Banks, Insider Connections, and Industrialization in New England: Evidence from the Panic of 1873

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Abstract: Using newly collected data from Massachusetts, this paper documents the extent of bank director representation non-financial firms' boards, and investigates whether bank-affiliated companies fared better during the recession that followed the Panic of 1873. Around 59 percent of all non-financial corporations had at least one bank director on their boards. These firms survived the recession of the 1870s at higher rates, and among the surviving firms, those with bank affiliations saw their growth rates and credit ratings decline less than firms without bank affiliations. Consistent with banker-directors helping to resolve asymmetric information problems, these effects were strongest among younger firms, and those with lower shares of fixed assets on their balance sheets. In contrast, the presence of bank cashiers on firms' boards, which created an association with a bank without significantly increasing the likelihood of a credit relationship, had no effect. These results imply that during New England's industrialization, affiliations with commercial banks helped nonfinancial corporations survive economic downturns.

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1. Introduction

The contribution of commercial banks to America's industrialization and development remains an unsettled question. Some have argued that rapid financial development in the late eighteenth and early nineteenth centuries stimulated economic growth (Rousseau and Sylla, 2005). Yet some of that financial development and bank creation was likely undertaken in anticipation of rapid economic growth, and perhaps more importantly, the specific mechanisms through which banks actually contributed to industrialization have not been conclusively identified. In the case of New England, which led American industrialization, Lamoreaux (1986; 1994) has argued that the region's banks functioned like investment clubs, channeling capital to the industrial firms founded by their directors. This suggests that personal connections between banks and other enterprises were used to overcome problems of asymmetric information, and provided access to finance for firms established within networks of well-connected entrepreneurs. Although this view has gained wide adherence, some scholars have expressed skepticism, and argued that the lending records of individual institutions often do not show high levels of lending to insiders.[1] However, both the advocates of this view and its critics have been forced to rely on records of a small handful of banks, whose representativeness is difficult to assess. And perhaps more importantly, the consequences of any such ties for industrial development in the region have never been analyzed systematically.

This paper presents newly collected data on the nonfinancial corporations of Massachusetts in the 1870s and their ties to commercial banks, and analyzes the role of bank-firm affiliations in promoting industrial growth. Using comprehensive data on the composition of boards of directors and on firms' balance sheets, the paper documents the extent of bank affiliations, as measured by board interlocks, and analyzes their effects. In order to address the problem that bank affiliations were likely to have been established among a positively selected group of firms, the effects of bank-firm affiliations are estimated

[1] Wright (1999) and Lockard (2000) offer analyses of individual bank lending records that do not show high levels of lending to insiders. However, the data in Wang (2008) do show significant levels of insider lending.

by analyzing changes in firm outcomes in response to a major economic crisis: the Panic of 1873, and the ensuing economic downturn. This shock, which originated in New York, disrupted financial markets and reduced demand, and arguably made an affiliation with a commercial bank much more valuable, by creating substantial adverse selection problems in credit markets.[2] By analyzing changes in firm outcomes in response to this shock, the influence of any time-invariant firm characteristics such as managerial quality, which were likely correlated with bank affiliations, can be eliminated.

The results indicate that affiliations between banks and nonfinancial corporations were quite extensive in 1870s Massachusetts, and that the firms with bank affiliations did indeed suffer less in the wake of the crisis. Around 59% of all nonfinancial corporations had a bank director on their board, and among the publicly traded corporations, the rate was even higher (85%). All firms suffered in the years following the 1873 panic, but firms affiliated with banks failed at lower rates, and among the surviving firms, those with bank affiliations saw their growth rates fall and credit ratings deteriorate by less than firms without bank affiliations. These effects were substantial: the failure rate over the years 1873-81 for firms with bank affiliations was about 8 percentage points lower (equivalent to more than 20 percent of the mean failure rate in the years up to 1881), and the post-1873 growth rates of those firms was about 6 percentage points higher (equivalent to 85 percent of the overall 1872 growth rate). Consistent with bank affiliations helping to resolve asymmetric information problems, the effects were stronger among younger firms, and those with lower shares of fixed assets on their balance sheets.

The presence of a bank director on a company's board could potentially benefit that company through several different channels. Nineteenth century bank directors held discretion over the allocation of credit from their institution, so a directorship with a nonfinancial corporation may have facilitated greater access to credit by the corporation.[3] But the affiliation with a bank may also have functioned as a

[2] The adverse selection problems produced by a financial crisis are described in Bernanke (1983). Of course, a shock that originated with an affiliated bank could have the opposite effect, and transmit the effects of the contraction to its client firms—see Frydman, Hilt and Zhou (2015), and Chrodorow-Rech (2014).
[3] On the decision making procedures by which nineteenth century American banks approved or declined loan requests, see Lamoreaux (1994), Bodenhorn (2003a), and Meissner (2005). Gibbons (1859) presents a first-hand account.

signal of the quality of the corporation, and the bank director may also have contributed financial expertise to its management. In order to obtain suggestive evidence of the importance of credit relationships in the results, I study the effects of the presence of a bank cashier on firms' boards. As bank cashiers normally could not direct the flow of credit the way bank directors could, their presence on a firm's board likely created only a quality signal and financial expertise. Their presence on firms' boards produced no discernable effect.

An obvious source of concern regarding the empirical results is that they may reflect the selection of particular types of firms into relationships with banks. Most of the empirical analysis controls for time-invariant unobserved characteristics such as the quality of a firm's assets or management, but if firms that were more resilient to a shock were more likely to be affiliated with banks, then this could explain the results. Indeed, firms with and without bank affiliations differed in several respects that might be associated with resiliency, such as size, leverage, and age. This would imply that the firms without bank affiliations in the data may not constitute an appropriate control group for the firms with bank affiliations. Yet when inverse propensity scores are used to re-weight the treated and control firms so that the observable characteristics of both resemble those of the population, and the regressions are re-estimated, the results remain, with slightly diminished magnitudes.

The findings of this paper contribute to several areas of research. A large literature has investigated the operations of nineteenth-century American banks (for example, Lamoreaux, 1994; Meissner 2005; Bodenhorn 2003a; 2003b; 2007) and their importance for American economic development (Calomiris 1995; Rousseau and Sylla, 2005). Most recently, Jaremski (2014) has documented that counties with greater bank entry under the national banking acts experienced greater industrialization, and Fulford (2015) has shown that rural counties just above the population level needed to sustain the presence of a national bank (given the minimum capital required by the statute) experienced greater agricultural production. This paper adds to the literature by presenting new firm-level evidence on the extent of relationships between banks and nonfinancial companies and, more importantly, on the value of those relationships during a major economic downturn. The results suggest that one mechanism

that could be responsible for the observed correlations between the development of the banking sector and industrialization could be that affiliations with banks help nonfinancial corporations survive and grow during economic downturns.

Secondly, this paper contributes to the literature on the role of banking systems in the Industrial Revolution and subsequent historical waves of industrialization around the world. Some scholars have argued that financial institutions were not important in these episodes, because most of the investments in fixed capital in the new enterprises were financed by direct equity investments from firm founders or from retained earnings, rather than sources outside the firms such as banks.[4] The analysis of this paper suggests that banks may nonetheless have served a vitally important role, if they provided industrial enterprises with liquidity during critical periods, such as economic downturns. Some of this research has evaluated the effects of bank-firm affiliations in a variety of historical contexts, such as Germany (Edwards and Ogilvie, 1996; Guinnane, 2002), Mexico (Maurer and Haber, 2007), and the United States (Delong, 1991; Ramirez, 1995; Frydman and Hilt, 2017). This paper complements those latter works in its finding that bank affiliations were quite extensive, and valuable, in 1870s Massachusetts. It also presents an interesting contrast with studies of modern American firms, which show that affiliations with commercial banks are relatively rare (Güner, Malmendier, and Tate, 2008; Kroszner and Strahan, 2001).

Finally, historical American banking and financial crises have long attracted the attention of economic historians.[5] This paper's analysis of the impact of the Panic of 1873 at the firm level, and the value of bank affiliations following the crisis, add to that literature.

[4] For the case of the Industrial Revolution in Britain, see Mokyr (1999: 95-103), and the references cited therein. For some related arguments applied to the case of Germany, see Edwards and Ogilvie (1996).
[5] Broad overviews are presented in Calomiris and Gorton (2000), Wicker (2000), Bordo and Haubrich (2010) and Hanes and Rhode (2013).

2. Historical Background

2.1 Banks and Industrialization in New England

The rise of large-scale manufacturing enterprises in the United States began in New England, in particular with the development of the integrated cotton textile mill in Massachusetts.[6] The very first such enterprise, Francis Lowell and Nathan Appleton's Boston Manufacturing Company, incorporated 1813, was financed by merchants who had accumulated large fortunes in international trade, and who drew on their connections with other prominent merchant families to raise capital for their venture. These men and their associates have been called an "enterprising elite," and went on to found a number of other companies that followed the same model but on a much greater scale, channeling the capital they accumulated in commerce into manufacturing.[7]

Many of these entrepreneurs also held directorships with banks. The founders and principal stockholders of the Boston Manufacturing Company included at least three bank directors, including two from the Boston Bank, from which the company borrowed regularly.[8] This pattern would continue with the companies that were founded in the years that followed to emulate the Boston Company in Lowell, often by many of the same individuals.[9] These firms maintained close ties to major banks, and benefitted from those ties. This pattern was followed among the regions railroads as well, whose founders and early board members included prominent capitalists who held directorships with banks.[10]

Lamoreaux (1994) has argued that over the following decades, the proliferation of manufacturing enterprises in New England was made possible by close ties between those firms and the region's banks.

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[6] An 'integrated' mill both spun thread from raw cotton and wove it into fabric, using machines driven by water power (or later, steam power). For a history of the early years of this industry in America, see Ware (1931). See also McGouldrick (1968) and Handlin and Handlin (1974).

[7] The term "enterprising elite" is due to Dalzell (1987), who tells this history well.

[8] Nathan Appleton and Israel Thorndike, Jr., founders of the Boston Company, were directors of the Boston Bank (see the Appendix). Rosenberg (2011) documents the company's early borrowing from the bank.

[9] All of the textile firms of Lowell incorporated prior to 1830 included at least three Boston bank directors on their boards.

