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ABSTRACT

Limited liability is a defining feature of the modern corporation, but it was not always so. By the early 1850s about one-half of all states imposed double liability on bank shareholders. This paper shows that double liability was adopted as deposits increased relative to banknotes and in conjunction with free banking; that double liability was associated with more concentrated bank shareholdings, but had little effect on share liquidity; that it increased the price of bank debt; and, that a regulatory change toward greater shareholder liability increased bank leverage ratios. In forcing bank shareholders to have more "skin in the game," double liability changed bank investor, creditor and managerial behaviors.

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In November 2015 the *Wall Street Journal* reported new rules developed by the Federal Reserve System to bolster banks' loss-absorbing capacity (Carney 2015). Under the regulations, banks will be required to hold 9.5% of their leverage exposure in shareholder-contributed equity and "plain vanilla," domestically-issued, high-grade, long-term debt. In the event of failure the bank's core creditors will be better protected because the debt will cover some losses after shareholder equity is exhausted. The proposal also implies that banks will hold less of their portfolios in foreign debt, derivatives and other relatively risky assets. In some sense the rule harkens back to the bond-secured note issue of free banking, which required banks to hold (mostly) investment-grade debt equal to their note issues. In instituting these rules, the Federal Reserve is forcing banks to hold more capital and asking bank shareholders to have more skin in the game with the expectation that in doing so banks will hold fewer risky assets and pose less of a systemic threat to the financial system.

The Federal Reserve's rules reveal long-standing regulatory concerns with bank risk taking, especially at large, systemically important financial institutions, that predates modern central banking. In the nineteenth-century United States regulators adopted various mechanisms to limit bank risk taking and reduce creditor exposure to bank defaults. Free banking's bond-secured note issue is well studied, but states also imposed various capital regulations, including minimum capital requirements and maximum debt-to-capital ratios. Regulators also prohibited or restricted certain types of loans, most notably long-term mortgage credit. But as Grossman (2010) notes, there was yet another creditor-protection option that was invoked in the US and elsewhere around the globe: extended shareholder liability. Under extended liability rules, shareholders in corporate commercial banks are variously subject to double, triple or even unlimited liability. In the event of bank failure, bankruptcy administrators assess shareholders for payment if, in resolving a bank failure, the bank's assets fall short of fully indemnifying its creditors.

Although some recent scholarship (Guinnane et al 2007) challenges the traditional view, many students of business organizations view limited liability as a key feature of the modern firm (Jensen and Meckling 1976; Woodward 1985; Carr and Mathewson 1988). Shareholders place their personal wealth at risk up the amount they invest in the corporation and no more. As a general rule – mostly absent fraud on the part of the firm's owners and managers – creditors of a

corporation have no recourse against the personal wealth of the firm's individual owners/shareholders, one consequence of which was that shares in the modern corporation are readily transferable and traded in thick, liquid markets (Easterbrook and Fischel 1985). Moreover, limited liability firms tap into larger pools of capital and capture economies of scale unavailable to closely held or family firms, investor/shareholders can better diversify their portfolios, and consumers have greater access to inexpensive, mass-produced goods (Chandler 1977). Blandi (1934, p.39) finds virtually no mention of shareholder liability in the earliest corporate charters up to the early 1850s because there was, at that time, no more settled rule of law than that individual shareholders were not liable for the debts of the corporation in which they owned shares.

Early American courts of law upheld limited liability when the charter was silent on the issue, but the acceptance of limited liability at law did not place the rule above challenge (Angell and Ames 1871; Blandi 1934; Wright 2014). By the 1830s the debate came down to two points. One side, mostly Jacksonian populists, "looked upon corporations as an evil … they were exceptions to the common law," mostly because they shielded their investors from personal responsibility, a belief that found favor into the twentieth century (Hammond 1836, p. 189; Ballantine 1923, p. 82). On the other side were those who viewed the limited liability corporation as one of the principal mechanisms underlying modern economic growth. Potential shareholders in search of productive investment, but without the inclination to manage the firm, sought protections offered by perpetuity and limited liability; and this argument, too, was repeated into the twentieth century (Livermore 1935, p.687).

Nineteenth-century jurists, legislators and regulators resolved this fundamental debate through a series of compromises. When business firms were granted limited liability they were regulated in other dimensions, ostensibly to limit risk taking and their capacity to inflict losses on creditors or the public. More importantly, legislators modified shareholder liability rules either through general statutes applying to all corporations in a sector, or individually through firms' charters, though by the 1820s bank charters mostly followed standard templates concerning the election of directors, appointment of officers, voting rules, note-issue limits, and so on. Massachusetts' manufacturing corporation act of 1809, for example, imposed full joint and several (unlimited) liability on all manufacturing firms' shareholders. Other Massachusetts corporations enjoyed limited liability. Pennsylvania, too, extended limited liability to banks,

turnpikes, bridge and canal companies, but incorporated manufacturing firms typically operated with unlimited liability (Dodd 1948). Among other regulations designed to protect creditors, New York and New Jersey imposed something akin to double liability on manufacturing firms (Dodd 1948). In the event of corporate insolvency, shareholders holding shares in a double-liability firm were liable up to the par value of the shares they held. Thus, if a shareholder owned a single $100 share in a failed corporation unable to make its creditors whole, he faced a call from the bankruptcy court of up to $100 and no more. Double liability was limited liability, but its limits extended beyond the original purchase price or par value of the shares held.

Several studies have investigated the economic implications of double and unlimited liability on banks. Macey and Miller (1992), Esty (1998) and Grossman (2001) posit that banks operating under double liability should be less risky than banks operating under traditional limited liability rules. Relying on cross-sectional data Macey and Miller (1992) find that double liability increased measured bank leverage, a result they attribute to double liability serving to reassure creditors that they would be made whole in the event of bank failure. To the extent that double liability served as an implicit, off-balance sheet increase in the bank's capital account, the increase in measured leverage overstates creditor risk. Evans and Quigley (1995) show that capital-deposit ratios at Scotland's unlimited liability banks were about 2 to 2.5 percentage points lower than the country's limited liability banks. They attribute the lower equity-debt ratio (or greater leverage ratio) to increased creditor confidence in unlimited liability banks. Wagster (2007) finds a similar effect for Canadian banks subject to double liability. Grossman (2001) compares Mississippi, which adopted double liability in 1914, with Alabama banks, which did not, in a type of difference-in-difference analysis. He finds that capital ratios at Mississippi banks decreased (leverage increased) following the legal change, but it is not a clean test of the double liability effect because Mississippi simultaneously imposed deposit insurance and overhauled its regulatory regime as part of the 1914 change in its banking laws. Thus, the measured effect is best interpreted as a double-liability effect net of the deposit insurance and regulatory effects, but sorting out the independent effects is problematic because deposit insurance and double liability are expected to have opposing effects on risk taking (Saunders and Wilson 1995; Kane and Wilson 1996).

The traditional interpretation also holds that limited liability is a prerequisite of liquid markets in corporate shares. Extended liability, whether unlimited or double, makes the price of

shares partly dependent on the personal wealth of the firm's stockholders, so that every share will be priced differently depending on the composition of the other owners. It is not unreasonable to think that if a change toward double liability influences bank portfolios, it will also lead to a different mix of shareholders. Some individuals who might invest under limited liability will choose not to if doing so exposes them to assessments in the event of failure. The limited evidence on this issue is inconclusive, however. In his study of the American Express Company Grossman (1995) finds little evidence that California's extended liability limited militated against share ownership or trading activity in the firm's shares. In its early years, the American Express's 1,500 shares were held by just 39 shareholders. By 1869, however, the firm's 180,000 shares were owned by "a diverse pool of shareholders" (Grossman 1995, 73); by the 1950s it had about 25,000 shareholders holding an average of nearly 85 shares. Alternatively, Acheson and Turner (2006) and Hickson, Turner, and McCann (2005) find that changes in liability rules changed the number and mix of shareholders at nineteenth-century Irish banks.

This study investigates five features of double liability in the pre-Civil War era. First, it reports a previously unappreciated feature of free banking, namely that six states adopted double liability in conjunction with free banking. Bond-secured note issue protected banknote holders; double liability protected other creditors. Second, double liability is associated with more concentrated bank ownership, because double liability was effective only if creditors could effectively monitor the non-bank wealth of shareholders. Monitoring was more effective when fewer investors were monitored. Third, double liability had no discernible effect on share liquidity. Trading volumes did not decline and bid-ask spread did not change after the imposition of double liability. Fourth, when double liability offered additional security only to noteholders, its adoption reduced discounts in secondary banknote markets. And, fifth, a difference-in-differences approach reveals that post-double liability leverage at New York and Rhode Island banks increased by about 25 percentage points, which suggests that creditors viewed the double-liability contingent guarantee as less than certain, but it allowed banks to increase their asset portfolio without increasing their capital.

