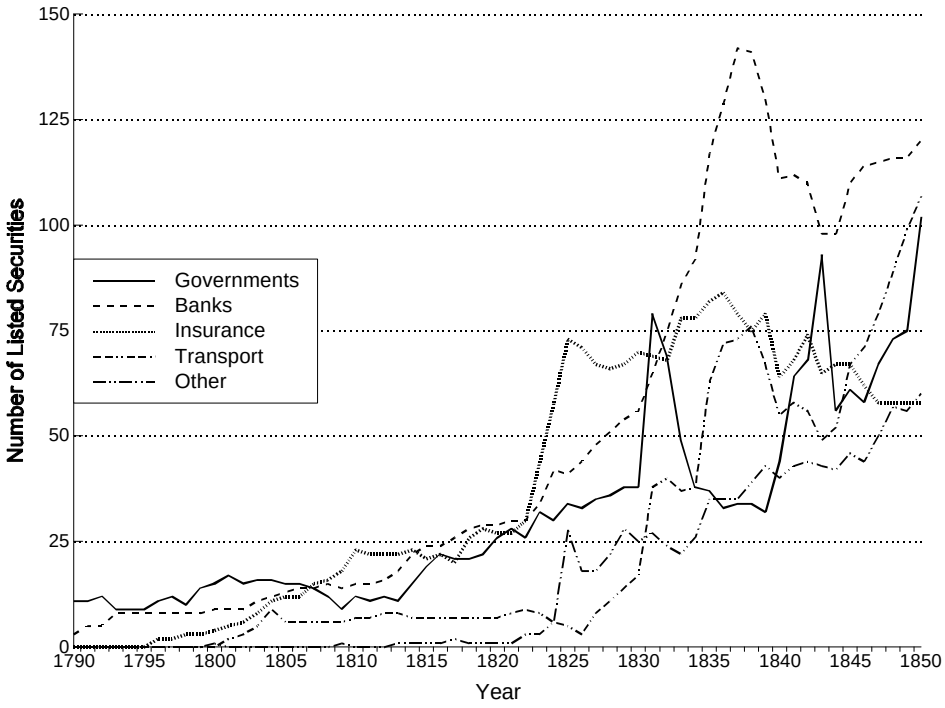

Figure III. Breakdown of Listed Securities in Three Cities, 1790-1850.

corresponding average growth rates by decade. Though a sharp rise in the number of securities listed in newspapers is evident from Figure II for the 1820s in all three markets, it is less obvious from the figure but apparent in Table I that the 1790s and 1800s were also decades of active market growth.[6]

The breakdown of total listings for government, financial, transportation and other (including manufacturing) securities shown in Figure III sheds some light on the sectoral sources of securities-market growth. The number of government securities shows the most variation among the categories, but a sharp increase in level occurs for all categories in the 1820s. Table I shows, however, that listings for financial institutions–banks and insurance companies–grew at an average annual rate of 18

[6] Though not included in Table I, it is interesting to note that listings rose at an average annual rate of nearly 11 percent between 1795 and 1804. There is some double counting in the totals of securities listings from newspapers, as issues of U.S. debt and Bank stock–the "national market" securities–were traded in all cities and were not consolidated in the totals reported here. Our view is that these issues were the blue-chip securities in each market, and that consolidation would result in underestimating the size of the market that emerged in each of the cities.

percent in the 1790s, which is double their growth rate in the 1820s, and at a rate of nearly 12 percent per year in the decade 1800-1809. This suggests that a fundamental transformation in the way that the nation mobilized and allocated capital resources began long before the 1830s, a period more often associated with the rapid expansion of banks. Listings of transportation securities also grew rapidly between 1800 and 1809, suggesting that the early capital markets met with some success in raising funds for internal improvement projects such as turnpike roads and bridges.

As with bank capital, we can make a rough comparison of the size of the U.S. and English securities markets in 1825. For the three large cities whose markets are portrayed in Figure II, 187 securities entered the 1825 listings. Adding in the Baltimore (33 securities) and Charleston (12 securities) markets, we arrive at a total of 232 securities listings in 1825. The newspaper of record for the English market, Wetenhall's *Course of the Exchange*, lists 320 English securities as well as a number of foreign issues in mid 1825. On that reckoning, the U.S. markets were smaller than the English, but already in the same league.

Course of the Exchange also provides sufficient information to make a rough estimate of the size of the English equity market in 1825. Our calculations put it at £38 million, or $183 million.[7] This

[7] The national debt of the U.K., comprising some 27 of the 320 English securities listed and including Bank, South Sea, and India stock since these companies were capitalized by government debt, was vastly larger (£820 million, or nearly $4 billion) than the U.S. government debt ($84 million) and indeed all U.S. public debts in 1825. England had fought many more wars over a far longer period than had the young United States. If we look just at equity markets, a different sort of comparison emerges. For most of the 293 English securities that were not part of the national debt, *Course of the Exchange* lists the par value of shares and the number of company shares, as well as the par value of a small number of non-national debt issues (which came to £7.2 million or $34.3 million dollars at $4.8 to the pound sterling). The total value of English equity issues that can be calculated came to £32.79 million. For 42 of the 293 issues, or about 14 percent of the listings, there was insufficient information to calculate par value capitalization. Some of these, perhaps most, were new issues just beginning to be traded, but if we assume that they were on average of the same capitalization as the issues whose par value capitalization could be measured, a likely liberal estimate of the total size of the English equity market in 1825 is some £38 million or $183 million.

estimate of English equity in 1825 is not all that much larger than the equity of U.S. banks alone that year, which including the Bank of the United States and state-chartered banks came to $138 million. The total U.S. equity market was, of course, larger, but how much larger is not yet known. A rough estimate can be derived from the data of Goldsmith (1985), indicating that the U.S. equity market came to $40 million around 1803 and $890 million in 1850. If we assume constant continuous growth (which works out to be 6.6 percent per year over the period), we derive an estimate of $171 million as the size of the U.S. equity market in 1825.

The conclusion we draw from these exercises is both obvious and perhaps surprising: By 1825, the size of the U.S. and English equity markets was virtually the same. And this despite the fact that the English had been developing their market for fully a century before the Americans got started on developing theirs. Thus, when the two nation's financial systems are compared, conventional views that the English were far and away the financial leaders of the nineteenth century, and that the United States circa 1825 was just beginning to develop in modern ways, would seem to require some revision.

That the United States had an equity market capitalization virtually the same as England's in 1825, but with fewer equity securities listed, implies that the average U.S. equity was more highly capitalized than the average English equity. This likely was a consequence of the United States taking the lead in chartering corporations, particularly banks in the early period, with limited liability. In a number of ways the U.S. and English equity markets were similar. Both listed insurance and transportation companies, a variety of utilities, and miscellaneous companies including manufacturing enterprises. The great difference between the two markets was banks. The Americans had them in spades. The English market in 1825 listed but two, one the Bank of England–more a government security than a private equity, and treated by the English as such–and the other, in the "Miscellaneous" category, was not an English bank at all, but the Provincial Bank of Ireland.

C. The Stock of Money

Still another way to measure financial development is through growth in liquid assets, or the money stock. This includes obligations of banks to the public and specie outside of banks. Both components represent assets that are either acceptable or quickly convertible for use in market transactions. Increases in the real value of these assets reflect more widespread use of the market economy. As the United States modernized, expanded its international trade and gained the confidence of foreign investors, an inflow of specie and the expansion of bank credits arising from these activities encouraged imports, modern production activities, and the start of internal improvements.

Any estimate of the money stock before 1850 must necessarily be based on sketchy and incomplete data. This is primarily because the most important component in the early years, specie in the hands of the public, is difficult to determine with confidence. In this paper, we start with Peter Temin's (1969) estimates of the money stock for 1820-1850 and replicate his method as closely as possible to extend the series backward to 1790. The result is the first attempt to provide a continuous view of money growth before 1820, and to our knowledge makes the best possible use of available data. Although it is an approximation, we expect that the series captures fluctuations in the money stock well. Appendix A offers a detailed description of its construction.

Figure IV plots the series, which indicates a three-fold increase in the money stock between 1790 and 1820, indicating an average annual growth rate of about 3.7 percent. During the next one and one-half decades, to the mid 1830s, the money stock rose at a rate of more than 7 percent per year. From 1836 to 1842 occurred a major collapse, comparable with that of the Great Depression of the 1930s, as the money stock shrank to less than three-fifths of the 1836 level before recovering rapidly at a rate of 8 percent per year in the late antebellum era (1842-1858). Over the six decades, 1790-1850, portrayed in Figure IV, the money stock grew at an annual rate of 4.3 percent.

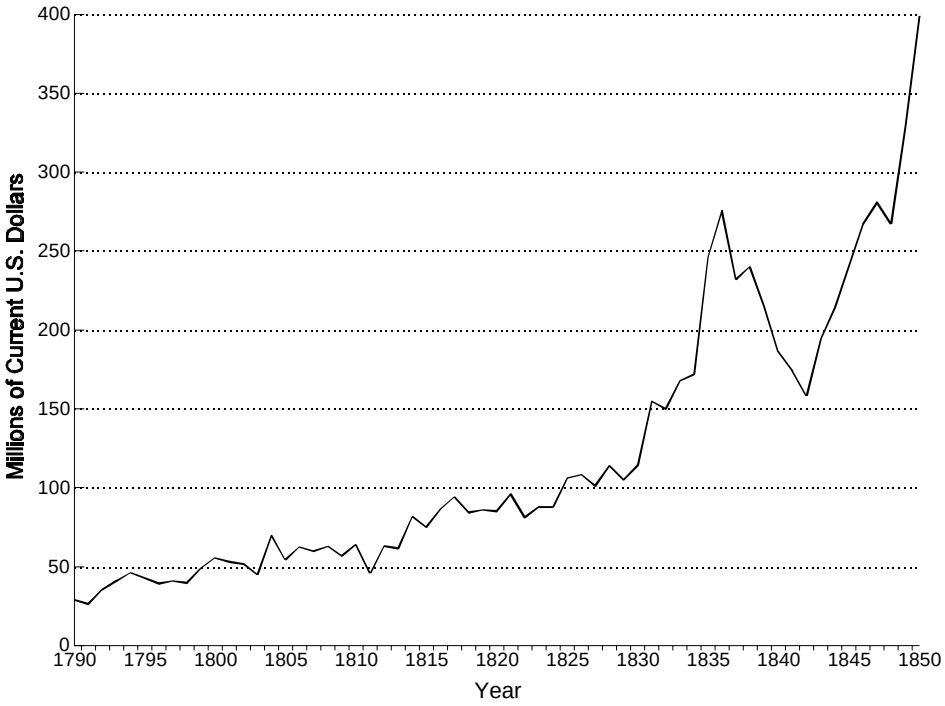

Figure IV. The Stock of Money, 1790-1850.