[10] For example, the board of the Boston and Worcester railroad in 1842 included David Henshaw, a director of the Merchant's Bank of Boston, and Nathaniel H Emmons, a director of Boston's Union Bank. (*Report of the Directors of the Boston and Worcester Rail-Road Corporation to the Stockholders…* Boston: I.R. Butts, 1842; *Stimpson's Boston Directory*).

The directors of early New England banks often founded them specifically for the benefit of the firms they controlled, and channeled capital from the banks to their other enterprises through insider lending—that is, lending to the directors or to enterprises owned by the directors. Such transactions were not hidden from the banks' shareholders, who knew that investing in bank stock was really investing in a portfolio of loans to the directors and their firms. Close relationships between nonfinancial firms and banks helped resolve many of the information problems inherent in financial markets in a relatively early stage of development.

Although manufacturing firms borrowed primarily from banks to finance their working capital (Davis, 1966), much of their fixed capital was financed through equity. Banks did not purchase equity directly, but they often provided credit to entrepreneurs—so-called accommodation loans—that were partly collateralized by shares of stock (Lamoreaux 1986). These loans were short-term but renewable, and the liquidity they provided to entrepreneurs was likely quite important.

Many of the region's industrial enterprises achieved enormous scale by attracting equity investments from large numbers of investors. Although the shares of some of these firms were traded on the Boston Stock Exchange, trading in industrial enterprises was neither liquid nor anonymous, and indeed personal or business connections often formed the basis of many investors' portfolio decisions (see Martin, 1886, Davis, 1957, and Atack and Rousseau, 1999). Nonetheless, relatively small investors did participate in this market, and some of the largest manufacturing corporations had hundreds of shareholders. As Berle and Means (1932) noted, these enterprises exhibited what they termed the "separation of ownership from control" to a substantial degree—with diffuse ownership by many small investors, control over some of these enterprises resided with their managers, who often held only a relatively small portion of their firms' equity.[11] Some contemporary observers argued that the governance of at least some of these enterprises suffered as a result, and Erastus Bigelow, a prominent textile

[11] Berle and Means (1932) claim that New England's largest manufacturing enterprises of the mid-19th century were an exception to the rule that the separation of ownership from control occurred in the late nineteenth century with liberal corporation laws and the rise of big business. However, Hilt (2008) argues that in fact this problem was quite common in very early American corporations.

manufacturer, complained that the passive investors in large corporations sustained highly inefficient enterprises.[12]

Close ties between financial institutions and nonfinancial corporations create conflicts of interest, but when the nonfinancial corporation is controlled by directors who are unaccountable to the other stockholders, and who also control the financial institution, these conflicts become particularly acute. In a pamphlet filled with polemical attacks against the management of many public corporations in Massachusetts, one early stockholder claimed that the managers of some of these enterprises engaged in rampant self-dealing, and in particular argued that a prominent financial institution connected to several major textile corporations had lent excessively to those firms, contributing to their insolvency.[13] Thus at least some contemporaries felt that these relationships were harmful, rather than helpful, to nonfinancial corporations and their owners.

2.2 The Panic of 1873 and Its Aftermath

In September of 1873, a panic broke out on Wall Street, plunging financial markets into turmoil. The New York Stock Exchange closed for 10 days. The subsequent economic contraction produced substantially elevated unemployment, and a long slump (see Rezneck 1950). As illustrated in Panel (a) of Figure 1, the growth of industrial production fell substantially during the years 1874-78, with a significant contraction of nearly -6% in 1875. Among the consequences of the disruption of financial markets and fall in spending was a rise in bankruptcies. Panel (b) of Figure 1 shows that the total liabilities of failing businesses nearly doubled in 1873 and remained elevated through 1878.

Following the outbreak of the panic, a number of Massachusetts manufacturing firms moved to dismiss parts of their workforce and reduce output.[14] The business environment over the subsequent

[12] Bigelow is quoted at length in Harris-Gastrell (1873). Hilt (2015) presents a detailed analysis of the governance of these enterprises.
[13] Ayer (1863). In many respects, Ayer's analysis foreshadows that of Louis Brandeis' enormously influential *Other People's Money* (1914).
[14] *Boston Daily Advertiser*, 30 September 1873.

years was regarded as quite difficult, and many firms either shut down or came close to shutting down.[15] One contemporary journalist offered an assessment of the causes of the firms' poor performance:

> "Most of our manufacturing cities and towns feel the effect of the dullness and financial stringency of the times. The Atlantic Mills, Lawrence, have reduced their product, and will run on short time for the present; the Blackstone is rumored to have decided on a temporary suspension…The Fall River owners are taking steps to ensure concert of action in the matter of running cotton mills on shorter time. This is considered necessary because of the *falling off in the amount of sales* and the *high price of money* [italics added]."[16]

The fall in demand, and the contraction in the supply of available credit, were both seen as contributing to the problems firms faced. The disruption of New York's banking markets likely contributed to the credit stringency, but there was another factor as well. Early in the panic, several prominent "jobbers"—mercantile firms involved in the distribution of goods—failed (Sprague, 1910: 77-80). These failures created significant losses for any manufacturers that had extended credit to them, and likely disrupted mercantile credit networks. Panel (d) of Figure 1 plots the rates of profit (measured as return on assets) for large Massachusetts textile manufacturers over the 1870, and shows a precipitous decline between 1873 and 1876.[17]

Similar problems were faced by railroad firms. The panic followed a period of rapid growth in railway mileage, both nationally and in Massachusetts, and in fact broke out when Jay Cooke & Co., railroad bankers, closed their doors. The ensuing years witnessed a wave of railroad bankruptcies, and a rapid decline in railroad investments.[18] Although the effects on Massachusetts railroads were not as extreme as those of other regions, the state's railroad commissioner noted that the panic "gave a decided

[15] For example, in 1875 the *Boston Daily Advertiser* noted that "many large manufacturing companies during the year past have had their profits so largely reduced, or wholly swept away, that they were confronted with the option of suspension of business…" (7 September).
[16] *Salem Register*, 23 October 1873.
[17] The profit rates are calculated from McGouldrick (1868). McGouldrick's sample was obtained from the manuscript holdings of Baker Library at Harvard University, and includes eleven of the largest and most prominent textile manufacturers from Massachusetts and the surrounding states. These firms are therefore not representative, but the fact that their results were so poor over this period suggests that smaller and less prominent firms likely suffered to an even greater extent.
[18] Benmelech and Bergman (2017) document the freeze-up of the bond market that occurred following the panic, which particularly affected railroads, the most important issuers of corporate debt at the time.

check to the work of railroad construction" in the state.[19] As Panel (c) of Figure 1 shows, the profitability of Massachusetts railroads was depressed throughout the mid-1870s.[20]

In such a difficult economic environment, the wave of insolvencies created by the downturn would likely have created adverse selection problems in credit markets. As Bernanke (1983) notes, the problem of identifying good borrowers from bad borrowers becomes much more difficult, as, for example, the value of collateral held by many firms became more uncertain. But if a firm and a bank had a longstanding relationship, in which the bank was able to gain privileged access to information about the firm's assets and operations, and its record of repayment of loans, the bank would likely have been more willing to lend to the firm at a time of greater uncertainty or greater pressure on the firm's resources. Although no systematic data on bank lending survives from this era, the narrative account of bank lending procedures presented in Gibbons (1859) suggests that in times of stringency, the privileged position of bank directors in the allocation of credit were quite valuable. And the loan data from a New York bank presented in Bodenhorn (2003) indicate that during a credit crunch, banks did indeed provide greater access to credit to their longstanding customers.

It is also important to note that the banks of Massachusetts were not directly affected by the events that led to the onset of the Panic of 1873, and were in a relatively strong position at its outset. Although they initially continued payments after the suspension in New York, the strong demand for reserves from New York led the Boston banks to enact a partial suspension September 27.[21] Over the following years there were no bank failures in Massachusetts, and indeed 21 new banks opened in Massachusetts between 1873 and 1880.[22] In general one would expect that in a financial panic, firms affiliated with financial institutions facing runs would be differentially impacted, and indeed, recent

[19] *Sixth Annual Report of the Board of Railroad Commissioners*, January 1875. Boston: Wright & Potter. These comments were made in response to the railroads' 1874 fiscal year, Sept.1873-Sept. 1874.
[20] These data are calculated from Massachusetts railroads' annual reports submitted to the state's railroad commissioner, used as part of the main dataset for this paper (see below). Railroads were the only category of sample corporations required to submit information on revenues or profits.
[21] Sprague (1910: 66-67) documents the response of Boston and Worcester banks to the onset of the panic. Sprague notes that at the outset of the panic, Boston banks had $10 million in cash reserves against $61 million in deposits.
[22] The state's banks did however see a significant decline in their returns on equity, and wrote off substantial losses (Comptroller of the Currency, 1872-1880).

research has sought to identify the economic consequences of financial crises using borrowers' exposure to troubled financial institutions.[23] But the commercial banks of Massachusetts were conservatively managed and in sound condition in 1873, and firms affiliated with them were unlikely to have suffered.[24] Whether or not bank affiliations were actually helpful is the focus of the analysis below.

3. Data

Beginning in 1870, the state of Massachusetts required all nonfinancial business corporations except railroads, which were subject to different regulations, to submit an annual "certificate of condition" to the state. Microfilm copies of the original certificates were found within the collection of the Massachusetts Archives, and transcribed. These data open a new window into the financing of mid-nineteenth century corporations—but a highly imperfect one. An example of one of these forms, submitted by the Wason Manufacturing Company of Springfield Massachusetts for 1872, is presented as Figure 2. At the top of the certificate the names of the officers and directors are listed. In the questions that follow, the corporation is asked to report the date of its most recent annual meeting, and some fairly rudimentary accounting information: paid-in capital, real estate, personal estate, total assets, and total debt.[25] As the required disclosures were primarily intended to protect the interests of the firms' creditors, the form did not solicit any information about revenues, profits or dividends.

On the lower half of the form, the name of every shareholder, along with the number of shares they held, is listed. From these data, the ownership stakes of the directors were calculated. In the example of the Wason Manufacturing company, all of the corporation's officers and directors were substantial shareholders, which was quite typical. Although the list of shareholders is difficult to read, it includes

[23] See, for example, Chodorow-Reich (2014) and Fernando May and Megginson (2012) on firms affiliated with or dependent on Lehman Brothers following its bankruptcy, or Frydman Hilt and Zhou (2015) on firms affiliated with New York trust companies following the Panic of 1907.
[24] This is not to say that the mid-1870s were a particularly good period for the state's banks—they saw a significant decline in their returns on equity, and wrote off substantial losses (Comptroller of the Currency, 1872-1880).
[25] The categories of "real estate" and "personal estate" was likely taken from property tax statutes. Real estate would include the value of buildings and machines, whereas personal estate included intangible assets and financial claims.

another entry worth noting: that of the Agawam National Bank, which is listed as an owner of 60 shares. These shares were likely held as collateral for a loan to one of the stockholders. H.S. Hyde, who was the company's treasurer and a director, was a director of that bank.