The law and economics of single and double liability

One obvious question surrounding the corporation is why liability is limited. Manne (1967), echoing arguments advanced in the nineteenth century, contends that limited liability offers several advantages over unlimited liability. First, limited liability encourages small investments from a broad class of investors, middling sorts as well at the wealthy. Unlimited liability (also known as joint and several liability) means that the totality of each owner's personal estate can be assessed to make creditors whole in the event of the firm's insolvency. Under unlimited liability wealthy investors will not want to join with relatively impecunious investors because the costs of insolvency are disproportionately borne by wealthy investors. Thus, wealthy investors will prefer to invest with similarly wealthy people and will demand a say in the sale and purchase of any and all shares. Under unlimited liability *who one invests with* is as important as *what one invests in*.

Second, single liability generates economies in monitoring among owners in that it eliminates the costs of owners continually monitoring and updating estimates of all other owners' net worth (Winton 1993).[1] Single liability also reduces creditors' monitoring costs because the firm's net shareholder equity (i.e., capital plus retained earnings less unrealized losses) rather than the shareholders' aggregate net worth provide what nineteenth-century jurists labeled a "trust fund" for the indemnification of creditors in the event of default (Blandi 1934, p.40). Like single liability, double liability eliminates joint monitoring among shareholders because double liability places a cap on each owner's exposure independent of the shareholdings and wealth of other investors. Double liability, however, alters creditor monitoring. In addition to monitoring a debtor firm's capital accounts, creditors must generate and update estimates of the shareholders' abilities to meet a call on shares in the event of bankruptcy.

Third, by eliminating shareholders' continual monitoring of one another, single liability facilitates the transfer of shares because share values are uncoupled from the value of the owners' assets (Hansmann and Kraakman 2000, p.426). Under unlimited liability owners must recalculate their expected liability with every share transfer. The acceptance of less wealthy investors into a firm's shareholding ranks increases the potential liability of wealthier owners. Because each owner places a different value on his or her shares, depending on his or her wealth as well as the wealth of all other shareholders, shares are traded in less liquid markets than shares

[1] To avoid confusion, single liability will hereafter refer to limited liability in its traditional usage. Double liability means that shareholders are subject to a call up to the par value of their shares. Extended liability implies any form of liability beyond single, including double, triple, unlimited and others.

of limited liability firms. Double liability does not undo this uncoupling of investor wealth and share value. Creditors must form estimates of shareholders' ability to meet an assessment, but investors do not need to monitor their fellow investors. Grossman (1995) and Hickson, Turner and McCann (2005), however, find that unlimited liability did not have a notable effect on share liquidity, so the effects of liability rule on share transferability remains an open question.

Fourth, Easterbrook and Fischel (1984, p.103) note that one of the principal issues surrounding liability rules is risk bearing and risk shifting: "Is it better," they ask, "to allow losses to lie where they fall, or to try to shift those losses to some other risk bearer?" Unlimited liability places the lion's share of bankruptcy risk on owners, so long as their aggregate wealth is sufficient to make creditors whole. Unlimited liability may be an efficient rule if owners are lower cost monitors of the firm's health and each other's wealth than are creditors. Single liability, on the other hand, will be more efficient if creditors are superior monitors. When creditors are superior monitors, limited liability provides for efficient monitoring and risk sharing between owners and creditors. By adjusting the amount of owner-contributed equity in a firm, owners and creditors can achieve a wide range of risk-sharing arrangements. Weaker forms of owner liability, such as double liability, alter the nature of the agreement, but do little to diminish the parties' abilities to tailor risk-sharing agreements among themselves. Double liability, in effect, offers an off-balance sheet contingent "trust fund" for creditors, but one less easily valued than an explicit on-balance sheet capital account. Nineteenth-century legislators and regulators likely recognized the ability to contract around the double liability rule and supplemented double liability with minimum capital requirements, reserve ratios, and other restrictions.

A fifth advantage of limited liability is that it facilitated diversification. As is well known, diversification across several different classes of investments reduces aggregate risk, but only in the case of single liability. Under unlimited liability broad diversification increases rather than decreases risk because each separate investment places the entirety of the investors' estate at risk. The preferred strategy under unlimited liability is for investors to reduce the number of risky investments, which in the limit is one or, perhaps, zero (Easterbrook and Fischel 1984, p.96). Double liability retains the idiosyncratic risk-reducing benefits of broad diversification while redistributing some fraction of insolvency risk from creditors to shareholders.

Sixth, Hansmann and Kraakman (2000) and Woodward (1985) note that single liability eliminates the social costs of pursuing expensive litigation against individual shareholders after bankruptcy. If the costs of securing and collecting personal judgments against individual shareholders consume a large fraction of the assessment actually collected, personal liability is inefficient for widely held firms. It is more efficient to shift some of the risk onto creditors and have them price that risk into debt contracts and have a single authority resolve the bankrupt firm. Yet, Macey and Miller (1992) and White (2011) report that receivers appointed by the US Comptroller of the Currency and state bank regulators recovered 50 percent of the assessments levied against individual bank shareholders at relatively modest administrative costs.

Esty (1998) shows that double liability operates like an equity call option in that the market price of a firm's equity is made up of two components: a long position on the call option, which is the difference between the market value of the firm's debts and the maximum shareholder liability assessment (D – L); and a short position on a bond, which is the maximum liability assessment (L). Although double liability exposes shareholders to a contingent call on the bond, it also reduces funding costs. Because shareholders face greater liability, creditors assume that, compared to a single-liability bank, a double-liability bank will hold less risky loans and consequently, shift less of the default risk onto creditors. Koehn and Santomero (1980) and Kim and Santomero (1988), however, show that more stringent capital regulation gives banks incentives to realign their portfolios in a way that sometimes increases risk. Although regulators tend to prefer less levered banks, asking banks to hold more capital without strict regulation of portfolios will induce some banks to take on more risk.

Available data on nineteenth-century banks does not reveal much about portfolio allocations, but leverage (asset-to-capital) ratios are readily calculable from published balance sheets. Using cross-sectional differences in liability rules, Macey and Miller (1992) and Evans and Quigley (1995) find that reported leverage ratios were higher at double-liability than at single-liability banks. Macey and Miller (1992) posit two competing hypotheses for their finding. First, creditors may have demanded lower on-balance sheet net worth because the threat of assessment induced banks to take on less risky portfolios. But the Koehn and Santomero (1980) and Kim and Santomero (1988) analyses suggests the opposite in at least some cases.

Second, creditors did not demand as high a capitalization ratio at double-liability banks because the added liability acted an off-balance sheet entry (contingent net worth) that offered

creditors a repayment guarantee. To see this, define leverage as the asset-capital ratio ($L = A / K$). Further assume that bank shareholders have some expectations concerning the probability ($0 \leq \rho \leq 1$) that a double-liability assessment will be made; and, if a call is made, shareholders expect to meet some fraction of the call ($0 \leq \alpha \leq 1$). A change from single to double liability, thus, induces a change in leverage to $L' = A' / (K + \rho\alpha K)$. If the bank's on-balance sheet capital (K) does not change in response to the change from single to double liability, measured leverage will naturally increase because $A' > A$. For actual, not measured, leverage to be equal before and after the change in liability regime, it must be the case that $(A' / A) = (1 + \rho\alpha) > 1$, or the percentage increase in actual leverage will be equal to the expected contingent call (i.e., $\%\Delta L = \rho\alpha$). A difference-in-difference measure of the change in leverage then provides a measure of the expected call (or the implicit guarantee), which also represents the proportional change in the value of assets that a bank can finance with a given amount of actual paid-in capital. Calomiris and Haber (2014) contend that the real value of double liability was that the contingent nature of double liability offered a guarantee to bank creditors and freed up capital to be used in alternative (nonbank) investments.

Adoption of double liability

Before moving forward with analyses of the effects of double liability on shareholder and bank behaviors, it is useful to understand why and when states adopted double liability. Moreover, if the adoption of double liability was an endogenous response to bank risk taking itself, any attempt to identify its effects will be compromised. Despite its importance, the antebellum origins of double liability in banking are barely explored and have a considerably more complex history than has been previously acknowledged. Table 1 summarizes the state of the literature on the adoption of double liability prior to 1860.