The tripling of the U.S. money stock from 1790 to 1820 can be compared with the behavior of the English money stock in approximately the same era. According to Cameron, a narrow version of the money stock of England and Wales doubled in size between 1800/1801 and 1831, while a broader version including bills of exchange barely grew at all (Cameron et al. 1967, Table II.2, p. 42). So the U.S. money stock, along with the U.S. population and economy, was growing faster than England's in the early nineteenth century. But the English money stock, even the narrow version of it, was about four times larger than the U.S. stock in 1820/21. England's population and economy were larger than those of the United States at that time, and the English economy was rather fully commercialized and monetized, something that the U.S. economy was still becoming. America's corporate banks also had large capitals in relation to their liabilities, whereas for England's small-partnership banks the opposite was the case (Sylla 1985; Lamoreaux 1994). Moreover, the striking U.S. financial developments of the early decades were largely confined to the New England and Middle Atlantic states. In

commercialization and monetization, the Northeast region of the U.S. by the 1820s had, it appears, become rather like England.

III. Indicators of Economic Growth in the Early U.S.

If we are to test quantitatively the hypothesis that financial developments jump-started U.S. modernization in the nation's early decades, we need to have some measures of modernization for that period. Such measures are not numerous, but there are a few. The ones that we consider here are estimates of GNP and its investment component, trade data, and data on business incorporations.

A. National Accounts Aggregates

Much of what is now known about the growth rate of output (or income) in the pre-1840 U.S. "statistical dark age" is the result of discussions in recent decades among economic historians[8] that culminated in Thomas Weiss's (1994) refinements of Paul David's (1967, 1977) conjectural estimates. The consensus view now abandons any notion of a "take off" in favor of a gradual acceleration in the trend rate of output growth over the 1800-1840 period, although it remains uncertain whether waves of more active growth occurred in such periods as 1790-1807, 1820-1835, and 1845-1855. Table II summarizes the David and Weiss estimates of growth rates, as well as those derived from the GNP estimates of Thomas S. Berry (1988). The pre-1840 estimates, particularly Weiss's, are modest by later standards, but they offer a sharp contrast to the picture of stagnation before 1840 posited earlier by Martin (1939) and Taylor (1964).

The differences between the David and Weiss estimates for 1820-1840 derive primarily from assumptions that underlie their agricultural basis, such as the number of acres under cultivation, the number of workers per acre, and the productivity of an average worker. Berry's GNP estimates, which

[8] These contributions include Martin (1939), Rostow (1960), Parker and Whartenby (1960), North (1961), Taylor (1964), and Gallman (1971).

Table II
Estimates of Annual Growth in Real Per Capita GNP, 1790-1860

Period	David	Berry	Weiss
1790-1806	1.30%	1.70%	NA
1800-1820	0.27	1.27	0.28
1820-1840	1.96	1.63	0.84
1840-1860	1.60	1.58	1.60
1800-1840	1.13	1.45	0.56
1800-1860	1.29	1.41	0.90

The table presents average rates of annual growth in per capita GNP over the subperiods listed at the left. Sources are the averages published in David (1967) and in Weiss (1994), and averages computed from the annual series in Berry (1988).

we used to compute the period averages attributed to him in Table II, are from his published annual series, which extrapolated the Kuznets-Kendrick-U.S. Department of Commerce estimates backward from 1875. Though the annual series is built upon a statistical rather than theoretical model and uses extrapolators which become less numerous the farther back the series runs,[9] the results are broadly consistent with David's conjectures and may well reflect, at a minimum, fluctuations in the level of economic activity. We would note in particular that Berry's series of real GNP per capita in Figure V shows a gradual acceleration before 1807 and from 1825 to 1835.

[9] Berry uses from 10 to 26 extrapolators for his GNP and investment series between 1789 and 1850, with 18 extrapolators available by 1804. His methodology averages the growth rates of a set of median extrapolators in each year (using 3 series in the 1790s and 6 series after 1800) to compute the growth rate of a "consensus pattern." The pattern is then linked with the Department of Commerce concept of annual GNP for 1876. The technique thus omits in each year those series that exhibit the widest and narrowest fluctuations. The authorized capital and deposits of U.S. banks are the only financial variables among the extrapolators, and are thus unlikely to have had a large effect on the evolution of the aggregates. Indeed, an earlier version of Berry's GNP series (1968) that does not include financial variables until 1816 has a correlation coefficient of 0.989 for 1790-1850 and 0.955 for 1790-1815 with the final (1988) series. See Berry (1968, 1978, 1988) for a complete discussion.

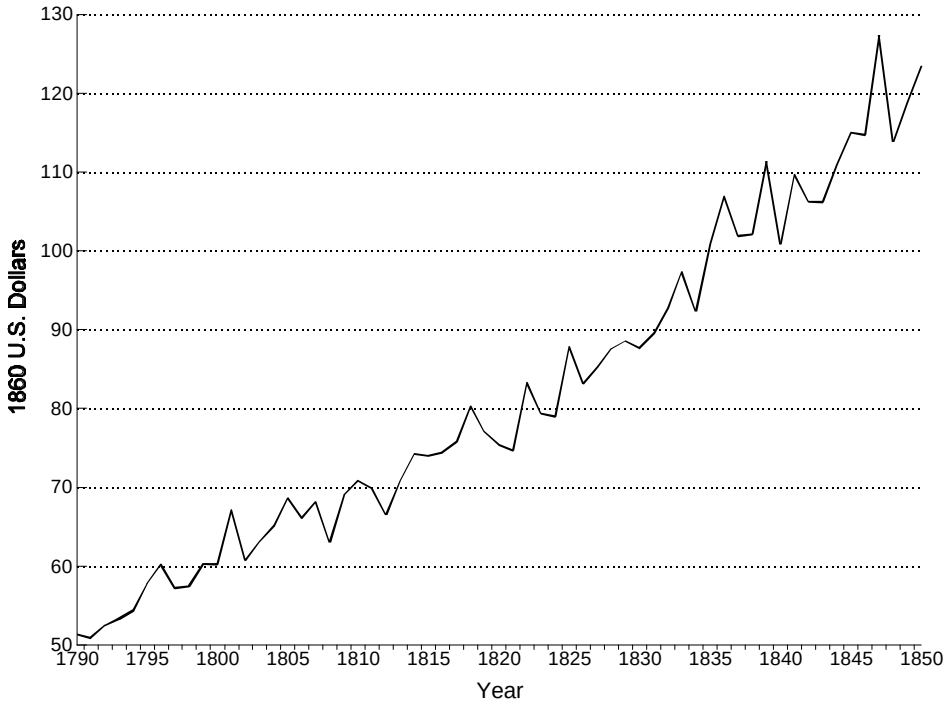

Figure V. Real Per Capita GNP, 1790-1850.

The inclusiveness of existing GNP estimates, which perforce reflect the dominance of agriculture in the early economy, makes their fluctuations unlikely to reflect activity in the relatively small and presumably more productive "modern" sector. For example, the panic of 1837 and the general downturn of the next six years do not produce a sharp decline in the series. Nevertheless, the use of modern technologies in commerce, transportation, and manufacturing was well underway by the 1820s and had already dramatically changed the complexion of the U.S. economy. Thus, GNP estimates might not indicate, but would not preclude, a "take off" in the modern sector at some time prior to 1820.

As a narrower concept, investment might reflect developments in the modern sector more effectively than aggregate output. Investment is also an economic activity likely to be promoted by a financial sector that is able to mobilize savings. As a measure of modern activity, however, investment is still flawed as it would, or could, mostly reflect traditional investment activities of the dominant

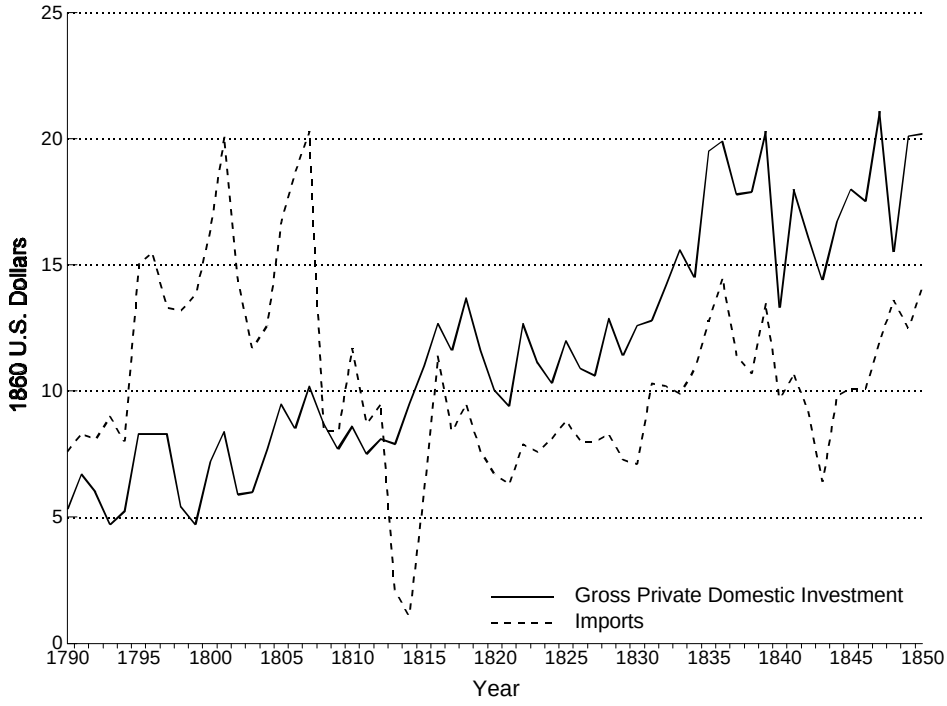

Figure VI. Real Per Capita Investment and Imports, 1790-1850.

agricultural sector. Despite such caveats, Berry (1988) constructs an annual series for per capita real investment by subtracting the consumption, net foreign investment and government expenditure components from GNP, and we will use it in our empirical investigation. This series, presented in Figure VI, shows a vigorous rise between 1799 and 1807, a rise that is not nearly as pronounced in his GNP series, as well as similar increases in the War of 1812 era and in the decade after 1825. Further, the series falls more than 25 percent between 1837 and 1843, suggesting that the panic of 1837 and its aftermath may have affected the modern sector more sharply than the agriculturally-oriented general economy upon which the GNP estimates are based.