For the purposes of this paper, this information was collected from all of the certificates filed for the year 1872. The accounting data presented on the forms were published annually in the *Abstract of the Certificates of Corporations* by the Secretary of the Commonwealth, and the data for prior and subsequent years was collected from those published volumes.[26]

Railroads and streetcar companies were regulated by different statutes, which required much more detailed disclosures. The railroads' and streetcar companies' annual reports were typically several pages long, and included detailed information about different categories of assets and liabilities, presented a fairly complete income statement and balance sheet, and also included the names of all officers and directors. The only information presented in the certificates of condition for the other corporations that was not included in the railroads' disclosures was a list of stockholders. Data for all independently operating railroads and streetcar companies in Massachusetts were collected from the compiled reports in the *Annual Report of the Board of Railroad Commissioners,* published annually.[27]

For 1872, accounting data and the names of all directors for 603 nonfinancial corporations were recorded, and those corporations' accounting data were recorded for all subsequent years in which they existed, up to 1881. The location of the firms, and the year in which they were incorporated, was obtained from the annual *Report of the Tax Commissioner of the Commonwealth of Massachusetts*. The industries in which the firms operated were collected from various issues of the *New England Business Directory*, which includes detailed tabulations of manufacturing corporations and their products.

[26] The forms became more detailed over time, and after 1875 included much more information about firms' balance sheets (although still no income statement information.) But as the empirical analyses focuses on using firms' characteristics from prior to an economic shock to predict performance after the shock, these additional post-shock characteristics cannot be used.

[27] Some railroads and streetcar companies were leased to other firms. Their legal existence as a separate corporation continued, but effectively, they were subsidiaries of other firms, receiving a fixed lease payment in exchange for granting the parent the right to use its track and equipment. These firms were excluded from the analysis.

In order to identify ties between banks and nonfinancial corporations, the names of all directors of all of the state's banks were recorded from the 1872 *Massachusetts Register and Directory*. This volume listed the directors for 203 banks and trust companies. These names were then cross-referenced with the names of the directors of the nonfinancial corporations, in order to identify interlocks.[28]

Among the 603 sample firms, 59 percent had a bank director on their board. The boards of directors of some banks were interlocked quite extensively with those of nonfinancial corporations. Consider the example of the National Bank of Northampton, illustrated in Figure 3. The bank had nine directors, of which six held directorships on at least one nonfinancial corporation. In total, the bank's directors held board seats with fourteen other corporations—twelve manufacturing firms, one utility and one railroad—all of which were located in nearby towns. Several of the bank's directors owned substantial equity states in the non-financial corporations where they held board seats, and were probably founders of those enterprises. In other cases, the bank directors held very little of the stock of the other companies, or even none of the stock at all. Perhaps those latter directors were primarily bankers, whereas the former are best thought of as entrepreneurs. This is a distinction we will return to later in the analysis.

The federal census of 1870 included information about real and personal wealth. The manuscripts were searched for all of the names of directors of Massachusetts nonfinancial corporations to obtain this information. There were 2,747 unique individuals who held directorships with nonfinancial corporations, and of those, 1,636 could be uniquely identified in the census, a match rate of around 59.5%. For 221 of those individuals, however, no wealth information was provided.[29] For the

[28] Given the variation across sources in the reporting of particular names (for example, the first name of "John" was often reported in the abbreviated form "Jno" or just "J," the names were first standardized to first initial, middle initial and last name, and then matched across datasets. Each match was then hand-checked to verify that individuals with the same initials but different names were not matched.

[29] The individuals with no wealth reported included noted figures such as Congressman Oakes Ames and his son Oliver Ames, who were major investors in the Union Pacific Railroad, and significant owners of several manufacturing corporations. This suggests that some wealthy individuals, perhaps those with ties to politics, may have refused to answer enumerators' questions about their wealth, and that the data on director wealth obtained from the census will be measured with error.

corporations for which the wealth of at least half the directors was found, average director wealth (real plus personal) was calculated.

Finally, credit ratings were collected for the sample corporations. At the time, annual volumes entitled *Bradstreet's Commercial Reports* were published by J.M. Bradstreet & Son and distributed to paying subscribers.[30] The publication's coverage focused on manufacturers, wholesalers and retailers, and did not include any railroads or streetcar companies at all. But for 337 of the sample firms, a letter-graded rating for 1872 was found in the volume. These ratings fell into six categories: AA ('Unquestioned'), A ('Very High'), B ('Excellent'), C ('Good'), D ('Fair'), E ('Very Moderate'). These ratings create an independent measure of the financial condition of the sample firms, and were indeed correlated with the probability of failures. In simple linear probability model regressions of a binary indicator for failure on indicators for the ratings, firms rated A, B, C, D and E were, respectively, 17, 22, 34, 37 and 86 percent more likely than firms rated AA to fail prior to 1882.[31]

Table 1 presents summary statistics for many of the corporations' characteristics for 1872. Column (2) of Panel A shows that the average log value of their total assets was 11.7; their average age, measured as years since incorporation, was 12.9 years; and the average leverage ratio (debts/total assets) for the firms was 0.35. The firms' property accounts—buildings and machines, or in the case of railroads, track and equipment—accounted for about 35 percent of their assets. And although director wealth was only available for about 63 percent of the sample corporations, its mean value was $122,000—equivalent to $2.4 million in today's dollars after adjusting for inflation. Panel B shows how the corporations were categorized into 13 different industries, the most important of which were textiles, and fabricated metals.

[30] These published volumes have not seen much use among economic or business historians, presumably because they are difficult to find today. Each subscriber's copy was numbered and was officially 'loaned,' rather than sold, to the subscriber, and was to be returned to the publisher "at the end of the subscription." A competing publication of ratings was published at the time by a competitor, the Mercantile Agency. However, no copy of the 1872 volume could be found.

[31] The R-squared of these regressions with n=337 was 0.09, implying that there was considerable variation in failure rates not captured by the ratings.

Panel C presents some firm outcomes. About 38 percent of the firms failed prior to 1882. The average value of the numerical code for the firms' credit ratings (where AA was coded as 1, and E was coded as 6) was about 2.2. And the growth rate of firms' assets in 1872 was about seven percent.

The top of Panel A presents the frequency with which the firms had a bank director on their boards, and column (3) presents the differences in the values of all the remaining characteristics between firms with and without a director interlock with a commercial bank, as estimated from regressions with robust standard errors. Turning first to Panel B, the industry variables in column (3) indicate that bank interlocks were more common among textile manufacturers and railroads, and less common among paper producers and makers of food and tobacco products. These differences in the distribution of industries between firms with and without bank directors will be accounted for in the empirical analysis below through the use of industry fixed effects.

But more importantly, the data in Panel A show that corporations with a bank interlock had less leverage, were older, had more assets, and had wealthier directors. And the data in Panel C show that firms with bank interlocks received substantially better credit ratings. This raises a particular challenge for empirical analysis, since the selection of stronger or more 'well-established' firms into bank affiliations could easily be responsible for any observed differences in performance between the two groups of firms during the 1870s. Although the growth rates of firms with and without bank directors did not differ significantly in 1872 (Panel C), one might imagine that any change in performance observed over subsequent years could be due the greater resiliency of the firms with bank directors on their boards. In the empirical analysis that follows, this challenge will be addressed carefully.

4. Analysis of Firm Outcomes

A range of firm outcomes can be calculated from the available data. The most important is survival. As discussed above, 38 percent of Massachusetts corporations that existed in 1872 failed prior to 1882. In at least some cases, this was likely an outcome of firms being unable to roll over or pay

maturing debts, or being unable to obtain financing for the acquisition of working capital or other critical transactions. If affiliations with banks enabled firms to overcome asymmetric information problems and gain access to credit during the economic downturn, then they should have increased firms' survival rates.

Other firm outcomes will necessarily be observed only among surviving firms. As the certificates of condition available for most of the sample firms do not provide any information about profits or cash flows, the usual accounting measures of rates of return cannot be computed. However, the annual growth rates of firms can be computed as the change in total assets from year to year. In addition, the credit ratings for surviving firms during or after the shock can be compared to their ratings prior to the economic shock, to construct a measure of the change in their financial condition. An additional volume of the same publication of J.M. Bradstreet & Son was found for the year 1878, so that the change in ratings between 1872 and 1878 can be computed for surviving firms. Among the 337 firms for which an 1872 rating was found, 227 of them were rated in the 1878 volume. In a reflection of the difficult economic conditions that prevailed, the average value of the change in ratings among these surviving firms was +0.93, indicating a worsening by nearly a full notch (effectively going from a rating of A to B).

Given that the latter two outcomes are observed only conditional on survival, the empirical relationship between them and bank affiliations will be difficult to interpret. In particular, if bank affiliations enable otherwise weaker firms to survive and remain in business, the observed relationships between bank affiliations and surviving firms' growth rates and credit ratings changes will be biased downward. Put differently, a firm affiliated with a bank that faces a rapid decline in its growth rate or credit rating may be better able to survive and remain in the dataset, thereby lowering the average value of those outcomes for bank-affiliated firms.

Before proceeding with the analysis, some suggestive evidence of the effect of bank affiliations on the outcomes for Massachusetts' corporations is presented in Figure 4. Panel (a) of the figure plots Kaplan-Meier survival curves for corporations with and without bank directors on their boards.[32] The

[32] The exact failure times of firms are not observed. What is observed is the date of the final certificate of condition, submitted around the time of the firm's annual meeting. Failure times are assumed to be the date when their next

survival functions for the two groups of firms are starkly different; those without bank directors failed at much higher rates throughout the period. Panel (b) presents the annual growth rates of the firms between 1872 and 1881. All of the sample firms' growth rates fell in 1874 and remained depressed through 1879. Clearly, these were difficult years. But the differences between the two groups are quite significant, particularly in the years 1874-77. Corporations with ties to banks enjoyed a substantial advantage during the downturn, and their growth rates did not fall to the same extent as those of other firms. It is worth noting that the firms with bank affiliations did not enjoy any advantage in growth rates in the years following or prior to the recession.