< Table 1 about here >

Beginning in the 1800s and 1810s, several states imposed double liability on chartered commercial banks. Pennsylvania adopted double liability in 1808, but returned to single liability in 1810. In their earliest incarnations, three New England states imposed double liability only in

the case of bank mismanagement, but Rhode Island in 1833 moved to unlimited liability regardless of cause. New York, like Ohio, Pennsylvania and Vermont imposed some form of extended liability, but when the law proved unpopular it was quickly rescinded. In 1829 New York eliminated double liability in favor of state-sponsored banknote insurance. It reinstated double liability in 1850. Indiana (1851), Massachusetts (1850), New Jersey (1851), Ohio (1851), Virginia (1851) and Wisconsin (1852) adopted double liability coincident with the adoption of free banking or liberalized chartering. Pennsylvania and Massachusetts modified their rule in 1850 such that shareholders were doubly liable but only for a bank's note issues not its other debts. It is obvious that the rule was in flux in the first half of the nineteenth century. Political and regulatory concerns led to alternative rules across states and changes within states over time.

Dodd (1948, p.1377) could not identify any pattern in the patchwork of states that adopted unlimited liability in manufacturing, but several testable hypotheses have been advanced to explain the adoption of double liability for banks. In his history of the American Whig party Holt (1999, p. 77) contends that Democratic opposition to New York's free banking law followed less from the law's antimonopoly approach than to its failure to hold shareholders individually liable. Vincens (1957) argued that double liability was adopted mostly to protect depositors because noteholders were insured by the bond security clause in the free and national banking acts. Grossman (2007) finds that, in the early twentieth century, more commercially developed states and those in which the costs of bank failures were expected to be relatively large were more likely to impose double liability. Michener and Jaremski (2015) also emphasize the growing importance of deposits relative to banknotes, and as an alternative to effective bank supervision.

To determine which factors are correlated with the adoption of double liability, a discrete time hazard model is estimated in which the dependent variable is a dichotomous variable measured at five-year intervals beginning in 1830 that equals one if a state adopted double liability in the previous five years and zero otherwise. All other variables are also measured at five-year intervals. The analysis starts with 1830 because discrete-time hazard models assume a common start date and 1830 was the earliest year for which data is available for a large enough number of states to conduct the test. The analysis proceeds as if a state "died" in the post-1830 year in which double liability was instated. If a state adopted double liability prior to 1830, it is excluded from the analysis. The exceptions are Massachusetts, Rhode Island, and Maine because

mismanagement could be difficult to prove and, even if proved, it might take years of court hearing before that determination was made. If creditors anticipated delayed recoveries the value of double liability was reduced.

The choice of independent variables to explain adoption follows the literature. States with more banks per capita are more likely to suffer from the failure of a systemically important bank than states with fewer banks, so the regressions include the number of banks per 1,000 inhabitants. Total assets or capital may better capture the size of a state's banking sector, but bank reports are incomplete in many (mostly earlier) years, and Comptroller of the Currency's (1876) and Weber's (2015) census of banks provide quality counts of the number of banks. Additional controls include deposit-to-circulation ratio, which will capture the relative importance of deposits to banknotes in the adoption of double liability. Four indicator variables are also included: free banking, which equals one in years in which free banking was in effect; branch banks, which equals one in those states in which branching as allowed (Indiana, Ohio, Tennessee, and Virginia); states in which all or much of bank capital was state-owned (Indiana and Ohio); and bank failures, which is a crude measure that equals one if the state experienced a bank failure in the five years prior to the year of observation. Because the branch and state-owned variables are highly correlated, three regressions are estimated: one each with either state-owned or branch and one with both. Finally, the regressions include bank leverage (assets to equity) ratios to test for whether double liability laws were enacted endogenously to this measure of bank risk taking. If so, it reveals a threat to the identification of the hypothesized reverse effect, or that double liability induced changes in shareholder and bank management behaviors.

< Table 2 about here >

Table 2 reports the summary statistics of the variables, as well as the estimated average marginal effects of three discrete-time hazard regression specifications. Consistent with Grossman (2007), states with more banks per thousand inhabitants were more likely to adopt an extended liability rule. And consistent with Holt (1999), free banking and double liability were correlated. Free banking states were 17 percent more likely than chartering states to adopt double liability. The positive coefficient on the deposit-circulation ratio also supports the contention that

double liability was adopted as deposit banking spread. Importantly for the analysis to follow, states with more levered banks were not significantly more likely to adopt double liability.

The results reveal a previously unappreciated feature of free banking, namely, that free banking laws were designed to offer multiple protections to bank creditors. The much-discussed bond collateral feature explicitly protected note holders, more so after the laws were revised to eliminate the profits of arbitraging bonds into currency (Rockoff 1974; Rolnick and Weber 1982). The protections offered the banks' other creditors through double liability has gone unremarked and points to a fruitful line of further research into its ability to protect non-noteholding creditors through reduced risk taking and post-failure assessments.

Double liability and bank shareholdings

Few state bank regulatory authorities reported individual shareholdings, but it is possible to assemble such information from bank histories, legislative reports, other contemporary sources, and archives. Most of the data used here come from one of three sources. First, state legislative committees, including New York and Pennsylvania, gathered data on the original shareholders, or those subscribing to and paying for shares at the bank's opening. Legislative committees gathered the information to determine whether share subscriptions had been allocated according to the conditions imposed by law. The data includes 32 newly chartered Pennsylvania banks (1814-1815) and 12 newly chartered New York banks (1831-1832). Together, these represent less than 10% of the sample, and the regressions reported below include dummy variables to capture any systematic differences between newly chartered and more seasoned share holdings.

A second type of records included in the dataset is shareholder lists compiled by state bank commissioners or legislative committees following a financial crisis. Michigan, for example, collected information on bank shareholdings for its banks in 1840-1841 following a panic and suspension of specie payments. Ohio collected similar information in 1854 after a localized panic. It is not clear how a panic might influence reported shareholdings, if at all. If panics were of the sunspot variety described by Diamond and Dybvig (1983), existing shareholders were unlikely to have sold out ahead of the panic. Fortunately, Ohio's 1854

investigating committee collected and reported information on shareholdings in 1849 (pre-panic) and 1854 (at the outset of the panic) and found them to be relatively stable. Regressions also include a Panic dummy variable to capture any differences in shareholdings due to financial crises. The variable, however, is more likely to capture some feature or concern of the regulatory authority requesting the information than about how shareholdings changed in response to a panic. Regulators concerned with wide ownership, for example, may have requested shareholder lists to determine if concentration increased because small, less sophisticated shareholders sold out during a crisis.

The third and most useful sources of shareholding information are legislative or bank commission reports that provide information for all banks in a state at a point in time. Among the data used here, Indiana, Massachusetts, Maine, New Hampshire, New York and Wisconsin published some type of regular shareholder information. Maine published annual shareholding reports in the 1840s; New York in 1826, 1831 and 1832, and Wisconsin between the mid-1850s and the mid-1860s. Massachusetts (1858 and 1860) published only the number of shares held by the largest shareholder, which is less useful than complete lists but provides information about the concentration of share ownership. In the 1850s New Hampshire reported only the total number of shareholders, which also provides some useful information on the dispersion of shareholdings.[2]

< Table 3 about here >

Table 3 provides summary statistics on bank shareholdings for 610 banks that operated between 1810 and 1864. Column 1 reports statistics for the full sample; columns 2 and 3 divide the sample by liability rule. Before discussing the shareholding measures, bank age and year of observation are both smaller, on average, for single liability than double liability banks. These are features that are particular to this sample because the single liability sample is dominated by banks chartered in New York in the late 1820s and observed in the 1830s and Pennsylvania banks chartered and observed in the 1810s.

By modern standards, early American banks were closely held corporations with 92 shareholders, on average. It is apparent, however, that double-liability banks had just 14% as

[2] A complete list of sources is provided in Bodenhorn (2015).

many shareholders as single-liability banks. The contingent liability (or being short a callable bond) associated with double liability seemingly dissuaded at least some prospective shareholders from investing in banks. Double liability is also associated with greater shareholder concentration, whether measured by the fraction of shares held by the largest shareholder or the five largest shareholders. The largest shareholder held, on average, 9% of shares at single-liability banks, but 23% of shares at double-liability banks. Similarly, the five largest shareholders at single-liability banks owned 28% of shares compared to 62% at double-liability banks.

The greater concentration of shareholdings at double-liability banks is consistent with Hansmann and Kraakman's (2000) contention that extended liability tends to increase the costs of shareholders monitoring managers and creditors monitoring shareholders. Double liability altered the investment calculus for investors because the contingent call placed more of the investors' net worth at risk, so they would have been more interested in the daily goings-on at the bank. Double liability also changed the calculus for creditors because they now had to monitor not only a bank's managers and its capital accounts, but the net worth of its shareholders. It was less costly for creditors to monitor a few, high net worth investors than a large number of middling investors. For the bank to issue debt at competitive rates, it had to limit its shareholdings to fewer, presumably higher-wealth individuals whose net worth was more readily observable.