Trade data might reflect developments in the modern sector still better than broad aggregates such as GNP and investment. North (1961) made this argument forcefully by characterizing foreign demand for U.S. exports as a stimulus to business innovation and expansion between 1790 and 1840. Engerman (1977) and others have pointed out, however, that export data by themselves do not fully

capture the internal impact of such "export-based" expansions. Imports, on the other hand, may reflect demand-side growth more effectively since they are sensitive to increases in income from exports, re-export services, and inflows of foreign capital. Most importantly, imports also reflect changes in income arising from additional export-induced production that finds its way into domestic markets.

Figure VI includes the annual level of real per capita imports using North's (1961, pp. 229, 280) index of import prices as a deflator. The period between 1790 and 1802 saw rapid growth, while the period 1808-1820, marked by the embargo and non-intercourse policies as well as by war and postwar adjustments, was one of sharper fluctuations. Imports revived after 1820 and gradually rose through the mid-1830s, before falling by nearly 50 percent from 1837-43. The sharpest growth came early in the nation's history and may well have reflected, along with opportunities arising from European wars, the existence of adequate financial resources for their support. The decline in real imports that followed the Panic of 1837, as well as the fall in real investment, coming as they did at a time when the financial system was stressed by banking failures and a seizing up of securities markets, lends support to our view that good (and bad) finance matters for real economic performance.

B. Business Incorporations

A different and underutilized approach to studying the development of the modern sector is through the activities of its most fundamental units–entrepreneurs, broadly construed to include enlightened statesmen. These individuals recognized early in the nation's history the potential of the corporate form of enterprise for promoting projects that would otherwise remain unstarted or stunted in development because of indivisibilities (for example, the "lumpiness" of investment) and inadequate opportunities for diversifying risks. Historians have called attention to the uniqueness of corporate development in the United States after the Revolution (Handlin and Handlin 1945; Maier 1993). Maier notes that the corporation was moribund in eighteenth-century England, when it was “salvaged” or “rescued” by Americans who “utilized its capacity to empower individuals whose resources were

unequal to their imaginations" (Maier 1993, p. 83).

As the corporate form facilitated the subscription of large amounts of capital, incorporated firms also provided a stimulus from which smaller unincorporated businesses could arise. Thus, the widespread incorporation of businesses had an influence on the modern sector that extended well beyond firms actually chartered by state governments. Since the vast majority of charters granted by states before 1850 were by special acts rather than general laws[10], the legislative nature of the incorporation process encouraged examination of applicants, which may have led to chartered enterprises of higher quality than might have otherwise arisen.

Individual state archives are rich sources of information about the granting of early corporate charters. Much of the formidable task of organizing this information was completed decades ago by Joseph Stancliffe Davis (1917) and George Heberton Evans, Jr. (1948). Davis's account, which covers the period from 1781 through 1800 on a sectoral basis for sixteen states, is the most comprehensive, covering ostensibly all incorporations. Figure VII presents the number of financial and non-financial incorporations annually from Davis's survey.[11] Most striking are the sharp increases in incorporations after 1790 and the degree to which financial and non-financial incorporations exhibited similar

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[10] Some precursors of general incorporation laws were enacted by states for non-business entities and for special purpose businesses such as the provision of aqueducts, yet the only general laws enacted for businesses over the period of our study were by New York in 1811 and New Jersey in 1846. In New York, 317 of 1,436 incorporations (22.1 percent) between 1811 and 1846 fell under the 1811 act. In New Jersey, 22 of 142 charters (15.5 percent) between 1846 and 1850 were taken out under the general law (Evans, 1948, p. 12).

[11] Davis's totals include renewals and incorporations of a single entity by more than one state. Figure VII adjusts these figures for multiple charters (see Davis, 1917, Table V, p. 30) to reflect the number of business units that actually received corporate status. The corporate form was controversial. The nation's first bank, the Bank of North America, for example, was chartered by Congress in 1781 and by the legislatures of three states that had doubts about Congress's authority to enact such a charter. In the 1780s, as mentioned earlier in the text, Pennsylvania rescinded its charter, and then enacted a new one for the bank after Delaware had granted it a charter in the interim. It was only one company, but Davis counted and reported it as having five state charters from four states.

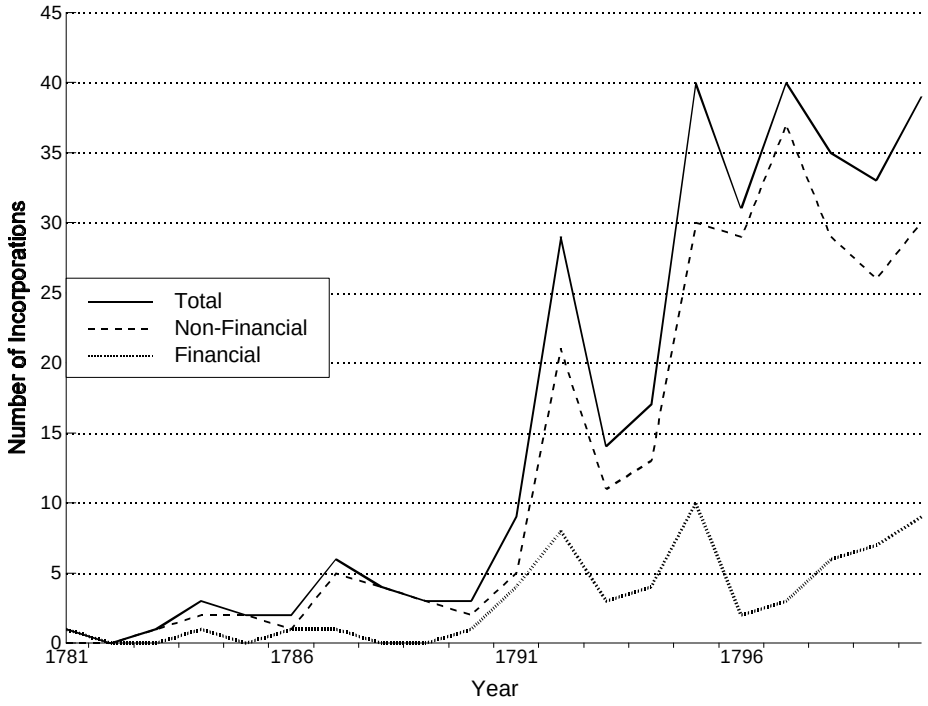

Figure VII. Annual Business Incorporations, 1781-1800.

fluctuations over time. The controversial granting of a federal charter to the First Bank of the United States in 1791 likely encouraged individual states to exercise their incorporation-granting authority more liberally and may well account for some of the increases.

Evans (1948) organizes incorporations on a sectoral basis for as many as seven states prior to 1850. The coverage includes Maryland 1800-1850, New Jersey 1800-1850, Pennsylvania 1800-1850, New York 1800-1845, Ohio 1803-1850, Maine 1820-1850, and Connecticut 1837-1850. The lack of representation for the New England states in the early part of the sample is unfortunate, as Davis shows these states to be the most active in chartering corporations prior to 1800. Evans admitted (1948, p. 10) that his coverage was incomplete but maintains that his sample included states in which incorporations were numerous. If so, it is interesting and likely no coincidence that the largest numbers of incorporations occurred in states such as New York, Pennsylvania, and Maryland that hosted rapidly

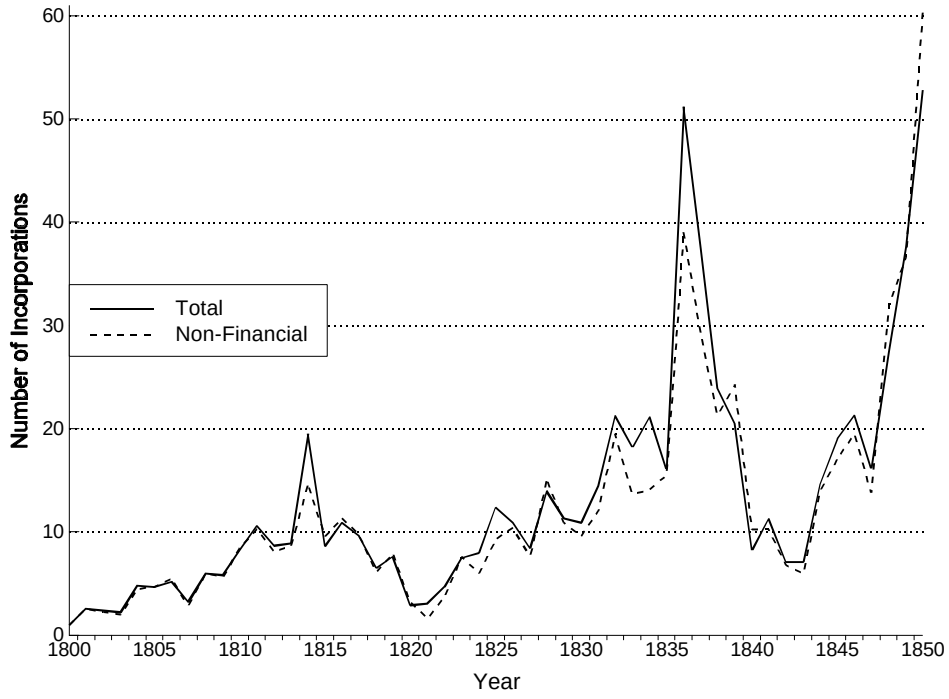

Figure VIII. Index of Annual Business Incorporations, 1800-1850.

developing securities markets.