In order to investigate these differences more carefully, and account for firm characteristics that may be correlated with bank affiliations, the effect of bank affiliations on each firm outcome will be investigated using regressions. Given the varying structure of the data for the three outcomes, slightly different empirical specifications will be used for each one. However, in each case, the characteristics of firms prior to the shock, as observed in 1872, will be used to predict firm outcomes after the shock.

The effect of bank affiliations on firm failure rates will be estimated in a linear probability model as follows:

$$(1) \qquad fail_{icj} = \beta_0 + \beta_1 banker\text{-}director_i + \mathbf{z}_i\beta_2 + \alpha_c + \delta_j + \varepsilon_{icj.}$$

where the determinants of failure include a binary indicator for an affiliation with a bank (*banker-director*$_i$); county and industry fixed effects (α_c and δ_j); and other 1872 firm characteristics likely predictive of failure that differ between firms with and without bank affiliations, such as log assets, firm age, and leverage ($\mathbf{z}_i$).

A somewhat different specification will be used for estimating firm growth rates. With the latter, we can observe the rates before and after the shock, and therefore use the panel dimensions of the data to

certificate of condition should have been submitted—exactly one year following the date of the last certificate of condition. The failure data are also right-censored, as no data for survival or failure after 1881 was collected.

estimate the difference in differences in a model with firm fixed effects. These will absorb any unchanging firm characteristics, such as management quality, which may influence the firms' growth over time. The effect of bank affiliations on the growth rates of corporations will be estimated in the following empirical framework:

$$(2) \qquad y_{it} = \beta_0 + \beta_1 \textit{banker-director}_i \times \textit{post-1873}_t + \mathbf{z}_{it}\beta_2 + \gamma_i + \theta_t + \varepsilon_{it}$$

where y_{it} is the growth rate of company i in year t; $\textit{banker-director}_i$ is an indicator for the presence of one or more bank directors on the board of company i; $\textit{post-1873}_t$ is an indicator for the years following 1873; $\mathbf{z}_{it}$ is a vector of different firm characteristics, including industry and county indicators, as well as 1872 characteristics such as firm size, age and leverage, interacted with a post-1873 indicator; and θ_t and γ_i are year and firm fixed effects.

Finally, the change in firms' credit ratings will be estimated in a different framework. In order to account for the fact that the initial credit rating likely predicted the subsequent change in firms' credit ratings, initial rating fixed effects will be used.[33] Thus the effect of bank affiliations on ratings changes will be estimated only from the variation within a given initial rating level. The 1872 ratings levels represent summary indicators of the financial condition of firms, so that the estimation framework focuses on the effect of bank affiliations on subsequent changes in financial health, among firms of initially similar financial condition. As the initial ratings likely took into account the effect of observable characteristics such as firm size and leverage, including those additional characteristics in the regression with the initial ratings may be redundant. The specification to be estimated will be:

$$(3) \qquad \Delta \textit{rate}_{icj} = \beta_0 + \beta_1 \textit{banker-director}_i + \mathbf{z}_i\beta_2 + \lambda_r + \alpha_c + \delta_j + \varepsilon_{icj.}$$

[33] For example, it was likely impossible for a firm with a very poor credit rating to exist for a sustained period with that same credit rating. Given its poor rating, it would likely have difficulty in obtaining credit, and was therefore likely to fail. However, if it managed to turn things around and survive, it would then receive a higher rating reflecting its improved status. But only in the latter case could a change in ratings be calculated.

which is the same as equation (1) above, with the addition of the λ_r term, which represents the fixed effects for the initial ratings levels.

4.1 Baseline Estimation Results

Table 2 reports results for regressions based on different versions of equation (1)-(3). In column (1), the model is estimated with fixed effects only, and in column (2) additional firm characteristics are included in the regression (interacted with a post-1873 indicator, in Panel B). The results in both columns provide clear evidence that firms with bank directors on their boards survived at higher rates, and conditional on survival, they experienced less of a decline in their growth rates and worsening of their credit ratings in the years following 1873.[34] The results in column (2) indicate that the survival rate of firms with bank affiliations was nearly 10 percentage points higher; that the growth rates of these firms, relative to the years 1873 and before, was 6 percentage points higher, compared to firms without bank affiliations; and that the change of the credit ratings of firms with bank affiliations was higher by nearly a quarter of a notch. The latter two estimates likely understate the true effect of bank affiliations, since they are observed conditional on survival, and bank affiliations likely enabled otherwise weaker firms to survive.

An obvious concern regarding these results, however, could be that the firms with and without bank directors were quite different, and in particular the firms without bank directors were in fact so different they do not constitute an appropriate control group. The firms with bank directors on their boards were larger, older, and less levered—to the extent that these observable differences contributed to the resiliency of firms or success during the downturn, this could be responsible for the results. In order to address this concern, I use estimated propensity scores to restrict the sample to the common support in the propensity to have an affiliation with a bank, and also weight the observations by their inverse

[34] Credit ratings were given on a scale of AA to E, which were coded numerically as 1 to 6. So a lower number is better, and a negative estimate reported in the table reflects a *better* change in credit rating.

propensity scores.[35] The results of these regressions are presented in column (3) of Table 2. The estimated effect of an affiliation with a bank is reduced in magnitude slightly, but remains generally similar, particularly for firm failure rates and growth rates.

An additional concern regarding these results may be that they reflect the effects of other director or board characteristics that may be correlated with bank affiliations. That is, the estimated effects of bank interlocks may not result from bank affiliations per se, but from other characteristics or connections of banker-directors. For example, banker-directors were likely to have been wealthier than most directors, and director wealth may have been an important determinant of firms' survival and growth, for example because wealthier men would have been better able to guarantee their firms' debts or tolerate losses for longer periods. Table 1 above showed that on average, the directors of firms with bank affiliations were wealthier than those of other firms.

Alternatively, firms with bank directors on their boards were almost certainly better connected in a much broader sense, and likely had director interlocks with firms other than banks. Recent research from Babina et al (2016) on American firms during the Great Depression has shown that better connected firms were more likely to survive that period. In order to explore this latter possibility, the full network of all interlocks among all Massachusetts corporations' boards was used to calculate the eigenvector centrality of each corporation's board.[36] The graph of the network is presented as Figure 5.

Table 3 presents the results of regressions that are the same as those reported in column (2) of Table 2 (with firm characteristics as controls), but with average director wealth and the eigenvector centrality of the board included as additional controls. With the exception of the change in rating, the

[35] The procedure is as follows. I first estimate the propensity scores using a firm-level probit regression of an indicator for an affiliation with a bank with 1872 measures of log assets, leverage, firm age, and industry indicators. I then restrict the sample to the common support in the propensity to have such an affiliation; that is, I eliminate firms without an affiliation with a propensity score below the minimum for the firms with an affiliation (and above the maximum for those with an affiliation). Finally, I use the estimated propensity scores to construct weights for each firm. These weights are applied to the treated and control firms so that both groups resemble the population, and ensure that the regression will produce consistent estimates of the Average Treatment Effect of bank affiliations. See Imbens (2004).

[36] Eigenvector centrality captures the importance of a node in a network by measuring the importance of the nodes to which it is connected (and is therefore recursive in nature.)

estimated effect of bank affiliations is quite robust to the inclusion of these variables. Interestingly, the director wealth variable is positively correlated with firm failure—perhaps wealthier directors took greater risks with their firms. Director wealth was essentially uncorrelated with the change in firms' growth rates following 1873, but it led to a significantly better change in ratings. Somewhat different from the Babina et al (2016) results, the eigenvector centrality of the board was essentially uncorrelated with firm failures. However, it was positively related to substantially better post-1873 growth rates and ratings changes.

4.2 Mechanisms Behind the Effects: Asymmetric Information

A variety of different mechanisms could plausibly explain these results. For example, well-connected bankers may simply have tunneled resources out of banks into the nonfinancial corporations they controlled. The resulting infusion of credit could easily explain the improved performance of the nonfinancial firms, but it would not have any clear implications for any variation in the intensity of the effect among firms with bank interlocks.

Alternatively, bank affiliations may have helped address problems of adverse selection in credit markets. This would imply that the firms that benefitted most from a resolution of the adverse selection problem would have seen their outcomes improve to the greatest extent. In order to test whether or not this was the case, some variables reflecting the degree of asymmetric information faced by each of the sample firms are needed.

One good candidate as a proxy for the degree of asymmetric information faced by firms might be their ages. Relative to a new firm, creditors would have had more experience dealing with the older, better-established firms. The quality and business prospects of new firms may have been relatively difficult for outsiders to assess, particularly in an economic downturn. This implies that these firms should have benefitted to a much greater extent from an affiliation with a bank, as the affiliation would have enabled the bank to obtain better information regarding the firm's assets and prospects. In addition, higher quality or more reliable firms were almost certainly more likely to survive over time. A creditor

who was completely unfamiliar with a firm could therefore infer from its age that it was relatively more likely to be a reliable borrower.

Another possible proxy for the degree of asymmetric information the percentage of firms' assets represented by their buildings, equipment and land—their property account, or fixed assets. Although imperfect, this is an indication of the share of firms' assets that may represent good collateral for a loan, or that might actually have some salvageable value in case the firm were liquidated. The firms were in fact required to report this value exactly for the benefit of their creditors. Firms with a lower share of these fixed assets, which likely had a higher fraction of intangible assets such as patents or financial claims, would have been much more subject to asymmetric information problems. These are exactly the firms that should have benefitted most from affiliation with a bank, which, again, could have obtained better access to information about the true quality of the firms' assets through participation in the firms' management.

In order to test for this mechanism, the same specifications as column (2) of Table 2 are used, and a series of interaction terms added. For example, for the outcome of firm failures, and the case with firm age, equation (1) becomes:

$$(1a) \qquad fail_{icj} = \beta_0 + \beta_1 banker\text{-}director_i + \beta_2 banker\text{-}director_i \times age_i + \beta_3 age_i + \mathbf{z}_i\beta_4 + \alpha_c + \delta_j + \varepsilon_{icj.}$$

The parameter of interest becomes β_2, the interaction between a bank affiliation and firm age, and the hypothesized sign is positive: the preventative effect of bank affiliations on firm failures (reflected in a negative value of β_1) should be diminished for older firms. The validity of the test itself is reflected in β_3—firm age should help avert failures if it is a good proxy for firms with lower degrees of asymmetric information. Similar modifications will be made to equations (2) and (3).