It is interesting, as well, to consider whether double liability was associated with different types of shareholders. The data afford the opportunity to explore whether alternative regimes were associated with differences in the fraction of shares held by individuals sharing a common surname, which proxies for family block holdings. The variable *Common* is the fraction of shares owned by people sharing a surname with at least one other shareholder. It is designed to capture the possibility that a small group of families might, through their combined voting power, control a bank and its risk-taking and leverage policies. If the family held a sufficiently large fraction of shares they could elect a board of directors that would implement policies preferred by the controlling families. Consider, for example, the Commercial Bank of Philadelphia, at which individuals with the surname Pleasants held 1,212 shares, the Bayards held 348 shares, the Carrolls owned 410 shares and the Schotts owned 204 shares. These four families, along with others with common surnames holding smaller stakes, held nearly 62% of the bank's shares. The

univariate comparison in Table 1 reveals that the 5 percentage point difference in *Common* between single- and double-liability banks is barely significant at conventional levels (p-value=0.09), and is about one-fifth the standard deviation in the variable. It is possible then that not only were shareholdings more concentrated at double-liability banks, but they may have been more likely to fall under sway of a controlling family block.

A second measure designed to capture systematic differences between single- and double-liability banks is the fraction of shares held by unaffiliated women and children, which is defined as female and child shareholders *not* sharing a surname with an adult male shareholder.[3] Contemporaries considered shares of established, well-managed banks as appropriate investments for the support of widows, spinsters and orphaned minors. Bank shares had fairly consistent dividend yields, which made them attractive investments for trusts. How double liability affected a share's attractiveness is ambiguous. On one hand, the potential to be assessed in the event of bank failure could have catastrophic consequences for a trust designed to support a beneficiary, which would have diminished its attractiveness. On the other, if double liability encouraged a bank's managers to hold less risky portfolios, the rule may have made shares more attractive, so long as returns were sufficient to support the beneficiary. The univariate comparison in Table 3 reveals that unaffiliated women and children held a larger fraction of shares in double-liability (3.3%) than in single-liability (1.8%) banks.

The shareholding data are used to investigate whether an association exists between double liability and the various shareholding measures, after controlling for other features likely to influence the concentration or composition of shareholding. Specifically, ordinary least squares (OLS) regressions of the following general form are estimated:

$$\text{Shareholdings}_{it} = \beta_0 + \beta_1 \text{ Double Liability}_{it} + \beta_x X_{it} + \varepsilon_{it}$$

where i indexes banks and t indexes years. X is a vector of bank-specific control variables likely to influence shareholdings independent of the liability rule. These include a bank's age, the year observed, whether the bank is a free bank rather than a chartered bank, whether it was a new bank in Pennsylvania (1814-1815) or New York (1831-1832), whether the shareholdings were

[3] Women and children sharing a surname with a male shareholder are excluded from this measure because some families may have divided shares among family members in order to maximize voting power in graduated-voting banks.

observed immediately prior to a financial crisis, shareholder voting rights, and the natural logarithm of the population of the city or town in which the bank was located.

Bank age (in years since establishment) is likely to influence share ownership because shares change hands and holdings may become either more or less concentrated over time. Helwege, Pirinsky and Stulz (2007) find that most modern firms begin with relatively concentrated shareholdings that become more dispersed over time. The controls for new banks in Pennsylvania and New York are also included to capture a localized age effect because both states wrote into their banks' charters restrictions on subscriptions designed to limit concentrated holdings. The rules were more effective in Pennsylvania than in New York so separate dummy variables are included in the regressions (Bodenhorn 2006).

A free banking variable is included to capture any effect of liberalized bank chartering after 1836. Free banking laws were among the nation's first general incorporation laws that made incorporation an administrative procedure rather than legislative prerogative. Because most states modeled their laws on the 1838 New York act, with the exception of the collateral securities eligible to secure note issues, the laws are similar. The issue is how to interpret a free banking coefficient against the alternative of chartered banking, which is often portrayed as a complex, individualized negotiation between bankers and legislators. Bodenhorn (2011) finds, however, that by the 1810s charters contained common features and the boilerplate concerning charter features -- proxy voting at annual elections, limits on non-financial assets, debt limits, note redemption requirements, interest rate ceilings, that directors had to be citizens of the state and determined executive compensation -- used similar language across states and over time. Free banking laws included most of the same clauses. The four features that were open to negotiation or differed across states among the banks in the data were the number of directors, whether shareholder elections followed a one share-one vote or a graduated voting rule, minimum capital, the dollar denomination of shares, and shareholder liability. With the exception of the number of directors and share denominations, the regressions control for the features that differed across states (double liability and voting rules) or banks (capital). One critical difference between charters and free banking rules is that free banking laws did not place any limit on the number of shares or shareholders or the concentration of shareholdings within a bank, so it is important to control for free banking in a share concentration regression.

Alternative voting rights also had profound effects on the concentration and composition of shareholdings. Nineteenth-century banks operated under either of two share voting regimes: straight or one share-one vote rules; or graduated voting in which votes per share declined in the number of shares owned. Hilt (2006) and Bodenhorn (2014) contend that graduated voting rules protected minority shareholders from majority shareholder tunneling or other forms of self-dealing behavior. Graduated voting is associated with less concentrated shareholdings and with a larger fraction of shares owned by individuals sharing surnames. New York, Ohio, Indiana and Wisconsin banks operated under one share-one vote regimes; all other states imposed some form of graduated voting.

City and town population (linearly interpolated between census years) is included to capture the effect of local market size on shareholding. More populous towns, ceteris paribus, presented prospective bank incorporators with more potential investors.

< Table 4 about here >

Table 4 presents estimated coefficients from four OLS regressions with clustered standard errors. The dependent variables are four measures of concentration – log shareholders, fraction of shares held by largest single shareholder, fraction of shares held by women and children, and fraction held by individuals with common surnames. The regressions appear to be well specified; the included regressors account for 50 to 70 percent of the variation in the dependent variables and many of the regressors are individually statistically significant. Banks operating under graduated voting rules, banks in more populous towns, and banks observed in later years have more shareholders, less concentrated shareholdings, more female shareholders and banks with a larger fraction of shares owned by family groups. Free banks and banks observed around a panic are associated with fewer shareholders and less concentrated shareholdings, though the effects are small on female and family shareholdings. Pennsylvania's efforts to spread share ownership were more effective than New York's, which is consistent with Bodenhorn's (2006) finding that initial share allocations were corrupted by New York's Jacksonian-era Democratic legislators. Because these are cross-sectional OLS regressions, the results cannot be interpreted as causal; they are, however, consistent with prior expectations.

The variable of current interest, of course, is the effect of double liability on bank shareholdings. The OLS estimates point to double liability having a profound effect on shareholdings. The estimate in Column 1 (log of shareholders) implies that double liability banks had just 12.5 percent as many shareholders as single-liability banks. Subsequent columns report estimates that suggest that the largest shareholder at double-liability bank held a 27.3 percentage point larger stake than the average largest shareholder in a single-liability bank. Women and minor children shareholders at double-liability banks held a 3 percentage point lower fractional stake and family blocks about 10 percentage points less than at single-liability banks.

The effect of double liability on shareholder concentration observed here are consistent with the effects of liability rule changes in Irish banking in the nineteenth century. Acheson and Turner (2006) find that the number of shareholders increased five-fold after the introduction of limited liability, and Hickson, Turner and McCann (2005) find that moving from unlimited to quadruple liability doubled the number of shareholders and share ownership was significantly more diffuse. The move from double to single liability was a less pronounced change than was the change from unlimited to quadruple liability, so the magnitude of the single to double effect is smaller, but the direction of changes found in nineteenth-century Irish and American banking are the same.

One of the purported advantages of limited liability is that it alters the calculus of potential investors. Under limited liability, investors are free to diversify because the decision of which firms or industries to invest in is divorced from the decision of who to invest with. Unlike unlimited liability, limited liability makes one shareholder's outside wealth irrelevant to the investment decision of others. A priori it does not appear that double liability should alter that calculus. Creditors need to be concerned with the ability of shareholders to meet a contingent call, but there is no obvious reason why shareholders should concern themselves with the identities of other shareholders. An exception arises, however, if there are diseconomies in creditor monitoring. The benefits of lower funding costs that flow from double liability may be eliminated if the costs to creditors of determining the financial capacities of dozens (or scores, or hundreds) of shareholders outweigh the incrementally larger expected recovery in the event of failure. The double-liability guarantee is meaningless if shareholders are unable to meet calls or if creditors are unable to analyze shareholder net worth so the credit cost advantage accrued only to those banks whose creditor monitoring costs were relatively low. The cost advantages may

have accrued mostly to banks with fewer and more concentrated shareholdings, which would be consistent with the results.