Since the number of incorporations is available continuously for only three states between 1800 and 1850, we build an index to provide an overall view of incorporations. The index is constructed by summing the number of incorporations available in each year and dividing the sample into segments for which the composition by state is steady. We then splice the segments and set 1800 as the base, giving the index a value of unity in that year.[12] The resulting index of business incorporations, presented in Figure VIII, indicates sharp rises in annual incorporations from 1800 to 1814, from 1820 to 1835, and after 1843. These waves track Paul David's periods of faster economic growth fairly closely, although the first of them extends beyond David's dating. The relative importance of individual sectors in the non-financial series varies over time, being dominated by turnpikes and manufacturing firms during the

[12] Since Evans's descriptions do not indicate those instances under which firms were incorporated by more than one state, the index cannot be adjusted for these occurrences.

first wave and by railroad and mining firms during the second.

Figures VII and VIII present data on the flow of incorporations, but not on the evolution of the stock of existing corporations over time. Figure IX approximates this stock in index form by splicing the incorporations series based on the Davis and Evans samples and then cumulating the annual changes. Figure X presents the indices in logs, which make more clear the rapid growth of our stock measures between 1790 and 1815. If business incorporations can be taken as an index of economic modernization, the evidence of Figure X could be construed as indicative of a "take off" in this early period, fully half a century before Rostow's much disputed "take off" began in the 1840s.

The cumulations of Figures IX and X can only approximate the stock of corporate entities in any year because the fragmentary nature of information on corporate failures and non-starts makes a correction for such happenstances virtually impossible.[13] Nevertheless, the indices of cumulative incorporations perhaps capture a concept broader than businesses which actually succeed–namely, the stock of ideas or projects arising from America's entrepreneurs. Long-run trends and fluctuations of such a measure perhaps reveal something about the evolving business climate of the times. Growing access to financial resources, for example, may have provided incentives to develop corporations as productive outlets for funds. In the context of this study, where emphasis is on the long-run impact of financial market development, we think that the stock of ideas reflected in corporate chartering, as it cumulates over time, could well be related to the size and depth of financial markets (also stock measures) more closely than year-to-year fluctuations in the flow of incorporations. For this reason, our empirical work described below uses cumulative measures of incorporation activity.

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[13] Little is known about the life span of corporations prior to 1840. Hutchinson, Hutchinson and Newcomer (1938), in an examination of business life in Poughkeepsie, New York indicate that 54.6 percent of firms incorporated between 1844 and 1927 survived more than five years and only 29.3 percent survived for more than ten years. Since the timeline of these figures is not given and the period covered is one during which New York incorporations were accomplished primarily by general law, it is uncertain how well these figures reflect business failures in earlier years.

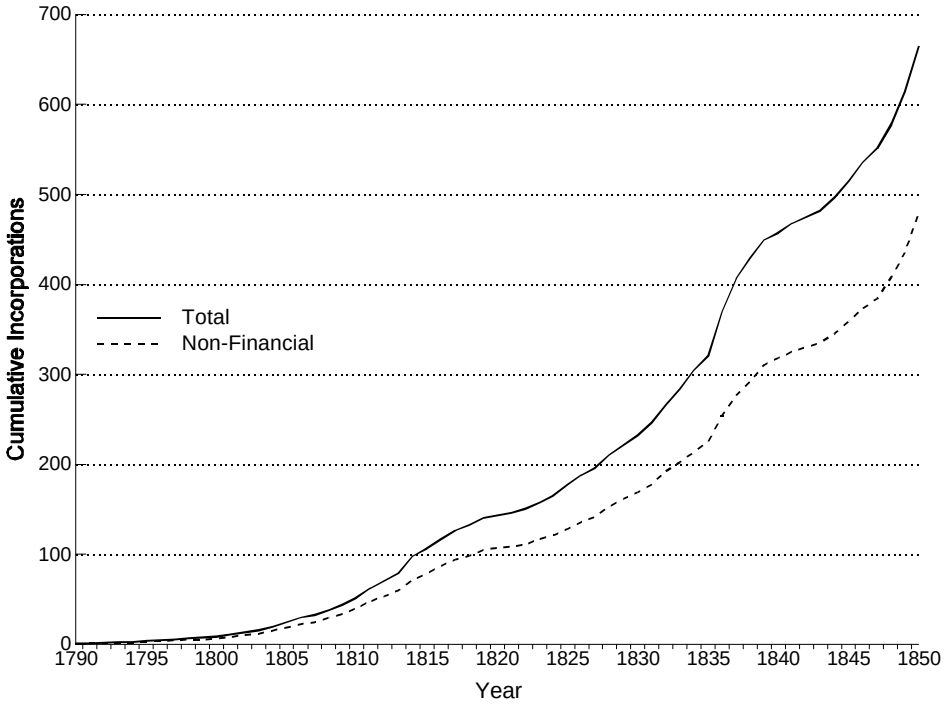

Figure IX. Index of Cumulative Business Incorporations, 1790-1850.

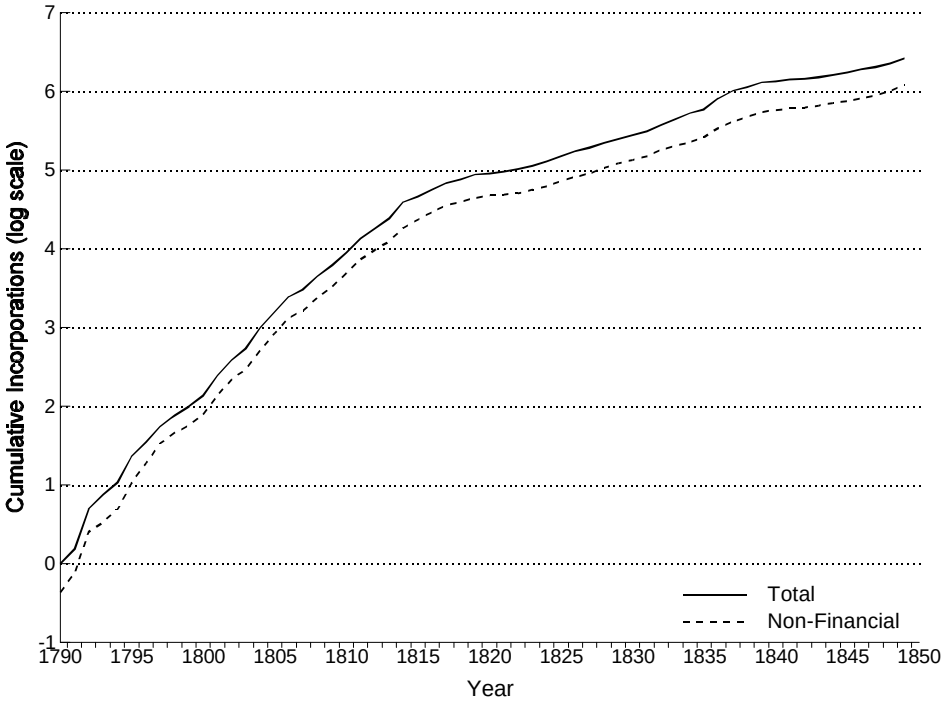

Figure X. Log Index of Cumulative Business Incorporations, 1790-1850.

IV. Identifying Links Between Financial Markets and Early U.S. Growth

A. Overview

The preceding sections indicate that the foundations of the U.S. financial system were largely in place by 1800 and that facilities for banking and securities trading had already begun to see regular use. U.S. securities markets grew steadily in the decades that followed despite varied and sometimes severe shocks associated with business cycles and geopolitics. A modern sector of the U.S. economy emerged and flourished in the midst of these developments as the social benefits of infrastructure investments and the productivity of new technologies became increasingly apparent. In this section, we more formally examine the hypothesis that growth in the size and sophistication of the financial sector, and securities markets in particular, played a leading role in promoting U.S. economic modernization between 1790 and 1850.

The theoretical literature offers strong analytical foundations for a general version of our hypothesis, namely that financial factors can exert a first-order influence on macroeconomic outcomes. Gurley and Shaw (1955), in developing the basic insights of Joseph Schumpeter (1911), describe a role for financial institutions in decreasing individual demand for precautionary money balances through diversification services and the promise of higher returns associated with the professional management of surplus funds. Their "debt accumulation" channel, which has been formalized more recently by Bencivenga and Smith (1991) and Rousseau (1998), seems especially applicable to the early U.S. experience, where fragmentation in the capital markets often tended to limit the size of new investments to those that could be funded through personal resources and kinship. Such imperfections in the early capital market also served to restrict much investment to traditional sectors such as agriculture and home production. The rise of chartered banks throughout the nation and securities markets in the major cities helped to overcome problems of project indivisibilities and satisfy the

demand for liquidity among savers, thereby organizing the large blocks of capital that modernization would require.

McKinnon (1973) and Shaw (1973) reinforce these basic themes, with McKinnon particularly stressing the impact of the pooling of resources and the screening and monitoring of projects on overall economic efficiency. This "total factor productivity channel," as further developed by Townsend (1979), Greenwood and Jovanovic (1990), and King and Levine (1993a), was also made operable by a rapidly deepening U.S. capital market that quickly developed liquid secondary markets. These in turn provided an environment that was conducive to business starts and offered a cost-effective mechanism for re-allocating resources among those investments that appeared to be the most promising. The discipline of the capital market also increased the extent to which firm and project managers were accountable to those who held their claims. Diamond (1984) focuses on the role of intermediaries and markets in striking effective arrangements for the sharing of risk between the users and suppliers of funds. The types of manufacturing and transport projects that characterized the early United States involved considerable risk, and many would have surely remained in the drawer without the risk-sharing arrangements that banks and securities markets made possible.