Tables 4 and 5 present results of these regressions. In all but one of the six regressions in the two tables, the estimated coefficients have signs consistent bank affiliations helping to address problems of asymmetric information. For example, in column (2) of Table 4, the main effect of a bank affiliation on

post-1873 firm growth is positive; the interaction term between bank and firm age is negative, meaning that the overall effect is smaller for older firms; and the effect of age itself is positive, implying that older firms did indeed grow differentially faster in the years following 1873, consistent with the hypothesized role of age as a negative proxy for asymmetric information problems.

In Tables 4 and 5, the rows labeled implied effects report the effects of the main bank affiliation variable plus the effects of the interaction term multiplied by different values of the firm characteristic. In the case of equation (1a) from Table 4, for example, these rows report the value of $\hat{\beta}_1 + \hat{\beta}_2 \times age_p$, where the value of age_p corresponds to the *p*th-percentile of the firm age distribution. Reading down the rows, the changing values reported reflect the variation in the effect of bank affiliations for corporations with greater values of firm age (or the greater vales of the share of fixed assets on their balance sheet, in the case of Table 5). Consistent with the effect being smaller for firms less subject to problems arising from asymmetric information, the absolute value of the coefficients falls, in some cases quite steeply, for firms at higher percentiles of the age or fixed assets share distribution.

The one exception is column (3) of Table 4, the effect of age interactions on the changes in firms' credit ratings. Here the interaction term is negative rather than positive, and the rows reporting the implied effects show magnitudes that increase, rather than decrease, with firm age. Evidently with ratings changes, older firms enjoyed a greater benefit from affiliations with banks than younger firms. But it should be noted that age itself does not have the hypothesized (negative) effect of improving firms credit rating changes, which implies that, at least in this context, age may not be a valid marker for asymmetric information problems. The initial ratings of firms, or perhaps selection into having a rating, may have fully reflected the effect of age on investors knowledge of the firm.[37]

[37] Two other proxies for asymmetric information were explored: firm size, and whether or not a firm had a credit rating. Firm size is commonly used in the literature as a proxy for asymmetric information (eg, Chodorow-Reich, 2014), and whether or not a firm was rated is certainly a reasonable measure of the prominence of a firm, and the extent of information about it. Both variables perform as expected in firm failure regressions; larger firms and rated firms survived at higher rates, and the protective effect of bank affiliations diminished with firm size and for rated firms. Yet neither has the hypothesized effects on post-1873 growth: larger firms, and rated firms, grew differentially slower, relative to the pre-1873 period. It is possible that the effects of post-1873 growth are biased downward, since they are observed only conditional on survival.

These results may also help address concerns regarding selection on unobservable characteristics leading to improved post-1873 outcomes. For that to be responsible for the results, the selection would have to have been differentially better for firms with fewer fixed assets on their balance sheet, and for younger firms. This is certainly not implausible, but one might generally expect the selection on unobservables to follow similar patters as the selection on observables.

4.3 Mechanisms Behind the Effects: Credit, or Signaling?

The benefits of affiliations with commercial banks documented in the preceding analysis could be the product of several possible mechanisms. First, bank directors may have provided financial or managerial expertise to a firm. Second, the affiliations with banks created by bank directors may have signaled to creditors and suppliers that the firm was reliable or unlikely to experience financial distress. Or third, the affiliation may have actually facilitated lending from the director's bank to the business, consistent with Lamoreaux's (1994) insider lending hypothesis. Call these the management channel, the signaling channel, and the insider lending channel. Each of them could potentially facilitate improved access to credit and enhance the resiliency of firms in response to an economic shock, and each of them might be expected to have greater effects among firms suffering differentially from problems arising from asymmetric information.

Although distinct, these three channels are not mutually exclusive. It is possible—perhaps even likely—that the estimated effects reported above are the product of some combination of the three. Yet it is important to distinguish among them, as each implies that bank affiliations solved a different problem. Understanding the role that banks played in America's economic development, and discerning any lessons from this experience for other contexts, requires identifying the specific problem they solved.

In order to identify the relative importance of the different possible channels, one would ideally want an experiment in which particular channels were shut down among subsets of bank-firm affiliations, and the outcomes compared. One possibility that comes close to this is the presence of bank cashiers, rather than directors, on nonfinancial company boards. Bank cashiers were the day-to-day managers of

banks, who maintained the accounts and oversaw all of the banks' operations. The ranks of bank cashiers often included many talented and ambitious men, who would go on to illustrious careers in finance and industry. They were certainly financial experts. But they generally could not allocate credit from the bank. They were typically present at the meetings of banks' discount committees, and interacted with banks' borrowers, but as they were expected to serve as an independent check on the directors and guard against any misuse of the banks' funds, they were generally not permitted to be borrowers from banks, or to serve as guarantors of their banks' loans.[38] The presence of a bank cashier on a firm's board could potentially benefit the firm through the management channel or the signaling channel, but generally not through the insider lending channel.

Twenty of the sample corporations had bank cashiers on their boards. Table 6 reports estimates from regressions similar to those of column (1) in Table 2—that is, without firm characteristics included as controls—but with the bank director on board indicator replaced with one for a bank cashier on the board. If a bank cashier brought financial expertise (the management channel) or a prestigious affiliation (the signaling channel), comparisons between the estimated magnitudes from these regressions with those estimated above for bank directors will reveal the relative importance of the insider lending channel.

The estimates reported in Table 6 reveal that the management and signaling channels were unlikely to have been important. For firm failures and growth, the point estimate for the presence of a bank cashier is quite small, and the effect on firm ratings changes was large but positive, indicating a harmful effect. The validity of this test requires that bank cashiers actually did bring financial expertise and a prestigious signal to the companies where they held directorships that was similar to those created

[38] Gibbons (1859) describes the role of cashiers in great detail, from first-hand experience. See also Bodenhorn (2003a). Lamoreaux (1994) does mention a case of a failed bank where a cashier was a borrower (p. 43), indicating that the practice of prohibiting cashiers from being depositors or borrowers was not universal. But given the significance of the cashier's role, it would have been prudent and sensible to rule out any loans to the cashier. It should also be noted that cashiers were normally required to post bonds to ensure that they would perform their role in good faith. A large enough loan balance with the bank could completely undermine the incentive mechanism created by the bond; the gain to a malfeasant cashier from defaulting on the loans from the bank could compensate for the loss of the bond.

by the presence of a bank director. If that was indeed the case, then the results of this test suggest that the insider lending channel was likely quite important.

4.4 Discussion: Reconciling the Results with Those of Modern Studies

Among modern American firms, board interlocks with commercial banks are relatively uncommon (see Kroszner and Strahan, 2001). Most of the bankers on American firms' boards today are regarded as independent or "outside" directors and only rarely represent banks with lending relationships with the firms where hold board seats. The extant evidence we have on the effects of bank-firm affiliations associated with lending relationships among modern firms suggests that they are not actually helpful, and tend to enable managers to make inefficient investments (see Güner, Malmendier, and Tate, 2008).

The differences between that study's results and those obtained here may be due in part to the different macroeconomic environments under study; the modern effects of affiliations with a healthy financial institution during a financial crisis or recession may be different. But there is another, more important factor that may explain the difference. The bankers on modern boards are, above all, bankers. In contrast, the bankers on the boards of nonfinancial corporations in the 1870s were not primarily bankers, but instead were entrepreneurs.

It is possible to quantify the extent to which these banker-directors were entrepreneurs, rather than bankers. For a subset of Massachusetts banks, those located in Boston, ownership lists are available, so the ownership stakes banker-directors held in their banks can be systematically compared to the stakes they held in the nonfinancial companies where they held directorships.[39] These comparisons are

[39] These data are from the volume, *A List of Stockholders in the National Banks of Boston, May 1 1866.* They were therefore six years old in 1872, when the ownership of the other corporations is measured. There is likely some measurement error in the ownership stakes in the banks presented in the table, but there is no reason to believe that it systematically understates the bank ownership shares. In addition, many of these men held directorships with railroads, for which no ownership stakes are available. The omission of railroad ownership stakes likely causes the comparisons in Table 7 to understate the differences between the financial stakes held by these men in non-financial corporations relative to Boston banks.

presented in Table 7. For the 87 different individuals who held directorships both with Boston banks and non-financial corporations for which an ownership list was available, the average fraction of the total stock of the banks they held was less than 1%, whereas their average stake in the nonfinancial companies where they held directorships was more than 8%. Since they often held board seats with multiple nonfinancial companies, the (par) value of their holdings in those firms was far greater than their holdings in banks—nearly $37,000 more.

The financial fortunes of these men were clearly much more closely tied to their nonfinancial firms than to their banks. This gave them a very strong financial incentive to use their connections to banks to help their non-financial corporations grow, rather than the other way around. These were not bankers on non-financial company boards; they were entrepreneurs on bank boards, and this distinction likely explains the contrast with modern firms' experiences. It may also help explain the prevalence of historical banker-directors; the large equity stakes they held likely minimized the conflicts between the interests of creditors and equity holders that may make it undesirable to have a banker on a corporate board.

5. Conclusion

In the 1870s, bank-firm affiliations, cemented with board seats, were quite common among nonfinancial corporations in New England. This paper has used newly collected data to document the extent of these affiliations, and their value. Among all nonfinancial corporations in Massachusetts, 59 percent had a bank director on their board. Entrepreneurs who founded and invested in manufacturing enterprises and other firms commonly held board seats with commercial banks, and these relationships likely helped address problems related to asymmetric information, and improved the firms' access to credit.

The empirical analysis used the shock of the Panic of 1873 and the ensuing recession to assess the value of these relationships, and the mechanisms creating that value. In the wake of the financial contraction, there was a significant decline in industrial production, and a wave of bankruptcies. In such an environment, adverse selection problems in credit markets become particularly acute. And if bank-firm ties helped address those problems, they would likely have become quite valuable. The analysis indicated that whereas all firms suffered following the panic, those that had ties to banks failed at lower rates, saw their growth rates fall by considerably less, and saw their credit ratings decline by less. Consistent with these effects arising from bank-firms helping to address asymmetric information problems, these effects were greater for younger firms and those with lower shares of fixed assets on their balance sheets.