Double liability, share liquidity and debt pricing

Alchian and Woodward (1987; 1988) and Bargeron and Lehn (2014) argue that one advantage of the modern corporation is the ready transferability and liquidity of shares. If shareholders have different beliefs about optimal strategy or policy, including how much risk to take on, shareholders who disagree with current or expected future strategy can exit ownership through sale of shares without disrupting the firm's operations. Ready transferability arises from the fact that a firm's value is independent of the personal wealth of its owners, a feature Alchian and Woodward label "anonymity." Anonymity follows from limited liability. If shareholders are individually liable for a firm's debts, creditors and shareholders would invest in gathering information about the wealth of each shareholder. Creditors and shareholders would also invest in mechanisms that discourage relatively wealthy shareholders from transferring shares to relatively impecunious shareholders, because the transfer from the more to the less wealthy increases the potential liability of remaining shareholders and leaves creditors with less security. Thus, shares of unlimited liability firms tend to trade less freely than shares of limited liability firms.

As discussed earlier, double liability changes the incentives of creditors as part of the security offered them is the potential assessments in the event of default. Creditors will invest in information on shareholders' wealth. Double liability does not change the anonymous nature of shareholders among the shareholders themselves. Double liability is still limited and, in the event of failure, assessments are independent of a shareholder's outside wealth. Double liability then should have no consequential effect on the trading and liquidity of shares even if, as the previous section shows, it diminished the attractiveness of shares to at least some types of potential shareholders.

< Table 5 about here >

To investigate whether the change from single to double liability had any effect on share liquidity, information was gathered on weekly bid-ask spreads of shares of New York banks trading on the New York exchange in the years immediately preceding and the immediately following the imposition of double liability. Table 5 reports average spread, its standard deviation and the number of observations for 14 New York City banks for which there were 15 or more simultaneous bid and ask quotes (in some weeks only a bid or an ask quote was reported; in some weeks neither was quoted) during the pre- and post-double liability periods (Sylla, Wilson and Wright 2016 report no quotes for 1849). Bid-ask spreads for three banks experienced a statistically significant increase, but the mean spread between the two periods increased little from 1.72 to 1.80 percent. In addition, the percentage of weeks in which quotes were reported (which may proxy for trading activity) increased slightly after the imposition of double liability from 24.5 to 32.7 percent of weeks. The currently available evidence is consistent with the hypothesis that double liability will not undermine the liquidity benefits of anonymity in share ownership.

A related question is how bank creditors responded to the imposition of double liability. If double liability has its desired effect, large block shareholders will prefer that the bank assume less risk and will invest relatively more to monitor management's risk-taking (Wagster 2007). If creditors consider shareholder monitoring to be effective and credible, creditors can reduce their monitoring at least in those dimensions in which creditor and large-block shareholder monitoring would be redundant. Kane and Wilson (1998) argue that creditors effectively compensate large-block monitors by accepting lower rates of return from banks with effective monitors. Depositors will accept lower interest rates on accounts; and if banknotes carry lower default risks under double liability, note holders will demand lower returns, which will be manifested in smaller banknote discounts.

Discounts on New York banknotes cannot be used to explore this possibility because country banks were required to hold redemption balances in Albany or New York City, and redemption agents redeemed notes at a fixed discount. Pennsylvania imposed no such requirement on its country banks, however. In 1848/49 the mean discount on the notes of 28 country banks with regular price quotes in Weber's (2016) data set transcribed from a contemporary banknote reporter was 0.82 percent. Pennsylvania's 1850 double liability law imposed extended liability on note issues only resulted in a decrease in the mean discount to 0.66

percent. An ordinary least squares regression (results not reported) of banknote discounts on the natural log of paid-in capital, cash, and circulation, as well as either bank or location fixed effects imply that the post-double liability discount was between 0.15 and 0.20 percentage points lower (p-value between 0.03 and 0.06). Evidence from the banknote market is consistent with the theoretical implications of the monitoring hypothesis. Whereas unlimited liability is predicted to decrease share liquidity, double liability is not expected to have an effect (Bargeron and Lehn 2014). The evidence from New York bid-ask spreads suggests it did not. Additionally, double liability is predicted to increase the quality of shareholder monitoring, which is predicted to reduce the returns creditors demand for holding debt. The change in banknote pricing is consistent with the limited evidence from antebellum banknote markets.

Liability regime and bank leverage

Another issue of interest with respect to shareholder liability is whether and how bank owners having more "skin in the game" influence a bank's choice of leverage (Michener and Richardson 2013). It is informative to exploit changes in Rhode Island's and New York's liability rules to understand how double liability altered bank behaviors. In 1833 Rhode Island changed its liability rule from double liability in cases of mismanagement to unlimited liability (see Table 1). It is not clear what motivated the change, but L. Carroll Root (1895 p. 263) attributes it to the failure of the Burrillville Bank in October 1831. The bank's noteholders were paid in full, but only after a years-long delay. It does not appear that the change in stockholder liability was an endogenous regulatory response to changes in bank behavior as the bank leverage ratio (assets / equity) did not increase between 1828 and 1832. The New York change came about during the state's 1846 constitutional convention. Near the end of the convention, a delegate proposed a clause to impose double liability on the banks, which was adopted after a brief debate. Although the clause was included in the 1846 constitutional revision, it did not go into effect until January 1, 1850, which provided a period for the banks to prepare for the change. The change appears to have been motivated by Democratic beliefs that the rule should have been incorporated into the 1838 free banking law (Holt 1999). The Whig majority in the New York assembly 1838 passed a bill without double liability. The Democratic majority at the convention prevailed and it was adopted.

It is reasonable then to approach the changes in liability rules like a treatment effect on a group of treated banks where the rule change was not an endogenous response to rising leverage. If we assume two groups of banks indexed by treatment status T = 0, 1 where T=0 indicates banks not treated (i.e., the control group) and T=1 indicates treated banks. If the two groups are observed in two time periods t=0,1, where t=0 indicates the period prior to change in regime and t=1 indicates the period after the change in regime. Banks are observed pre- and post-treatment and indexed by i=1, 2, 3, …, n. Using this notation we can write the standard difference-in-difference estimator as:

$$Y_i = \alpha + \beta\, T_i + \gamma\, t_i + \delta\, (T_i \times t_i) + \varepsilon_i$$

where α is a constant term; β is the treatment group specific effect, which accounts for permanent differences in the average realization of Y between the control and treatment groups; γ is the effect of a time trend common to the treatment and control groups; and δ captures the effect of the treatment on the treated, which is simply the product of the treatment dummy and post-treatment time dummy.

Double liability is expected to alter a bank's risk taking (Macey and Miller 1992; Grossman 2001). The issue is how best to measure it. Lacking individual-level loan records, this study adopt a standard measure of bank risk taking as an indicator of changing preferences toward risk before and after enactment of the double liability law, namely the leverage ratio. The asset-to-capital ratio (defined here as total assets divided by paid-in capital plus retained earnings) is a common metric of risk taking because it reflects the capacity of the bank to sustain losses on its loan portfolio borne by shareholders. Lower ratios imply that shareholders are assuming relatively more failure risk relative to creditors; higher ratios imply that creditors are assuming relatively more default risk (Mitchener and Richardson 2013).[4]

The unbiasedness of the difference-in-difference estimator rests on three assumptions: that the additive nature of the estimating equation is correct; that the expected value of the error term is zero; and that the error term is uncorrelated with either the treatment or the time variable.

[4] Other measures proposed in the literature to measure risk include: debt/(debt+equity) (DeAngelo and Stulz 2013), which captures the banker's problem of transforming fixed-dollar denominated debts with equity subject to repricing; retained earnings / equity (Bøhren, Josefsen and Steen 2012; Jensen 1986), which captures the tension between managerial preferences for free cash and shareholders' preferences for dividends; and equity/demandable debt (Evans and Quigley), which captures a bank's ability to accommodate unexpected withdrawals. Exploratory regressions using these dependent variables finds no consistent effect for any of the three alternative measures. The failure to identify an effect for these measures suggests that double liability encouraged bankers to be more concerned with long-term solvency than short-term liquidity. Solvency was more about leverage than reserve ratios or cash flows.

Two concerns with the last condition are relevant here: zero correlation between the error and the treatment and/or the time variable. First, because there was a lag between enactment and the onset of the treatment in New York, we need to reasonably confident that no other confounding event or regulatory intervention occurs between pre- and post-treatment for either the control or treatment group. Second, we need to be confident that the time (or trend) variable is not capturing some other feature of bank leverage that would be captured in the error term.