Other models, both theoretical and empirical, have characterized the interactions between banks and securities markets as an economy grows (e.g., Goldsmith 1969; Greenwood and Smith 1995; Levine and Zervos 1998; Rousseau and Wachtel 2000). These contributions suggest that banks and securities markets can play complementary and mutually reinforcing roles in mobilizing capital, rather than serving as substitutes for one another. The experiences of modern emerging markets have also alerted researchers to the presence of potentially important non-linearities in the relationship between finance and growth. Rousseau and Wachtel (1998), for example, present evidence from the historical experiences of five industrializing countries (the US, UK, Canada, Norway and Sweden) that

implies critical roles for both financial intermediaries and financial markets in the early phases of economic development. In the case of the early United States, banks served to finance smaller, and more information-intensive investments until they achieved a size for which direct public investment was possible. In addition, banks were able to attract deposits and capital through their ability to diversify and were thus instrumental in fueling the early securities markets directly.

B. Model Selection and Analytical Framework

Our approach begins with the selection of multivariate systems for examining the plausibility of channels through which financial markets may have influenced real activity. The annual nature of our series and their availability for sixty years facilitates investigation in a vector autoregressive (VAR) framework. VARs are reduced forms that are useful for characterizing statistical relationships that may exist among a set of time series and exploring issues of cause and effect. To be meaningful, however, it is critical that economic theory drives the selection of variables to include in each system. In our case, the recent economics literature described above suggests a number of theoretical channels through which the growth of stock markets and financial intermediaries can influence economic development. Although our data are not rich enough to distinguish decisively among the individual channels, they do facilitate the construction of reduced forms to test the joint hypothesis that financial markets operated through these channels to have positive effects on activity in the real sector.

We begin our investigation with the broadest measures of economic activity and proceed to those which more closely capture our notion of the modern sector. To this end, the first tri-variate system examines the potential role of financial markets in the most general of macroeconomic performance measures, real per capita output. The numbers of listed securities per capita in three (Boston, New York, Philadelphia) and then four (adding Baltimore) cities indicate the breadth of early U.S. securities markets. As fluctuations in output may be plausibly linked to the availability of both the

circulating medium and the resources of the banking system, our estimate of the real per capita stock of money serves as a key control variable.

Real per capita measures of gross private domestic investment and imports replace output in the second set of systems. These specifications allow an examination of the degree to which the data are consistent with the mechanisms for early growth driven by investment and outward orientation proposed respectively by Gallman (1986) and North (1961).

We then focus on measures that may reflect activity in the modern sector even more closely, namely our indices of cumulative total and non-financial business incorporations. These systems also include the number of securities listed in the organized securities markets. As business incorporations before 1850 are more likely to be influenced by the possibilities for external finance than the stock of money, we choose the number of state chartered banks as a control variable to reflect the importance of the banking sector in promoting new businesses. This choice also allows us to shed some light on the nature of interactions between banks and securities markets.

The VAR methodology permits an investigation of dynamic interactions in a multivariate system without imposing *a priori* structural restrictions. It involves estimating a separate regression equation for each variable on its own lags and those of the other variables in the system. For example, the first VAR described above has the form

$$x_{1,t} = a_{1,0} + \sum_{i=1}^{k} a_{1,i}\, x_{1,t-i} + \sum_{i=1}^{k} b_{1,i}\, x_{2,t-i} + \sum_{i=1}^{k} c_{1,i}\, x_{3,t-i} + u_{1,t}$$

$$x_{2,t} = a_{2,0} + \sum_{i=1}^{k} a_{2,i}\, x_{1,t-i} + \sum_{i=1}^{k} b_{2,i}\, x_{2,t-i} + \sum_{i=1}^{k} c_{2,i}\, x_{3,t-i} + u_{2,t}$$

$$x_{3,t} = a_{3,0} + \sum_{i=1}^{k} a_{3,i}\, x_{1,t-i} + \sum_{i=1}^{k} b_{3,i}\, x_{2,t-i} + \sum_{i=1}^{k} c_{3,i}\, x_{3,t-i} + u_{3,t} \qquad \text{(1a,b,c)}$$

where x_1 is income, x_2 is the money stock, x_3 is the number of listed securities, and k is the number of

lags. We use a series of nested likelihood ratio tests to select the lag order.[14]

Stationarity of a VAR is critical in building exact tests for Granger non-causality, that is, the hypothesis that past values of one variable do not jointly improve one-step ahead forecasts of another.[15] Specifically, the null hypothesis implies the following joint restrictions on the coefficients in (1):

$$\hat{l}_{j,i} = \hat{l}_{j,i+1} = \ldots = \hat{l}_{j,k} = 0 \qquad l = a,b,c; \quad j = 1,2,3. \tag{2}$$

In general, the distributions of these tests are affected by nuisance parameters (see Toda and Phillips, 1993) and are thus nonstandard when a VAR contains variables with unit roots, and differencing these variables is usually required to ensure stationarity. However, Sims, Stock, and Watson (1990) show that Granger tests conform to standard distributions in tri-variate VARs with unit roots so long as a single cointegrating relationship exists among the system variables. This result is important for many of the tri-variate VARs that we estimate here because unit root tests for all of the series in our analysis do not reject a null hypothesis of non-stationarity and firmly reject a null of stationarity,[16] and there appears to be single cointegrating relationship in all but two of the systems.[17] Levels specifications with the automatically-selected lag order are thus appropriate for drawing Granger-causal inferences in most cases. The exceptions arise when GNP serves as the measure of macroeconomic performance

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[14] This method starts with a sufficiently large lag length and then tests successively that the coefficients on the final lag are zero, stopping when the restrictions are rejected.

[15] Tests for Granger causality are used frequently when examining interrelationships among macroeconomic time series and are easily computed from a VAR model. Their statistical interpretation is simple. For example, if we reject a set of restrictions in (2) for one of the system variables (say the number of listed securities) when estimating (1a), this implies explanatory power for its lags in current output beyond that which can be attributed to past values of output and money alone.

[16] Augmented Dickey-Fuller (Said and Dickey 1984) tests for unit roots suggest non-stationarity in levels and stationarity in first differences in each case. After determining the order of cointegration in each of our multivariate systems, Johansen's test rejects the null hypothesis of stationarity for all individual variables. Appendix B includes these results and details of the test regressions.

[17] Inferences about the cointegration space in each system are based on the technique developed in Johansen (1991). Appendix B describes this technique and presents the full set of results.

and there is only weak evidence of cointegration. For cases in which the order of cointegration in a system with unit roots is uncertain, Toda and Yamamoto (1995) show the asymptotic consistency of tests for block exclusion can still be ensured, albeit with some loss in efficiency, by estimating an "augmented VAR." This levels specification uses one additional lag for each possible cointegrating relationship in the system. Tests for block exclusion then include only the number of lags that would be selected with cointegration imposed. For the systems with GNP, we discuss results which employ both traditional and augmented VARs.

The ability to construct valid tests for Granger causality from a levels specification of the VAR is advantageous in this study since it permits the joint evaluation of both short- and long-term effects of movements in one variable upon the others which make up each system. Indeed, as persistent yet gradual increases in market size might be expected to have real effects on the performance of the modern sector that accumulate over time, the implicit inclusion of long-run effects in the cointegrated VARs makes them particularly well suited for such an exploratory analysis. The tests must be interpreted cautiously, however, since as a statistical device a rejection of the null hypothesis does not necessarily imply "economic causality." In particular, the validity of the tests is predicated on the inclusion of the full information set in the VAR specifications. Since this condition is necessarily violated in any finite regression framework, the results presented in the following subsections can only be interpreted as strongly suggestive of the nature of linkages among the variables in each system.

When an investigator can specify a reasonable causal ordering for the variables (based on economic theory and perhaps the results of Granger tests), the nonlinear responses of each variable in the system to one-time shocks in the other variables can be traced through time via orthogonalized impulse responses. This facilitates an evaluation of the economic significance (or size) of the dynamic effects. For this reason, the results of the Granger tests are augmented with a graphical examination of

the impulse responses for those systems in which financial factors appear to matter.

C. The Effects of Securities Markets on National Accounts Aggregates

Our empirical analysis begins with VAR systems that use Berry's (1988) annual estimates of real GNP per capita as a measure of macroeconomic performance. When combined with per capita measures of the real money stock and the number of listed securities in either three or four cities, a series of nested likelihood ratio tests select four lags for the systems in logs. Since Johansen tests indicate that these systems have at most one cointegrating vector but that the presence of cointegration is uncertain (i.e., the null hypothesis of no cointegration is rejected at only the 15 percent level), we estimate a standard VAR with four lags which imposes the long-run relationship as well as an "augmented" VAR with five lags. Table III presents F-statistics and p-values for each block of coefficients. There is no evidence of Granger causality from the number of listed securities to output in any of the four specifications (see the entries for equation 1a under the columns labeled "No. Listed Securities"), though there is some evidence of bidirectional Granger causality between money and output. Neither money nor output appears to influence the size of securities markets.