The results of this paper suggest a role for banks in the industrialization process that previous studies have not emphasized. Economy-wide or sectoral shocks periodically buffet all economies, and when significant, they wipe out large numbers of firms. The cumulative effect of these shocks likely impedes development and industrialization. In nineteenth century New England, affiliations with banks helped sustain nonfinancial corporations faced with macroeconomic shocks, by mitigating the asymmetric information problems that become so acute. Whether or not banks provided a substantial fraction of firms' outside finance overall, relationships with banks were likely critical during periods of economic volatility.

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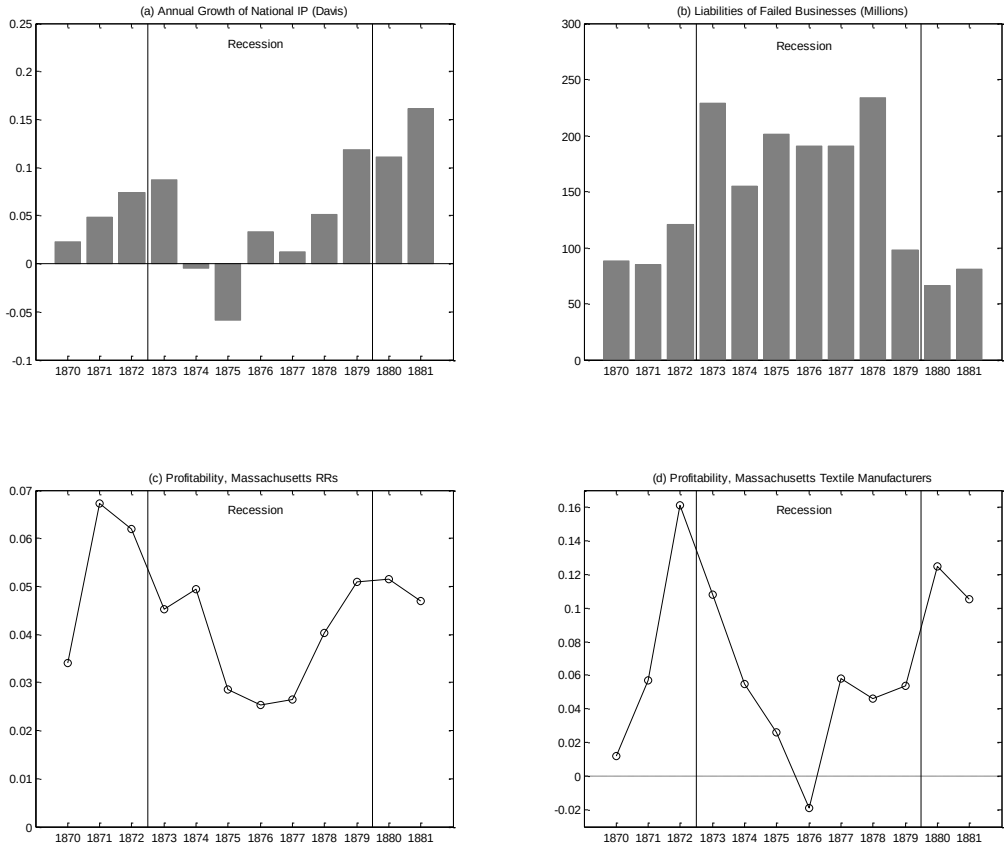
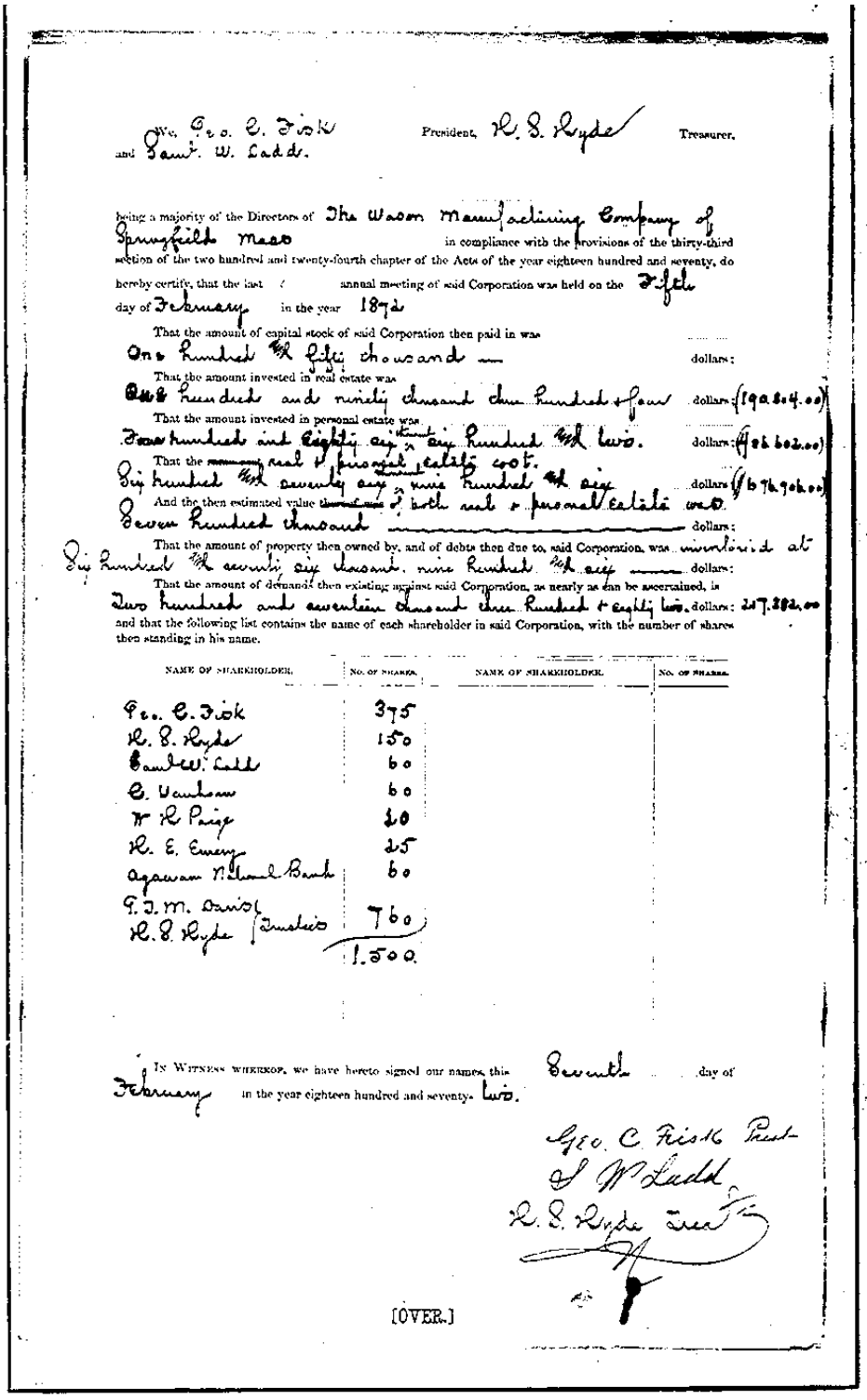


Figure 1: Effects of the Panic of 1873

Panel (a) presents annual rates of growth of industrial production, as calculated from Davis (2004). Panel (b) presents the annual value of liabilities of failed businesses, from the "Dun & Bradstreet Reference Book and Failure Statistics," as reported in *Historical Statistics of the United States.* Panel (c) presents the profitability of Massachusetts railroads, measured as return on assets (net income divided by total assets), as calculated from the reports submitted to the state's railroad commissioner. And Panel (d) presents the profitability of large textile manufacturers, mostly from Massachusetts, measured as return on assets, from McGouldrick (1968, Appendix D). Each panel presents data for 1870-1881, with the beginning and end of the period corresponding to the recession as dated by the NBER (October 1873-March 1879) marked with vertical lines.



We, Geo. C. Fisk President, R. S. Ryde Treasurer,
and Saml. W. Ladd.

being a majority of the Directors of The Wason Manufacturing Company of Springfield Mass in compliance with the provisions of the thirty-third section of the two hundred and twenty-fourth chapter of the Acts of the year eighteen hundred and seventy, do hereby certify, that the last annual meeting of said Corporation was held on the Fifth day of February in the year 1872

That the amount of capital stock of said Corporation then paid in was
One Hundred & fifty thousand — dollars:

That the amount invested in real estate was
One Hundred and ninety thousand three Hundred & four dollars: (190.304.00)

That the amount invested in personal estate was
Four hundred and Eighty six & one Hundred & two. dollars: (486 102.00)

That the ~~amount~~ real & personal estate cost.
Six hundred & seventy one nine Hundred & six dollars: (670.906.00)

And the then estimated value ~~of the~~ both real & personal estate was
Seven Hundred thousand ——————— dollars:

That the amount of property then owned by, and of debts then due to, said Corporation, was invoiced at
Six Hundred & seventy six thousand, nine Hundred & six —— dollars:

That the amount of demands then existing against said Corporation, as nearly as can be ascertained, is
Two hundred and seventeen thousand three Hundred & eighty two dollars: 217.382.00

and that the following list contains the name of each shareholder in said Corporation, with the number of shares then standing in his name.

NAME OF SHAREHOLDER.	No. OF SHARES.	NAME OF SHAREHOLDER.	No. OF SHARES.
Geo. C. Fisk	375		
R. S. Ryde	150		
Saml W. Ladd	60		
C. Washburn	60		
H R Paige	50		
R. E. Emery	25		
Agawam National Bank	60		
G. J. M. Davis	760		
R. S. Ryde Trustee			
	1.500		

In Witness whereof, we have hereto signed our names, this Seventh day of February in the year eighteen hundred and seventy two.

Geo. C. Fisk Pres.
S. W. Ladd
R. S. Ryde Treas

[OVER.]

Figure 2: Certificate of Condition, Wason Manufacturing Company, 1872

The form required companies to submit the names of their officers and directors, the date of their most recent annual meeting, basic balance sheet information, and the names of all stockholders and the amounts held.