Discussions in Knox (1903), Dewey (1910), annual acts of state assemblies, and constitutional conventions for several states reveal that it is no trivial matter to find a reasonable control group for which no new meaningful regulations were imposed in the interval between 1845 and 1850. New York did not issue any new regulations during this period. New Jersey's banking regulations remained unchanged between 1812 and 1850, when the state enacted a free banking that included a double liability clause but only for free, not existing chartered banks (Knox 1903, p.434). According to Weber's (2015) bank census no free banks entered before early 1851, so New Jersey might serve as a reasonable comparison group and no New Jersey free banks are included in the sample. Moreover, the introduction of free banking did not elicit a leverage response from New Jersey's chartered banks. Between 1847 and 1850, leverage in New Jersey rose modestly from 2.44 to 2.56 (p-value = 0.51) compared to New York in which leverage increased from 2.43 to 2.84 (p-value 0.00). The unconditional difference-in-difference estimate implies that double liability increased bank leverage in New York by 27.5 percentage points.[5]

One point of concern, however, is that New Jersey did not have a regional financial center on par with New York City. For that reason, I also use Pennsylvania as a control group. The only change in Pennsylvania's banking regulations in this period involved a change to partial-double shareholder liability in 1850, but it was less sweeping that New York's change. Pennsylvania's law imposed double liability only for a bank's note issues. That is, if a Pennsylvania bank failed its shareholders faced an assessment equal to any shortfall between the recovery value of its assets and its outstanding notes, up to the par value of the shares. Despite the effect of the regulatory change on the pricing of banknotes, it generated relatively trivial

[5] The unconditional difference-in-difference calculation is defined as:

$(DD = [L_{ny,\,1850} - L_{ny,\,1845}] - [L_{nj/pa,\,1850} - L_{nj/pa,\,1845}])$

changes in note-issuing behavior. Between 1849 and 1851, for example, the mean circulation-to-debt ratio increased from 0.493 to 0.514 (p-value = 0.66) and the mean circulation-to-deposit ratio fell from 2.474 to 2.442 (p-value = 0.95). The new regulation did not alter its leverage ratios either, which increased from 2.82 in 1845 to 2.84 in 1850 (p-value = 0.87). Leverage at New York's banks over this interval, by comparison, increased from 2.55 to 2.84 (p-value = 0.013). The unconditional difference-in-difference effect of the differential effect of imposing full double liability on New York banks relative to partial double liability on Pennsylvania banks was to increase leverage in New York by 26.1 percentage points.

In determining whether the change in Rhode Island's bank law from double liability in cases of failure due to mismanagement to unlimited liability for all closings had any effect, Maine is used as a comparison group. Both states operated within the Suffolk system of banknote clearings, or an endogenous private regulatory system designed to rein in banknote issues by country banks in Boston's periphery. Moreover, prior to Rhode Island's adoption of unlimited liability, both states operated under a common rule of double liability but only if creditors could demonstrate that failure followed from mismanagement. A complicating factor for the Rhode Island-Maine comparison is the timing; the early 1830s were a turbulent period for banks. Jacksonian Democrats ran on a platform opposed to the Second Bank of the United States, and after assuming office Jackson ordered government deposits removed from the Bank and redistributed to state banks managed by Democrats supportive of Jackson's agenda, which instigated a banking panic in autumn 1833 (Temin 1969; Jalil 2015). Banks naturally contracted in response. The bank leverage ratio in Rhode Island declined from 1.53 in 1831/32 to 1.47 in 1833/34 (p-value = 0.19) compared to the decline in Maine from 2.02 to 1.76 (p-value = 0.01). The unconditional difference-in-difference estimate implies that, relative to Maine, leverage in Rhode Island declined by 20.3 less basis points; that is, relatively Rhode Island leverage increased despite the panic.

A second point of concern with estimating difference-in-difference effects is that many states did not collect bank balance sheet information in the same month or even the same quarter. Bodenhorn (2003) reports a strong seasonal component to loans and to note issues surrounding the crop cycle, such that loans and note issues peak in the late autumn and early winter. So simply choosing pre- and post-treatment balance sheets from any point in the year could lead to a violation of the third assumption (the zero correlation between the error term and the trend

component). Thus, unless control and treatment group data are taken from the same season any estimated difference-in-difference effects may be driven as much by seasonal changes in balance sheet ratios as by changes resulting from the treatment. The restriction that the treatment and control group data be drawn from the same quarter further restricted the choice of potential control years to 1847 for the New York-New Jersey pre-treatment date (New York banks reported in February 1847; New Jersey banks reported in January) and 1850/51 for the post-treatment date (New York banks reported in December 1850; New Jersey in January 1851). The month-year requirement restricts the New York-Pennsylvania comparison to 1845 (NY and PA reported in November) and 1850 (NY reported in December, PA reported in November).

Table 6 reports difference-in-difference regression coefficient estimates for Rhode Island relative to Maine for the two years prior (1831/32) to the imposition of unlimited liability and the two years after (1833/34). Column (1) reports the basic regression with no additional controls and the estimated effect of the switch to unlimited liability was to increase bank leverage in Rhode Island by 20.3 percentage points relative to Maine. Column (2) includes an indicator variable to control for a differential Providence city effect because Maine had no comparable city. Controlling for Providence yields a comparable effect of a 20.6 percentage point increase in leverage. Given that the coefficients reported in Columns (1) and (2) may be subject to omitted variable bias, Column (3) estimates the regression using city or town fixed effects to capture the effects of local phenomena that may have influenced bank leverage. The estimated effect of unlimited liability is about half the size of the estimates reported in Columns (1) and (2) and is not significant at standard criteria (p-value = 0.20), but fixed effects estimates are subject to attenuation bias (Aydemir and Borjas 2011).

Given that Rhode Island banks operated with a mean leverage ratio of 1.53 in 1831/32, the unconditional difference-in-difference estimate implies that Rhode Island banks financed an average of 13 percent (= 0.203/1.53) more assets per dollar of shareholder equity than Maine banks after the adoption of unlimited liability. Recall, as well, that the coefficient may also be interpreted as the value of the expected contingent call, or the product of the expectation of a call and the expected fraction of an assessment to be recovered. Creditors discounted the contingent call, but not by as much as might be expected during a period of financial instability.

The first three columns of the upper panel of Table 7 report the regressions that compare New York and New Jersey for the autumn of 1847 and 1850, which was after the New York

constitutional convention changed the liability rule in 1845 and ten months after the law went into effect in 1850.[6] Difference-in-difference coefficients in the first three columns are between 0.245 and 0.275, depending on specification.[7] Relative to New Jersey's banks, New York's banks increased their leverage by about 25 percentage points, or about 10 percent of the New York mean leverage ratio prior to the regulatory change. Column (4) reports the results from a regression that includes bank location (city or town) fixed effects to capture local phenomena that may have affected leverage. The estimates are about three-fifths as large and imprecisely estimated, though attenuation bias remains a concern. Column (5) provides the difference-in-difference estimate using Pennsylvania as a control group. These estimates suggest that the mean leverage ratio in New York increased by between 24 percentage points relative to Pennsylvania. That is, a given value of on-balance sheet shareholder equity financed about 11 percent more assets after the institution of double liability. The contingent, callable capital allowed New York's banks to increase by a substantial amount the value of assets supported by a given capital, but by less than the face value of the contingent call. This raises questions about the ex ante credibility of double liability.

Was double liability credible?

If double liability was credible in the sense that bank shareholders and creditors believed that court-appointed receivers would diligently pursue shareholder assessments and would be able to recover assessments in a timely fashion. One measure of the credibility of double liability then is whether it induced bank shareholders and managers to close and liquidate voluntarily before loan losses exhausted shareholder equity and the need for assessments. In April 1855, *Bankers Magazine* commented favorably on Massachusetts' double liability law, noting that

[6] The sample is restricted to banks with a leverage ratio less than 8. Errors in the New York data generated leverage ratios as high as 150, which are surely the result of reporting or data entry errors. Some errors were readily corrected (e.g., capital reported as 30,000 rather than 300,000), but others were not and were dropped. The results are nearly the same if the sample if restricted to banks with calculated leverage less than 4, 6, or 10. The sample is not balanced, in that it includes all banks operating before or after the regulatory change. Use of a balanced panel of only those banks observed in both regimes generates quantitatively similar results.