One might interpret these findings as indicative of a non-pivotal role for the U.S. financial sector in promoting the growth of general living standards before 1850. Such a temptation should be resisted. The U.S. financial revolution in its earlier phases did not affect all sectors of the economy equally. Initially, it was an urban development having its greatest impact on the commercial and industrial groups that were a small part of the population. A large majority of the country's population was engaged in agriculture, much of it traditional and self-sufficient. Agricultural production dominated the nation's GNP, but the agricultural sector would only gradually come to be affected by the new financial system as it extended itself beyond cities and spread its influences beyond its urban roots. When seen in this light, our statistical results with finance and GNP are quite consistent with the

Table III
F-statistics for Granger-Causality in VARs with Real Per Capita GNP, 1790-1850

Estimation	Eq.	Three Major Markets: GNP	Money Stock	No. Listed Securities	R_a^2	Four Major Markets: GNP	Money Stock	No. Listed Securities	R_a^2
Cointegrated VAR (K=4)	1a	23.05 (0.000)	3.682 (0.011)	1.683 (0.171)	0.973	20.79 (0.000)	3.277 (0.020)	0.862 (0.494)	0.971
	1b	5.660 (0.001)	23.83 (0.000)	0.824 (0.517)	0.893	6.968 (0.000)	22.65 (0.000)	1.617 (0.187)	0.900
	1c	0.724 (0.580)	0.782 (0.543)	47.24 (0.000)	0.971	0.183 (0.946)	0.494 (0.740)	59.29 (0.000)	0.970
Augmented VAR (K=5)	1a	4.445 (0.005)	3.242 (0.021)	1.320 (0.279)	0.971	3.843 (0.010)	2.905 (0.033)	0.392 (0.813)	0.968
	1b	5.347 (0.002)	11.89 (0.000)	1.443 (0.238)	0.899	6.389 (0.000)	11.60 (0.000)	2.133 (0.095)	0.909
	1c	0.721 (0.583)	0.828 (0.515)	25.34 (0.000)	0.969	0.274 (0.893)	0.981 (0.429)	26.54 (0.000)	0.968

The VARs include GNP, the money stock, and the number of listed securities in three (left panel) or four (right panel) major markets. The three markets are Boston, New York, and Philadelphia, while the right panel also includes Baltimore. All variables are in per capita log levels and represent real quantities. Equation numbers correspond to the text, with (a), (b) and (c) employing GNP, money, and listed securities as the respective dependent variables. The columns report the F statistic for Granger non-causality on each variable block with the p-value in parentheses. The VAR system in the upper panel imposes a single cointegrating relationship and includes four lags. The system in the lower panel allows for uncertainty in the order of integration by adding an additional lag to the specification and computing the Granger causality tests based on only the first four lags.

consensus view that a gradual acceleration in the trend of U.S. output growth in the country's early decades was too smooth to be explained by the time path of any single economic factor. Only after an innovation such as organized finance permeates many facets of economic life should we expect to find its effects to be detectable in broad macroeconomic aggregates such as GNP (see David 1991).

We next examine systems which include real per capita private investment in place of output. As a narrower measure that reflects expenditure on or improvement of durable factors in the production process, investment is more likely than output to be affected directly by the availability of external finance. Likelihood ratio tests again select log specifications with four lags. The results reported in the upper left panel of Table IV indicate that the number of securities in three cities Granger-causes investment at the 1 percent level and that the money stock Granger-causes investment at the 10 percent level. There is no evidence of feedback from either investment or the money stock to the number of listed securities. Similar results obtain for the system which includes securities listed in four cities, with the money stock in this case Granger-causing investment at the 5 percent level. Thus, although financial development seems at best to have only a slight influence on GNP growth in the early U.S., its impact on the investment component of GNP is more pronounced.

We can be more precise in characterizing this influence. Figure XI presents impulse responses from the system with securities listings from three cities.[18] Impulse responses isolate the effects of a unit change in a given variable on the other system variables and trace their evolution over subsequent periods using the estimated coefficients from the VAR. These nonlinear and often complex functions allow us to explore the direction and size of effects which underlie the dynamics in a given system.

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[18] The estimated responses are nearly identical with the number of securities listed in four markets for this system, as well as those which we consider in section IV.D. To avoid redundancy in our presentation and discussion, we limit explicit examinations of impulse responses to systems which include securities listings from three markets. The full set of estimated impulse responses is available from the authors.

Table IV
F-statistics for Granger-Causality in VARs with Investment and Total Imports, 1790-1850

Macroeconomic Indicator	Eq.	Three Major Markets: Macro	Money Stock	No. Listed Securities	R_a^2	Four Major Markets: Macro	Money Stock	No. Listed Securities	R_a^2
Gross Private Domestic Investment	1a	1.621 (0.186)	2.223 (0.082)	4.028 (0.007)	0.845	1.311 (0.281)	2.900 (0.032)	4.409 (0.004)	0.848
	1b	1.835 (0.139)	21.15 (0.000)	0.724 (0.580)	0.861	2.661 (0.045)	24.87 (0.000)	1.346 (0.268)	0.868
	1c	0.792 (0.537)	0.758 (0.558)	61.88 (0.000)	0.971	1.001 (0.417)	0.731 (0.576)	77.90 (0.000)	0.972
Imports	1a	7.151 (0.000)	4.445 (0.004)	2.411 (0.063)	0.536	6.548 (0.001)	4.217 (0.006)	2.058 (0.103)	0.523
	1b	0.140 (0.966)	13.89 (0.000)	1.177 (0.334)	0.840	0.139 (0.967)	18.82 (0.000)	1.047 (0.394)	0.839
	1c	0.515 (0.725)	0.610 (0.658)	120.38 (0.000)	0.970	0.766 (0.553)	0.877 (0.486)	163.72 (0.000)	0.971

Each VAR system includes four lags of the macroeconomic indicator listed at the left, the money stock, and the number of listed securities in three (left panel) or four (right panel) major markets. All variables are in per capita log levels and represent real quantities. Equation numbers correspond to the text, with (a), (b) and (c) employing investment or imports, money, and listed securities as the respective dependent variables. The columns report the F statistic for Granger non-causality on each variable block with the p-value in parentheses.

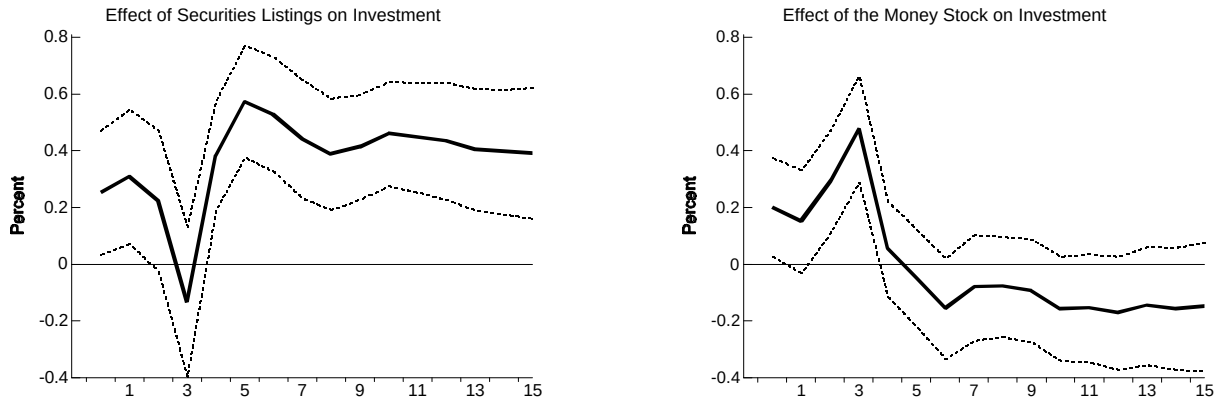

Figure XI. Selected impulse responses from system with the number of securities in three markets, the money stock, and gross domestic private investment.

Note: The impulse responses correspond to the system reported in the upper panel of Table IV. Each plot traces the percent change in the affected variable that results over a fifteen-year horizon from a 1 percent change in the orthogonalized innovation to the potentially causal variable. The variable ordering places listed securities first, the money stock second, and investment third. Using the Monte Carlo integration technique outlined in Thomas A. Doan (1995), the thick solid lines plot the mean impulse responses that result from 10,000 random draws from the posterior distribution of the estimated VAR coefficients. The dotted lines are one standard error bands.

Here we include only those interactions for which the Granger-causality tests are significant at the 10 percent level or less. Consistent with increasing endogeneity as implied by the Granger tests, we orthogonalize the error terms by ordering the number of listed securities first, the money stock second, and investment last.

The impulse responses indicate positive and substantive effects of both the money stock and the number of listed securities on investment. For example, the upper left panel of Figure XI relates an increase of 10 percent in the number of listed securities per capita, or about 1.1 new securities per million of population, to an increase in per capita investment of about 5.7 percent after five years, or about $0.64 (base 1860) from its sample mean of $11.29. The initial fall in investment and its subsequent rise to the higher permanent level depicted in the graph is consistent with delays between the appearance of securities in formal trading lists and the ability to raise funds through the capital

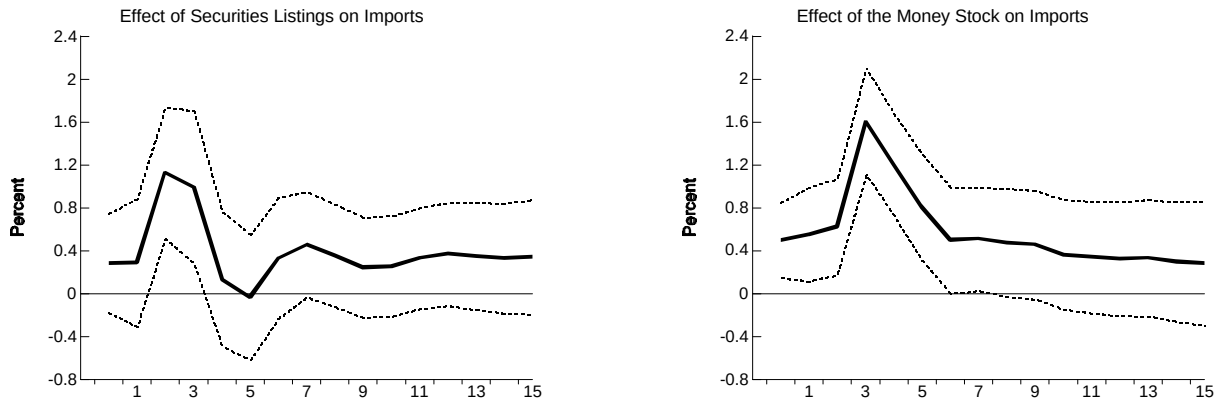

Figure XII. Selected impulse responses from system with the number of securities in three markets, the money stock, and imports.

Note: See note for Figure XI. The impulse responses correspond to the system reported in the lower panel of Table IV. The variable ordering places listed securities first, the money stock second, and imports third.

market and apply the proceeds to tangible investments. The right panel relates a 10 percent increase in the real per capita money stock, or about $0.90 from its sample mean of $8.98, to a rise of 4.7 percent in investment after three years, or about $0.53 from its sample mean. This response reflects the rapidity with which productive capacity can expand when encouraged by demand-led forces.

The lower panel of Table IV includes systems with real per capita imports as a measure of real activity. Imports should also reflect the progress of the modern sector more effectively than output, since they are related to the availability of foreign exchange arising from income from the production of goods for the organized market, as well as the nation's success in mobilizing foreign capital. The results are not as strong for imports as those obtained with investment. Nevertheless, the numbers of securities listed in three and four markets still Granger-cause imports at the 6 and 10 percent levels respectively, and the stock of real money per capita Granger-causes imports at the 1 percent level. There is no feedback from either imports or the money stock to the securities market variables.