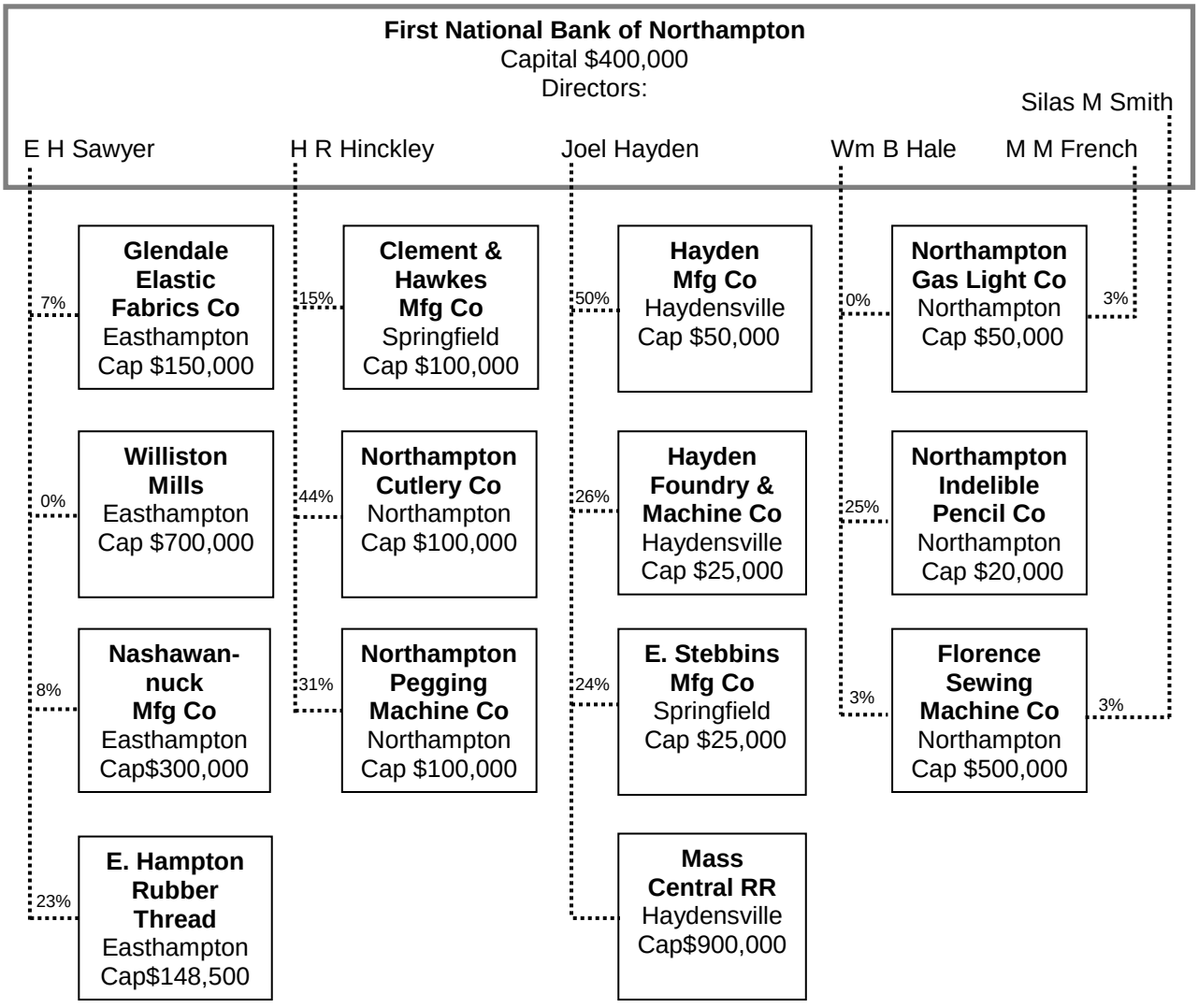


Figure 3: Board Interlocks with of the First National Bank of Northampton, 1872

This figure presents the additional directorships held by each of the board members of the First National Bank of Northampton MA in 1872. The bank had three additional directors who held no additional directorships. Dotted lines indicate directorships. The numbers indicate the percent of the equity of the nonfinancial companies owned by the individual directors. As no shareholder lists were submitted by railroads, the ownership stake held by Joel Hayden in the Massachusetts Central RR is not known.

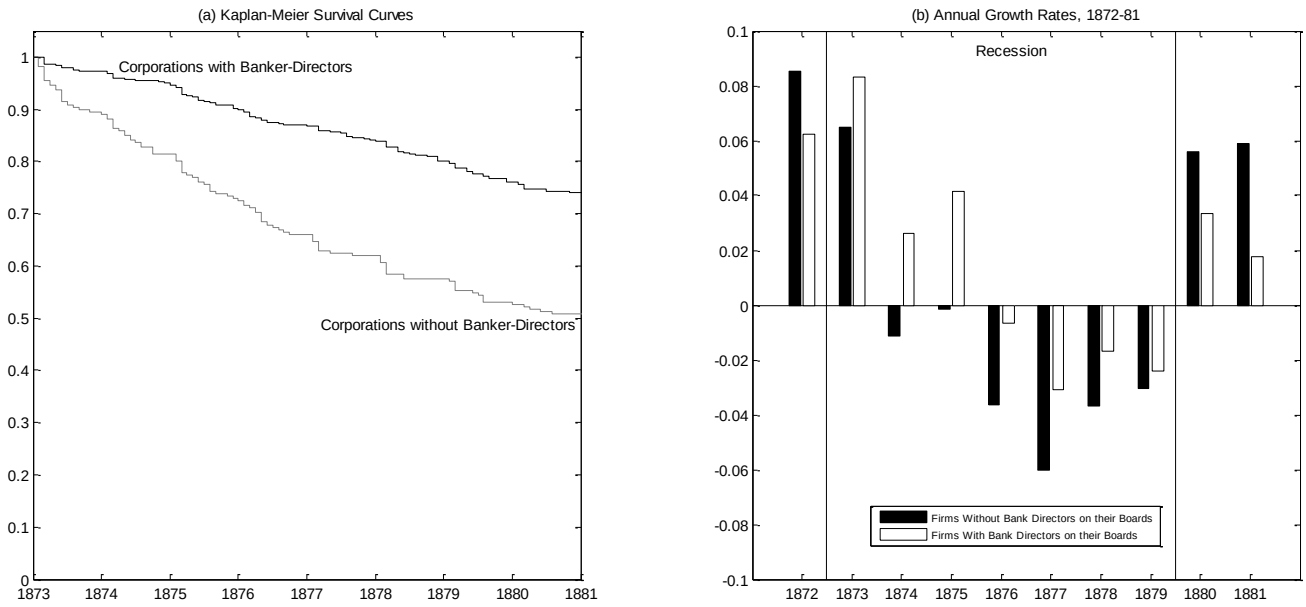


Figure 4: Survival and Growth Rates of Firms with and without Bank Interlocks

Panel (a) of the figure presents Kaplan-Meier survival curves for firms with and without bank directors, for firms existing in 1872. Failure dates are approximated as occurring one year following the final certificate of condition. Panel (b) presents the annual growth rates of total assets of firms with bank directors on their boards (white bars) and those without (dark bars).

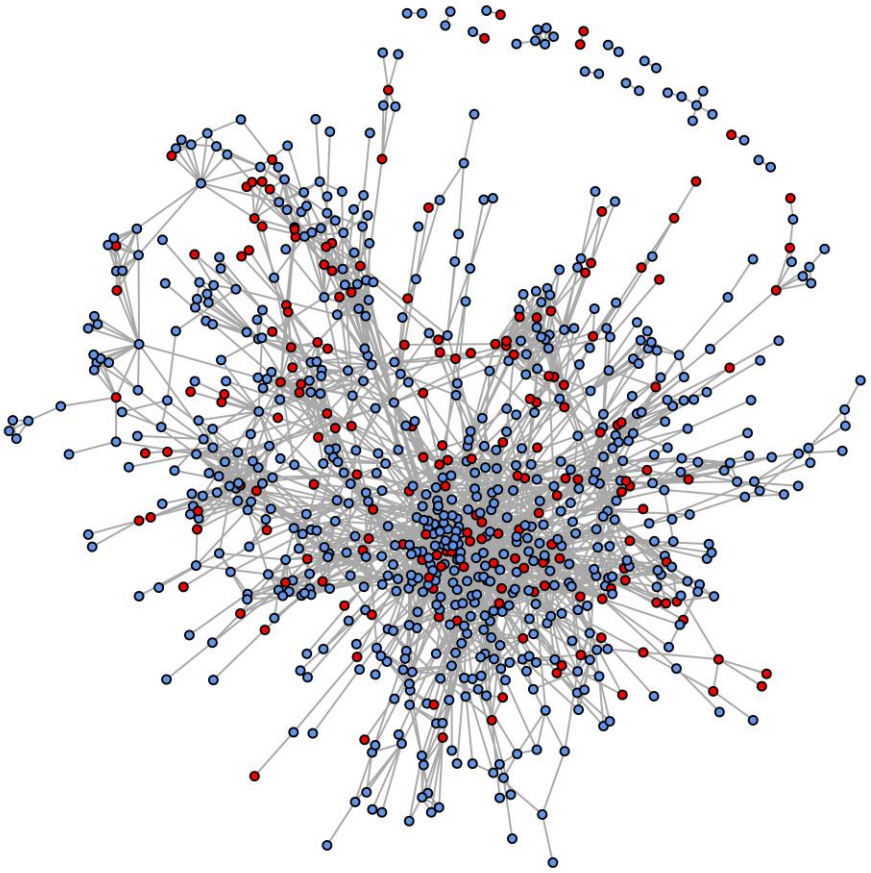


Figure 5: Graph of the Network of All Massachusetts Corporations' Boards, 1872
This figure presents the graph of the network of connections among all Massachusetts corporations in 1872. Commercial banks are depicted in red, all other corporations are depicted in blue. The connections among them are those created by board interlocks.