[7] New York's existing chartered banks were required to convert to free banks when their charters expired. Because there were several banks chartered or rechartered in the 1830s with 30-year charters, they had not yet converted by 1850. Two additional alternative specifications were estimated: one with the natural logarithm of assets as a control for the size differential between New York City and Philadelphia banks relative to country banks; and a second with both log assets and city dummies. The estimated coefficients are similar in magnitude and significance as those in Table 7 and are not reported.

since its enactment only two banks had failed. When the Pawtucket Bank closed it fully indemnified its creditors and returned $83 per $100 par value to the shareholders. The receiver had not yet closed the books on Cochituate Bank of Boston, but it was believed that the remaining assets would fully reimburse creditors.

Using the balance sheets provided in Weber (2011), an analysis of 12 New York banks that closed between January 1850 and December 1857 finds that six closed with positive net worth (assuming that bad loans exactly exhausted shareholder equity). Of those banks that "failed," the data generate an estimated shortfall (assessment) of 50% of shareholder equity reported in the quarter prior to failure. Unfortunately, the extant data do not report what fraction of the assessment was realized by the receivers.

The second issue with respect to credibility concerns the ability of receivers to recover assessments when losses exceeded shareholder equity. In his monograph explaining how receivers should shutter different types of bankrupt firms, Edwards (1857) provides the details surrounding the resolution of the Empire City Bank of New York City, which closed in 1854. The receiver assessed the shareholders $12.12 per $100 share for an aggregate of $140,890.[8] But the shareholders' attorneys were able, through various legal maneuvers, to delay collections on the assessment for nearly three years. In September 1857, the New York court of equity terminated the case by rendering final judgment against the shareholders. No further information is provided, so it is impossible to determine what fraction of the assessment was collected.

Studies by Macey and Miller (1992) and White (2011) find that receivers collected about 50 percent of the assessments in the National Banking Era (1864-1914). Using their 50 percent value as the expected collection rate on the assessment means that depositors and other (non-banknote) creditors of the Empire City Bank received about 74 cents on the dollar. It is likely then that it took time for receivers, shareholders and creditors to learn how failed and closed banks would be resolved and to determine the expected value of bank debt. Because shareholders could delay the collections and may not have paid them in full, the expected value of the callable contingent capital was not its face value.

[8] Using balance sheet data and the price of collateral bonds (to estimate repayment rates on banknotes prior to assessment), the estimated assessment is 29% of paid-in capital, compared to the 12% actually assessed by the receiver. The bank's note holders were paid in full because the value of the collateral bonds was sufficient to redeem the bank's outstanding notes (Warren Weber, personal communication).

Overall, the evidence from New York points to double liability having a substantial short-term effect on bank leverage. Leverage increased, but by less than the full nominal value of the contingent capital call. That is, assets increased less than potential liability, which reflects on either the shareholders taste for risk or the price of credit risk imposed by monitors to reflect their increased monitoring costs, or both.

Concluding comments

The banking crises of the 1980s and the 2000s led many to conclude that modern bankers do not have enough "skin in the game" (Barth 1991; Macey and Miller 1992; Grossman 2001; Mitchener and Richardson 2013). Deposit insurance subsidies and implicit "too-big-to-fail" bailout guarantees encourage banks to operate with risk-adjusted capital ratios that free markets would make too expensive for the bankers to allow them to be profitable. Barth reports that regulatory capital at savings and loans fell to as little as 3 percent in the mid-1980s, though the Bank for International Settlements (2014) reports a baseline regulatory capital-asset ratio of 8 percent, subject to adjustments based on a bank's counterparty risks. Historically, banks not subsidized by deposit insurance and without the too-big-to-fail backstop operated with much higher ratios – the average capital-asset ratio at New York banks in 1850 was an astonishing 39 percent; in 1900 it was 14 percent (Weber 2011; New York Superintendent of Banks 1901). The modern approach to limit risk taking has generally advocated for either more regulation, especially capital regulation, or reduced subsidies, or both.

An alternative approach, and the one adopted in the Jacksonian era of small government and maintained during the National Banking era up to the New Deal reforms, was extended shareholder liability.[9] The belief then was that double liability would reduce bank risk-taking. During the Congressional debates over the National Banking Act of 1863, Senator Sherman argued that double liability "tends to prevent stockholders and directors of a bank from engaging in hazardous operations" (quoted in Grossman 2007, 62). Macey and Miller (1992), Esty (1998), Grossman (2001) and Calomiris and Wilson (2004) found that it had the predicted effects; banks subject to double liability were more closely held and held proportionately fewer risky assets.

[9] Bodenhorn and White (2015) find that the New Deal reforms led to smaller bank boards of directors and Mitchener and Richardson (2013) find that the New Deal reforms, especially deposit insurance, led to greater bank leverage.

A study of the early nineteenth century does not shed any light on the riskiness of bank assets per se, but it does show that the imposition of double liability rules altered bank behaviors and influenced shareholdings. The difference-in-difference results reveal that the imposition of double liability actually encouraged bankers to increase their (measured) leverage. Asset-capital ratios, after the imposition of double liability, increased by about one-quarter, which suggests that the extent to which bank creditors initially viewed the contingent liability as a credible guarantee. One advantage of this was that shareholders tied up less of their investment capital in bank stock, which freed it for other investments. The second notable consequence of double liability is that it was associated with less dispersed, more concentrated shareholdings. Although the shareholder data used here does not distinguish between bank insiders (e.g., presidents and directors), the higher concentration is consistent with Espy's (1998) finding that double liability was associated with high levels of inside ownership. In the early twentieth century, high inside ownership facilitated the valuation of shareholder guarantees and discouraged risk taking. The topic deserves further study, but the early nineteenth-century results point to the same effect. The expected decrease in risk taking believed to follow from double liability is indirectly evident in its effects on shareholdings, banknote prices and leverage.

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Appendix A: Selected extended liability rules by state

Florida (1843):
"…the stockholders of the Bank of Florida shall be, and they are hereby, made responsible in their private and individual capacities to the amount of three times the stock owned by each stockholder respectively, for the circulation and liabilities of said Bank, issued or created before and during the period of the ownership of such stock, or created within six months after the transfer of such stock; and if said Bank should at any time fail or refuse to discharge and pay such circulation or liabilities, an action of debt shall be maintainable against such stockholder; and where suits for the liabilities of said Bank are instituted against any one stockholder, to a greater amount than three times his stock, the judgment first obtained shall have precedence." Florida. Legislative Council. *The Acts and Resolutions of the Legislative Council of the Territory of Florida*. "An act to amend the Charter of the Bank of Florida." Tallahassee: Printed at Florida Sentinel, 1843, pp. 57-58.

Georgia (1856):
"… the private or individual property of each stockholder, as well as their joint property, shall be liable as before stated for the redemption of the bills of said Bank, and the payment of all the debts and liabilities of the same, and when any judgment shall be obtained against said Bank, and execution issue thereon, it shall be the duty of the levying officer first to levy the same on the property of said corporation, and to sell the same, and if the proceeds thereof shall be insufficient to pay off said execution, and the return of said officer of not corporation property shall be sufficient proof of the same, it shall be the duty of said officer next to levy said execution on the individual property of any stockholder, or stockholders and sell the same until an amount is raised sufficient to pay off said execution, each stockholder only to be liable for the whole indebtedness of the Bank, in proportion to the amount of his stock…" Georgia. General Assembly. *Acts of the General Assembly of the State of Georgia*. "An Act to incorporate a Bank in the City of Rome, Floyd County, Georgia, to be called the Bank of the Empire State, and for other purposes. (March 3d, 1856)." Milledgeville: Boughton, Nisbet & Barnes, State Printers, 1856.

Same or similar clauses included in charters of 18 other banks in 1856.

Indiana (1834):
Sec 101. If the bank or any branch fails due to "fraudulent insolvency," the amount remaining due to creditors after assets are exhausted will be paid equally by the president and directors.
Sec. 102. If the assets of the president and directors are insufficient to make creditors whole, an assessment will be made on the remaining stockholders up to the nominal or par value of shares held by each stockholder.

Maine (1831):
"That in the case of any loss or deficiency of the capital stock in any Bank aforesaid, which shall arise from the official mismanagement of the Directors, the persons who are Directors at the time of the mismanagement shall in their private and individual capacities be respectively liable to pay the same; and in case of their inability to pay such loss or deficiency, the persons who are stockholders at the time of such official mismanagement shall be liable in the same manner as Directors. Provided however, That in no case shall any one stockholder be liable to pay a sum exceeding the amount of the stock actually then held by him. And provided further, That the liability of such stockholder as aforesaid, shall not continue beyond the term of one year from and after the time he shall have duly transferred his stock, pursuant to the provisions of this Act.