Figure XII presents the impulse responses associated with the statistically significant

interactions using the system with securities listings in three markets. The plots indicate that increases in both money and the number of securities have a sharp effect on imports after two years, an effect that decays after five years. Specifically, the left panel of Figure XII relates a 10 percent rise in the number of listed securities to an increase in per capita imports of 11.3 percent after two years, or about $1.11 from its sample mean of $9.84. The right panel relates a 10 percent increase in the real per capita money stock to a rise of 16.1 percent in per capita imports after three years, or about $1.58 from its sample mean.

D. The Effects of Securities Markets on the Stock of Entrepreneurial Ideas

We now shift attention to the effects of banks and securities markets on the stock of entrepreneurial ideas as captured by the number of total and non-financial business incorporations. The systems reported in Table V include cumulative incorporations, the number of state chartered banks, and the number of securities listed in three or four cities. All four systems show clear effects of expansion in banks and securities markets in the granting of corporate charters. The systems that include non-financial incorporations also suggest that expanded the use of the corporation encouraged new banks to form, perhaps to meet the needs of new businesses for additional finance.

Because the number of state-chartered banks is included in the total number of incorporations, there is a potential problem of collinearity in the systems presented in the upper panel of Table V. We therefore focus attention on the impulse responses that arise from the system with non-financial incorporations and securities listed in three markets. The responses shown in Figure XIII indicate that the effects of financial development on incorporations were positive, incremental, and permanent. For example, the left panel relates a 10 percent increase in the number of securities, or an increase of about 11.6 securities from the sample mean, to a rise of 2.1 percent after 10 years in the index of non-financial incorporations. In the right panel, a 10 percent increase in the number of state chartered

Table V
F-statistics for Granger-Causality in VARs with Measures of Modern Sector Activity, 1790-1850

Modern Sector Indicator	Eq.	Three Major Markets: Incs.	Three Major Markets: No. State Banks	Three Major Markets: No. Listed Securities	Three Major Markets: R_a^2	Four Major Markets: Incs.	Four Major Markets: No. State Banks	Four Major Markets: No. Listed Securities	Four Major Markets: R_a^2
Business Incorporations	1a	285.33 (0.000)	3.849 (0.015)	2.581 (0.065)	0.999	278.31 (0.000)	4.242 (0.010)	3.266 (0.030)	0.999
	1b	2.829 (0.048)	24.38 (0.000)	0.392 (0.759)	0.994	0.464 (0.709)	24.52 (0.000)	2.645 (0.060)	0.994
	1c	1.004 (0.399)	2.114 (0.111)	157.41 (0.000)	0.992	1.442 (0.243)	3.113 (0.035)	126.57 (0.000)	0.993
Non-Financial Incorporations	1a	346.06 (0.000)	3.771 (0.017)	3.384 (0.026)	0.999	341.17 (0.000)	4.196 (0.010)	3.992 (0.013)	0.999
	1b	2.730 (0.055)	29.88 (0.000)	0.670 (0.575)	0.994	2.723 (0.055)	29.74 (0.000)	0.902 (0.448)	0.994
	1c	1.479 (0.233)	2.094 (0.114)	154.99 (0.000)	0.992	2.291 (0.091)	3.247 (0.030)	138.42 (0.000)	0.994

Each VAR system includes three lags of cumulative business incorporations, the number of state chartered banks, and the number of listed securities in three (left panel) or four (right panel) major markets. All variables are in log levels. Equation numbers correspond to the text, with (a), (b) and (c) employing the number of cumulative incorporations, state chartered banks and listed securities as the respective dependent variables. The columns report the F statistic for Granger non-causality on each variable block with the p-value in parentheses.

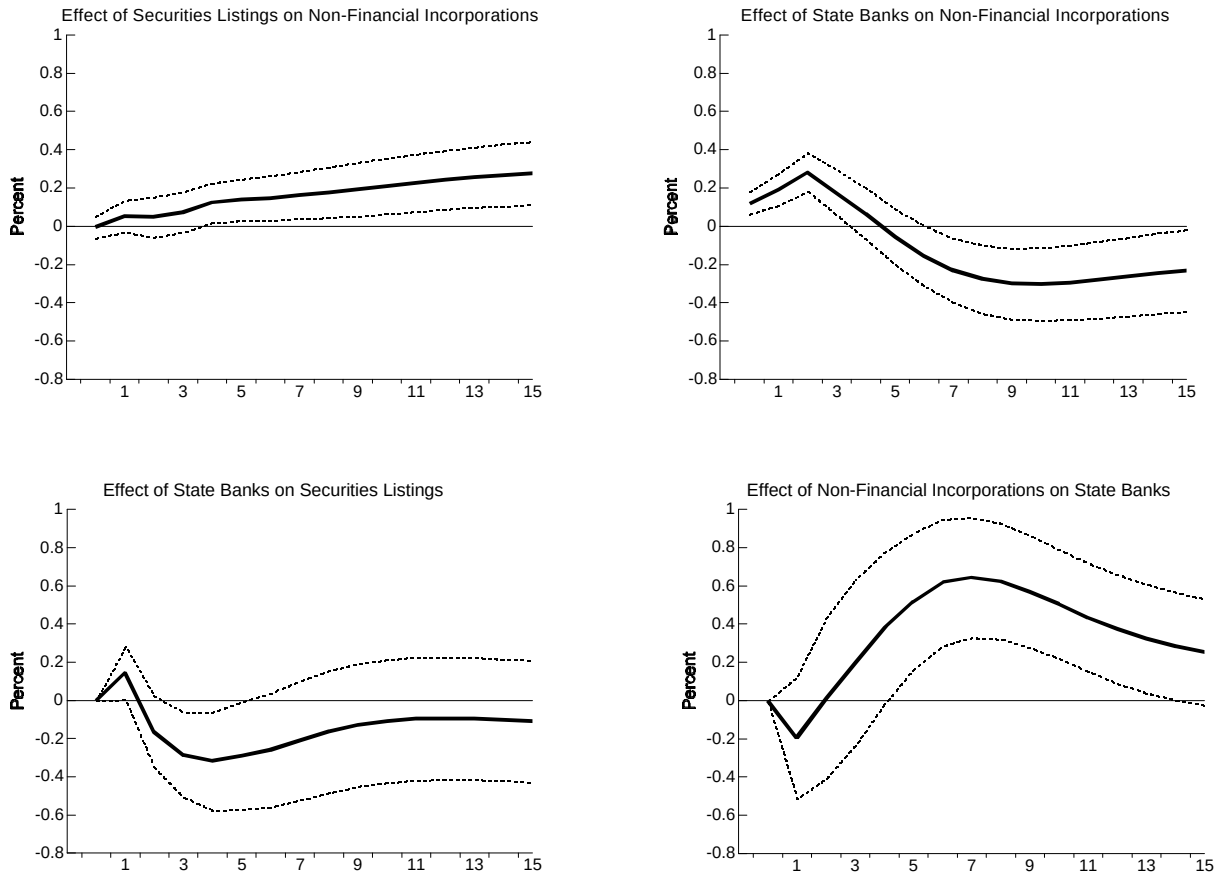

Figure XIII. Selected impulse responses from system with the number of securities in three markets, the number of state chartered banks, and the number of non-financial business incorporations.

Note: See note for Figure XI. The impulse responses correspond to the system reported in the lower left panel of Table V. The variable ordering places listed securities first, the number of banks second, and incorporations third.

banks, or the establishment of about 22 new banks from its sample mean, is related to a rise in the index of non-financial incorporations of 2.8 percent after only two years. Although these effects are not large, the narrow standard error bands suggest that they are estimated quite precisely. It is also important to recognize that the number of securities rose 45-fold between 1790 and 1850, so that cycles of impulses and permanent responses such as those depicted in Figure XIII would have

occurred many times over the sample period, with resulting large cumulative effects on the number of business incorporations. Thus, financial development had a persistent influence on this measure of real-sector activity.

V. Conclusion

Our paper describes in some detail the rather remarkable financial development that took place in the United States in its earliest decades, starting with the Federalist financial revolution of the 1790s. In the four decades thereafter, and starting virtually from scratch–although there were, to be sure, colonial precedents that had to be abandoned as much as amplified (see Perkins, 1994, for a discussion of these)–the United States built an articulated, innovative, and modern financial system that equaled that of any other country. One consequence of financial development and innovation was that the United States became history's most successful emerging market, attracting the capital of investors of older nations seeking higher returns. Another was that a wide range of American entrepreneurs, business enterprises, and governments enjoyed more access to financing, domestic and foreign, than did those of other countries. These developments, it seems, placed the United States of the early nineteenth century on a trajectory of economic growth higher than that of other nations. The die was cast early, perhaps earlier than most economic historians have thought. As its financial system continued to develop (with occasional setbacks) and promote growth over the course of the nineteenth century, the United States became the world's largest and, in many dimensions, most advanced economy.

We then do not merely state this case and document it with traditional historical evidence, but also treat it as a hypothesis and subject it to the sorts of statistical tests that macro economists now apply to rich contemporary, multinational data sets in order to make similar arguments about the effects of financial development on economic growth (e.g., King and Levine 1993b; Levine and Zervos 1998;

Rousseau and Wachtel 2000). Our historical data sets are far more limited than contemporary ones. But our test results are consistent with modern findings on the key role of financial development in accounting for differences in the economic growth performance of today's countries. The remarkable economic growth of the United States, we think, may very well have been "finance led." Judging by U.S. history, then, the widespread contemporary interest in developing and improving financial systems within and between countries to foster economic growth is not misplaced.

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Appendix A. Construction of Series for the Money Stock, 1790-1850

This appendix explains the methods used to construct a series for the stock of money over the period from 1790 to 1850. We begin with the estimates for 1820-1850 that Peter Temin compiled for his 1969 book *The Jacksonian Economy*, and then replicate his technique as closely as possible to extend the estimates backward to 1790. Our measure of the broad stock of money sums the total liabilities of banks to the public and specie in the hands of the public. At the time, the banking sector included a central bank (the BUS 1790-1811 and the Second BUS 1817-1839), banks chartered by individual states, as well as private (non-chartered) banks. Total liabilities for the latter are generally unavailable before 1850 but considered to be small. We discuss each of these components below.