Table 1: Summary Statistics

	N (1)	All Firms: Mean [StDev] (2)	Difference: Firms with And Without Bank Director (SE) (3)
A. Firm Characteristics:			
Bank Director on Board, 1872	603	0.589	--
		[0.492]	
Leverage	583	0.347	-0.059**
		[0.303]	(0.019)
Property account / Total assets	556	0.352	0.041
		[0.304]	(0.033)
Firm age, years	602	12.939	2.845+
		[12.547]	(1.367)
Log(Total assets)	584	11.716	0.935**
		[1.687]	(0.163)
Mean director wealth, millions	381	0.122	0.087**
		[0.153]	(0.013)
Eigenvector centrality, firm board	603	0.032	0.041**
		[0.093]	(0.009)
B. Industry:			
Brick and stone products	601	0.033	-0.018
			(0.016)
Chemicals	601	0.017	-0.003
			(0.011)
Fabricated metals	601	0.248	-0.073+
			(0.038)
Food and tobacco	601	0.037	-0.030+
			(0.017)
Glass products	601	0.013	0.008
			(0.009)
Maritime (steamboat, wharf)	601	0.028	0.011
			(0.013)
Mining and petroleum	601	0.038	-0.005
			(0.011)
Paper and wood products	601	0.080	-0.051*
			(0.024)
Railroads	601	0.038	0.060**
			(0.018)
Streetcar	601	0.022	0.014
			(0.012)
Textiles	601	0.271	0.095**
			(0.036)
Utilities	601	0.101	0.028
			(0.025)
Other	601	0.075	-0.037
			(0.025)
C. Outcomes:			
Firm failed prior to 1882	603	0.381	-0.212**
		[0.486]	(0.038)
Firm credit rating, 1872 (1=best, 6=worst)	337	2.291	-0.462*
		[1.112]	(0.185)
Growth rate of total assets, 1872	482	0.070	-0.026
		[0.281]	(0.024)

Table 2:
Effect of Bank Affiliations: Baseline Estimation Results

	(1)	(2)	(3)
A. Linear Probability: Firm Failure Prior to 1882			
Bank Director on Board, 1872	-0.212**	-0.099*	-0.077+
	(0.044)	(0.044)	(0.043)
Observations	601	554	554
R-squared	0.125	0.241	0.244
County FE	YES	YES	YES
Industry FE	YES	YES	YES
1872 Characteristics	NO	YES	YES
Inverse Propensity Score Weighted; Common Support	NO	NO	YES
B. Panel: Annual Firm Growth, 1871-1881			
Bank Director 1872 x Post-1873	0.050+	0.060*	0.056*
	(0.026)	(0.025)	(0.026)
Observations	4,404	4,338	4,338
R-squared	0.256	0.256	0.266
Firm FE	YES	YES	YES
County FE x Post-1873	YES	YES	YES
Industry FE x Post-1873	YES	YES	YES
1872 Chars x Post-1873	YES	YES	YES
Inverse Propensity Score Weighted; Common Support	NO	NO	YES
C. Change in Credit Rating, 1872-1878			
Bank Director on Board, 1872	-0.249+	-0.232+	-0.179
	(0.128)	(0.128)	(0.127)
Observations	227	227	227
R-squared	0.247	0.257	0.268
1872 Rating FE	YES	YES	YES
County FE	YES	YES	YES
Industry FE	YES	YES	YES
1872 Characteristics	NO	YES	YES
Inverse Propensity Score Weighted; Common Support	NO	NO	YES

This table reports estimates of equations (1), (2) and (3). Panel A reports the results for linear probability models of firm failure; Panel B reports difference in difference estimates from panel regressions of annual firm growth rates; and Panel C reports estimates of the determinants of the change in firms' credit ratings (for which a decline represents an improvement to a lower-numbered rating). Column (1) reports a baseline specification. Column (2) reports a specification in which a series of firm-level controls (leverage and firm age in all cases; additional characteristics such as log assets in Panels A and B as well) are included. Column (3) reports results for models in which the firms are weighted by their inverse propensity scores, and the sample is restricted to the common support in the propensity to have a bank affiliation. In Panels A and C, robust standard errors are reported. In Panel B, standard errors clustered by firm are reported. **, *, and + denote significance at 1%, 5% and 10%, respectively.

Table 3:
Effect of Bank Affiliations Controlling for Wealth and Connections of Directors

	Dependent Variables:		
	Firm Failure (1)	Annual Firm Growth (2)	Change in Rating (3)
Bank Director on Board, 1872	-0.156**		-0.133
	(0.055)		(0.166)
Eigenvector centrality of Board, 1872	-0.013		-0.910+
	(0.196)		(0.535)
Mean director wealth	0.460**		-0.703+
	(0.170)		(0.415)
Bank Director 1872 x Post-1873		0.080**	
		(0.031)	
Eigenvector centrality x Post-1873		0.252*	
		(0.100)	
Mean director wealth x Post-1873		0.003	
		(0.090)	
Observations	356	2,822	163
R-squared	0.314	0.276	0.256
County FE	YES	YES	YES
Industry FE	YES	YES	YES
Firm FE	NO	YES	NO
1872 Characteristics	YES	NO	YES
1872 Rating FE	NO	NO	YES
1872 Chars x Post-1873	NO	YES	NO

This table reports estimates of the same specifications as column (2) of Table 2 for each of the three outcome variables. That is, each column presents the same regression as column (2) of Table 2, with the addition of the controls for director wealth and eigenvector centrality of the board. In columns (1) and (3), robust standard errors are reported. In column (2), standard errors clustered by firm are reported. **, *, and + denote significance at 1%, 5% and 10%, respectively.

Table 4:
Effect of Bank Affiliations Estimated with Interactions with Firm Age

	Dependent Variables:		
	Firm Failure (1)	Annual Firm Growth (2)	Change in Rating (3)
Bank Director on Board, 1872	-0.143*		-0.186
	(0.059)		(0.187)
Bank Director 1872 x firm age 1872	0.003		-0.004
	(0.003)		(0.009)
Firm age 1872	-0.006*		0.002
	(0.003)		(0.007)
Bank Director 1872 x Post-1873		0.105**	
		(0.037)	
Bank Director 1872 x Post-1873 x firm age 1872		-0.004*	
		(0.002)	
Firm age 1872 x Post-1873		0.005**	
		(0.002)	
Implied effects:			
25th pctile of firm age	-0.132**	-0.090**	-0.200
50th pctile of firm age	-0.122**	-0.076**	-0.215
75th pctile of firm age	-0.093+	-0.037	-0.255*
Observations	580	4,338	227
R-squared	0.249	0.257	0.257
County FE	YES	YES	YES
Industry FE	YES	YES	YES
Firm FE	NO	YES	NO
1872 Characteristics	YES	NO	YES
1872 Rating FE	NO	NO	YES
1872 Chars x Post-1873	NO	YES	NO

This table reports estimates of the same specifications as column (2) of Table 2 for each of the three outcome variables. That is, each column presents the same regression as column (2) of Table 2, with the addition of the firm age interactions. The rows labeled "implied effects" report the values of the bank director on board coefficient plus the bank director times firm age coefficient multiplied by the value firm age corresponding to the reported percentile of its distribution. In columns (1) and (3), robust standard errors are reported. In column (2), standard errors clustered by firm are reported. **, *, and + denote significance at 1%, 5% and 10%, respectively.

Table 5:
Effect of Bank Affiliations Estimated with Interactions with Fixed Asset Share

	Dependent Variables:		
	Firm Failure (1)	Annual Firm Growth (2)	Change in Rating (3)
Bank Director on Board 1872	-0.119+		-0.711**
	(0.064)		(0.218)
Bank Director 1872 x (Property Acct / Assets) 1872	0.058		1.525*
	(0.134)		(0.641)
(Property Acct / Assets) 1872	-0.065		-0.876
	(0.114)		(0.581)
Bank Director 1872 x Post-1873		0.100*	
		(0.040)	
Bank Director 1872 x Post-1873 x (Property Acct / Assets) 1872		-0.125+	
		(0.066)	
(Property Acct / Assets) 1872 x Post-1873		-0.002	
		(0.055)	
Implied effects:			
25th pctile of (Property Acct / Assets)	-0.113*	0.088+	-0.560**
50th pctile of (Property Acct / Assets)	-0.102*	0.064+	-0.271*
75th pctile of (Property Acct / Assets)	-0.088+	0.033+	0.103
Observations	554	4,238	220
R-squared	0.241	0.251	0.306
County FE	YES	YES	YES
Industry FE	YES	YES	YES
Firm FE	NO	YES	NO
1872 Characteristics	YES	NO	YES
1872 Rating FE	NO	NO	YES
1872 Chars x Post-1873	NO	YES	NO

This table reports estimates of the same specifications as column (2) of Table 2 for each of the three outcome variables. That is, each column presents the same regression as column (2) of Table 2, with the addition of the interaction terms for the value of the property account as a share of total assets. The rows labeled "implied effects" report the values of the bank director on board coefficient plus the bank director times property account / assets coefficient multiplied by the value of property account/assets corresponding to the reported percentile of its distribution. In columns (1) and (3), robust standard errors are reported. In column (2), standard errors clustered by firm are reported. **, *, and + denote significance at 1%, 5% and 10%, respectively.

Table 6:
Effect of Bank Cashiers on Firm Boards

	Dependent Variables:		
	Firm Failure (1)	Annual Firm Growth (2)	Change in Rating (3)
Bank Cashier on Board, 1872	-0.033		0.544**
	(0.102)		(0.181)
Bank Cashier 1872 x Post-1873		-0.021	
		(0.053)	
Observations	601	4,407	227
R-squared	0.086	0.253	0.193
County FE	YES	YES	YES
Industry FE	YES	YES	YES
Firm FE	NO	YES	NO
1872 Rating FE	NO	NO	YES

This table reports estimates of the same specifications as column (1) of Table 2 for each of the three outcome variables, only with the bank director on board indicator replaced by an indicator for a bank cashier on board. In columns (1) and (3), robust standard errors are reported. In column (2), standard errors clustered by firm are reported. **, *, and + denote significance at 1%, 5% and 10%, respectively.

Table 7:
Ownership Stakes, Directors of Boston National Banks
Who Also Held Directorships with Nonfinancial Corporations
(*N*=87)

	Bank	Nonfinancial Corporation	Difference
	(1)	(2)	(3)
Mean fraction of shares held	0.0069	0.0805	-0.0736***
	[0.0098]	[0.1020]	(0.011)
Mean par value of shares held (Dollars)	6,175	22,116	-15,941***
	[8,264]	[28,420]	(3,118)
Total par value of shares held (Dollars)	6,344	43,111	-36,767***
	[8,364]	[57,938]	(6,125)

Note: A total of 87 individuals held directorships with a Boston National Bank and at least one nonfinancial corporation. These individuals held directorships with an average of 1.83 nonfinancial companies other than railroads, for which no ownership lists are available. The omission of railroad ownership stakes implies that the differences reported in the table understate the true differences. The first row compares the fraction of the shares they held in their bank, to the average fraction they held in their nonfinancial corporation(s). The second row compares the par value of the shares, and the third row compares the total par value of their stakes in their banks and in their nonfinancial corporations. Standard deviations are presented in brackets, standard errors in parentheses. Ownership stakes in banks obtained from *A List of Stockholders in the National Banks of Boston, May 1 1866.*