A.1 Obligations of Chartered Banks to the Public

These obligations are estimated by summing notes in circulation, deposits, and amounts due to other banks, and then subtracting amounts due from other banks and holdings of notes of other banks. Fenstermaker (1965a, Table 10, pp. 66-7) includes these items from 1819 to 1837 for a reasonably broad subset of banks, and also provides the total number of banks in each year. Temin used the ratio of total state banks to those reporting in each year to "blow up" the bank liabilities for Fenstermaker's subset to reflect the nation as a whole. We compute state bank obligations to the public for 1803-1820 by applying this technique to balance sheet items from Fenstermaker (1965b). This source is less representative. In 1818, coverage includes 43 percent of the state banks, but this falls to 29 percent by 1810, 24 percent by 1805, and only 13 percent by 1803. For 1803-1804, the sample includes only state banks in Massachusetts. Other states enter the sample as follows: Virginia 1805; Mississippi 1811; Pennsylvania, South Carolina, the District of Columbia, and New Hampshire 1814; New York 1817; Kentucky 1818. The article does not break down the balance sheet items or the number of banks by state. We again "blow up" these figures using the actual number of chartered banks to estimate

obligations.

We then use the amount of bills discounted at the Massachusetts First National Bank of Boston (from Gras, 1937, pp. 650-651) to extend bank liabilities and specie inside banks backward through 1790. Under the strong assumption that the amount of bills discounted by the few banks that had obtained charters over this period fluctuated similarly to the Massachusetts Bank's obligations to the public and specie, we then use the ratio of the capital of the Massachusetts Banks and total banking capital in the US in each year to "blow up" bills and discounts to a national level. We then splice this item onto both the obligations and specie series in 1803. This places much emphasis on fluctuations in a single bank's balance sheet, yet these records are the only ones available prior to 1803. It is also important to note that only three banks had obtained state charters as late as 1790, and that the obligations of state banks thus account for only a small portion of the money stock at this time.

A.2. Obligations of the First and Second Banks of the United States to the Public

The 1985 reprint of James Wettereau's *Statistics of the First Bank of the United States* includes observations for specie holdings, notes in circulation, individual and government deposits, notes of other banks, and balances due to and from other banks at (or around) the end of each year from 1792 to 1801 from balance sheets of the BUS. This allows computation of total BUS obligations to the public until 1802. Records for 1802-1807 do not appear to have survived, and when observations again become available in 1808 they include only specie, notes in circulation, and deposits. It so happens that the sum of individual and government deposits in 1801 is the same as that for total deposits in 1808. We fill in the intervening years by repeating the 1801 estimates for 1802-1807.

Notes in circulation are 5.08 in 1801 and 4.5 in 1808. Blodget (1806) includes a series for total bank notes for 1801-1807. One way to back out figures for 1801-1807 is to treat BUS notes as a residual obtained by subtracting state bank notes from total notes. Here, data on notes in circulation

from Fenstermaker (1965a, 1984) can be used to estimate those notes attributable to state banks, and the residual should approximate BUS notes. Since there is an overlapping observation in 1801, it can be used to splice the constructed series (1802-1807) to Wettereau's figure for 1801. The manipulation of Fenstermaker's data is similar to that described above for total obligations of state banks. Since notes of other banks and balances due to and from other banks are not available for the BUS after 1801, these cannot be included in the total BUS obligations. Rather, we compute obligations without them from 1802-1808 and ratio splice the result to the total for 1801.

Senate Document 128 (35th Congress, 2nd Session, 1838, pp. 208-211) includes all items required to compute obligations of the second BUS and its branches to the public for 1817-39.

A.3. Specie in the Hands of the Public

Temin obtains official estimates of specie in the hands of the public from 1830 onward, and uses net specie flows to extrapolate the series backward to 1820. Temin's estimate of the specie stock for 1820 (at $41 mil.) is 64 percent higher than that provided by Ezra Seaman for September of that year. We use North's net specie flows to extend Temin's estimates back to 1807, where Blodget's continuous series (1792-1807) ends. By then, the constructed estimates are 101.5 percent higher than those of Blodget. Lacking a more acceptable technique for estimating specie from 1808 to 1820, however, we apply it back to 1808, and then ratio splice Blodget's series to the result. This probably overstates the level of specie, but the series exhibits the fluctuations of Blodget's series for 1792-1807. Note that continuing to use specie flows before 1807 produces a series which is much less variable than Blodget's series and the later estimates. From this series for specie stock we subtract specie holdings by state banks (constructed with Fenstermaker's data as above) and specie in the first BUS to obtain an estimate of specie in the hands of the public.

Appendix B. Time Series Properties of Data Used in the Empirical Analysis

This section presents results of tests for unit roots and cointegration for the series and systems used in the analysis. We begin with a set of augmented Dickey-Fuller (ADF) tests, which take the presence of a unit root as the null hypothesis. If ADF tests are unable to reject the unit root for a series in levels, yet reject after differencing, there is some justification for treating the series as I(1) in subsequent modeling. The univariate representations for the ADF tests include four lags, which conforms with the "Akaike plus two" criterion. The trending nature of all series make both constant and trend terms necessary in the levels specifications, while a constant-only regression is used for the first differences. The log transformation is applied to all series prior to testing. Table B.1 reports test statistics and significance levels. The test rejects the null of a unit root for the data in levels and fails to reject for first differences.

We next test for cointegration in each of the ten VAR systems that we consider. A system with non-stationary variables is classified as cointegrated if a linear combination exists which yields a stationary series when applied to the data. In the tri-variate case, a single cointegrating vector also implies that the error terms of the system are stationary. The technique developed in Johansen (1991) provides a regression-based test for determining both the presence of cointegration and the number of linear stationary combinations which span the space. Each system is modeled as a VAR of the form

$$\Delta x_t = \mu + \sum_{i=1}^{k-1} \Gamma_i \Delta x_{t-i} + \Pi x_{t-k} + e_t, \qquad \text{(B.1)}$$

where x_t is a vector containing the three potentially endogenous variables and k is adequately large both to capture the short-run dynamics of the underlying VAR and to generate residuals that approximate the normal distribution. The lag order for each system is chosen with a series of nested likelihood ratio tests. The presence of trends in the data suggest the inclusion of an unrestricted intercept. The Johansen methodology tests whether the Π matrix in (B.1) is of less than full rank via the trace and

Table B.1
Augmented Dickey-Fuller Test Statistics for Macroeconomic Indicators and Measures of Market Development, 1790-1850

	Levels	1st Difference
Macroeconomic Indicators		
Real GNP Per Capita (GNP)	-3.13	-3.73**
Real Private Domestic Investment Per Capita (INV)	-2.50	-4.32**
Real Imports Per Capita (IMP)	-1.83	-3.95**
Cumulative Business Incorporations (INC)	-2.39	-2.39
Cumulative Non-Financial Business Incorporations (NFINC)	-2.81	-2.73*
Financial Variables		
Real Per Capita Money Stock (MSTOCK)	-2.38	-3.65**
Number of State Chartered Banks (NOB)	-1.44	-3.67**
Number of Listed Securities, Three Markets (3MKT)	-1.58	-3.61**
Number of Listed Securities Per Capita, Three Markets (3MKTP)	-1.55	-3.63**
Number of Listed Securities, Four Markets (4MKT)	-0.97	-2.95**
Number of Listed Securities Per Capita, Four Markets (4MKTP)	-0.89	-2.96**

All variables are in logs. The test regressions use four lags, and include constant and trend for the levels variables and constant only for first differences. * and ** denote rejection of the unit root hypothesis at the 10% and 5% levels respectively, using finite sample critical values are from Fuller (1976), Table 8.5.2.

Table B.2
Johansen Test Statistics for Cointegration, 1790-1850

	Trace		Max. Eigenvalue		
System	r=0	r≤1	r=0	r≤1	r≤2
GNP, MSTOCK, and					
3MKTP (K=4)	24.68	11.03	13.65	9.22	1.81
4MKTP (K=4)	24.13	12.68	11.44	10.82	1.86
GPDI, MSTOCK, and					
3MKTP (K=4)	28.72*	9.30	19.42*	6.98	2.31
4MKTP (K=4)	32.45**	8.95	23.50**	6.29	2.65
IMPORT, MSTOCK, and					
3MKTP (K=4)	29.35*	9.63	19.71*	7.77	1.86
4MKTP (K=4)	31.72**	12.21	19.51*	10.19	2.02
INC, NOB, and					
3MKT (K=3)	36.15**	10.95	25.19**	9.01	1.95
4MKT (K=3)	37.16**	11.29	25.87**	9.25	2.04
NFINC, NOB, and					
3MKT (K=3)	41.69**	12.25	29.44**	10.03	2.22
4MKT (K=3)	42.85**	12.90	29.94**	10.55	2.35

K is the lag at which the levels terms enter the test regressions. The columns labeled r=0 test a null hypothesis of no cointegration, while the r≤1 (r≤2) columns test a null of at most one (two) cointegrating vectors. * and ** denote rejections of the null at the 10% and 5% levels respectively, with critical values from Osterwald-Lenum (1992), Table 1.

maximum eigenvalue statistics.

Table B.2 reports these test statistics for the relevant tri-variate combinations. Rejection of the null hypothesis of no cointegration ($r = 0$) coupled with a failure to reject the null of at most one cointegrating vector ($r = 1$) provides evidence of a single long-run relationship in a given system. This result obtains in all but the first two systems, with rejections of the $r = 0$ hypothesis at the 10% level or less.

The Johansen regressions also facilitate a test for stationarity of the variables in those systems for which the number of cointegrating vectors is clear. These tests (not shown here) are able to reject the null of stationarity at the 1 percent level for the series which comprise the eight systems that can be characterized by a single cointegrating vector. Since ADF tests are unable to reject the unit root for a given series and the Johansen test rejects stationarity in these cases, our decision to treat all variables as I(1) processes is a reasonable one.