"That the holders of stock in any Banking corporation aforesaid in this State, when its charter shall expire, shall be chargeable in their private and individual capacities, and shall be holden for the payment and

redemption of all bills which may have been issued by said corporation, remaining unpaid, in proportion to the stock they may respectively hold; Provided however, That his liability shall continue for the term of two years only from and after notice given in the newspapers, which shall publish the laws of the State, that charter has expired." *Laws of the State of Maine*, Vol. III, Chapter 519, p. 390. Portland: Thomas Todd, Printer for the State, 1831.

Maryland (1851)

"The Legislature hereafter shall grant no charter for banking purposes, or renew any banking corporation now in existence, except upon condition that the stockholders and directors shall be liable to the amount of their respective share or shares of stock in such banking institution, for all its debts and liabilities upon note, bill or otherwise." Maryland. Constitutional Convention (1851, Art. III, §45)

Massachusetts (1850)

"If any loss or deficiency of the capital stock in any bank shall arise from the official mismanagement of the directors, the stockholders at the time of such mismanagement shall, in their individual capacities, be liable to pay the same; provided, that no stockholder shall be liable to pay a sum, exceeding the amount of the stock actually held by such stockholder at that time."

"The holders of stock in any bank, at the time when the charter shall expire, shall be liable in their individual capacities, for the payment and redemption of all bills, which may have been issued by said bank, and which shall remain unpaid, in proportion to the stock they may respective hold, at the dissolution of the charter."

"Any corporation, which is or shall be a stockholder in any bank, shall be liable, in its corporate capacity, to pay any loss or deficiency of the capital stock in such bank, arising from the official mismanagement of its directors, and shall be liable for the payment and redemption of all bills, which shall have been issued by said bank, and which shall remain unpaid, when its charter shall expire…" William A. Richardson. *Banking Laws of Massachusetts*. Lowell: Merrill & Metcalf, 1855, pp. 12-14.

Angell and Ames (1871, 628) suggest that the law, as written, was ambiguous concerning the "in proportion to" clause in the 1850 act. Two subsequent cases involving the closings of the Chelsea Bank and the Nahant Bank, clarified the issue. Massachusetts' court of equity held that the legislative's intent was to impose double liability ("... each [shareholder] is severally liable in such sum, not exceeding the par value of his shares, as the amount of unpaid bills may require.") See *Crease v. Babcock*, 10 Met. 525 and *Grew v. Breed*, 10 Met 569 for the details of the court's rulings.

It appears that Massachusetts law already had protection for bill holders prior to 1850 act. In *Smith v. Hurd et* al (371 Mass 1849, at 372), the Massachusetts high court wrote: "if the capital is lost by the official mismanagement of the directors, the stockholders are by law made answerable for it, and that, when the charter is annulled or expires, they are liable also for the redemption of all outstanding bills."

New Jersey (1851)

"… whenever default shall be made in the payment of any debt or liability of any association under this act, the stockholders of such association shall be individually responsible, equally and ratably; such responsibility to be enforced as herein after provided for the amount of such debt or liability, with interest, to the extent of the amount of their respective shares of stock in any such association. "An Act to Authorize the Business of Banking," *Acts of the Seventy-Fourth Legislature of the State of New Jersey* (1850).

New York (1846, in effect in 1850)
"The stockholders in every corporation and joint-stock association for banking purposes, issuing bank notes or any kind of paper credits, to circulate as money, after the first day of January, one thousand eight hundred and fifty, shall be individually responsible, to the amount of their respective share or shares of stock in any such corporation or association, for all its debts and liabilities of every kind contracted after said first day of January, one thousand eight hundred and fifty." Article VIII, §7, Constitution of the State of New York (1846).

Ohio (1851)
Sec. 24 "Individual liability of stockholders in proportion to stock when bank fails to redeem [banknotes]."
Sec. 25 "Where bank is owned by less than 6 stockholders they individually liable for all debts and liabilities of bank." Charles Clifford Huntington, *A History of Banking and Currency in Ohio before the Civil War*. Columbus: F. J. Herr Printing Company, p. 272.

Pennsylvania (1850)
"The stockholders of every such bank, in addition, to the corporate liability, shall be jointly liable to the creditors of the said bank, being note-holders, in their individual capacities, for the amount of the notes issued; and in manner of enforcing such liability shall be as follows: in case the said bank shall violate the provisions of this act, so as to forfeit its charter, or become insolvent and in failing circumstances by reason of the mismanagment of its affairs, and is compelled to make an assignment under the provisions of this act, the assignees so appointed shall proceed to make a fair and equitable appraisement of the assets of the said bank of every description, at their cash value; and also to make a list of all the debts due by the said bank, and if it shall appear that the assets are insufficient to redeem the notes in circulation, the stockholders of the said bank shall be liable to make up such deficiency, in proportion to the respective amounts of stock held by each, at the time such assignment is made." *Laws of the General Assembly of Pennsylvania passed at the session of 1850*, Ch. 322 (p. 490). Harrisburg: Theo. Penn & Co., Printers to the State, 1850.

Rhode Island
(1791)
Charter of the Providence Bank afforded stockholders limited liability, as did subsequent charters.

(1822)
Beginning with charter of Hope Bank of Warren, charters limited the liability of stockholders "only in case none of the directors had violated the provisions of the laws relating to banks." (L. Carroll Root, (1895) "New England Bank Currency," *Sound Currency* 2(13); 263.

(1828)
Stockholders retained limited liability except in cases of directors violating the banking laws. The state further refined the law in that stockholders could be sued in their individual capacity only after corporate property was exhausted. Root, ibid, p. 263.

(1833 new and renewed charters):
"... that the stockholders of said corporation shall be personally and individually liable for all debts due from said bank: Provided, that the corporation be first sued, and the corporate property be first exhausted

in payment of the debts of the corporation." "An Act to Incorporate the Stockholders of the Coventry Bank." *Rhode Island Acts* (June 1836, pp. 9-10).

"... the stockholders of the said bank shall be personally and individually liable for the debts due from said bank, in case of fraud or embezzlement, or violation of any of the provisions of the act relating to incorporated banks and insurance companies, and for other purposes therein mentioned; Provided, the corporation first be sued, and the corporate property and effects exhausted in the payments of said debts." "An Act to incorporate the Traders Bank." *Rhode Island Acts* (June 1836, p. 102).

South Carolina (1826):
"… the said private [non-state of South Carolina] stockholders shall be liable for the debts, losses and liabilities of said bank, in proportion to the capital owned by them." David J. McCord. *The Statutes at Large of South Carolina, Edited under Authority of the Legislature*. vol.8. "An Act to Admit and Incorporate Private Stockholders in the Bank of the State of South Carolina." Columbia: A. S. Johnston, 1840, p. 50.

Tennessee (1832):
Bank of Tennessee charter held directors personally liable for debts if the directors had acted in violation of the charter. In the event the directors could not cover the shortfall, the stockholders were liable up to the amount of the shares held (double liability). Shareholders were excused from such liability so long as the bank continued to redeem its notes at its usual place of business. *An Act to Charter the Union Bank of the State of Tennessee*. Nashville: Hunt, Tardiff & co., Printers, 1832, Sec 24, p. 14.

Similar terms for Farmers and Merchants Bank of Memphis, chartered in 1833.

Appendix B: Shareholding sources

Connecticut

Hartford Bank (1792). P. H. Woodward. *One Hundred Years of the Hartford Bank Now the Hartford National Bank of Hartford, Conn*. Hartford: Case, Lockwood & Brainard, 1892.

Litchfield Bank (1858). U. S. House. 35th Congress, 2d Session. "Condition of the Banks." House Executive Document No. 112. Washington: James & Steadman, 1859.

Indiana

Indiana. Senate. Journal of the Bank Investigating Committee: A Select Committee of the Indiana Senate, 1857. Indianapolis: Joseph J. Bingham, state printer, 1857.

Kentucky

Bank of Kentucky. *A List of the Present Holders of the Original Stock in the Bank of Kentucky; Also, a List of Spurious Stock*. Louisville: Morton & Griswold, printers, 1841.

Maine

Maine. "List of Stockholders (with Amount of Stock Held by Each,) in the Banks of Maine." *Documents Printed by Order of the Legislature of the State of Maine during Its Session A. D. 1840*. Augusta: Wm R. Smith & Co., Printers to the State, 1840.

Maine. "List of Stockholders, (with Amount of Stock Held by Each,) in the Banks of Maine." *Documents Printed by Order of the Legislature of the State of Maine, during its Session A. D. 1843.* Augusta: Wm. R. Smith & Co., Printers to the State, 1843.

Maine. "List of Stockholders, Amount of Stock Held By Each, Jan. 1, 1845." *Documents of the Legislature of the State of Maine during Its Session A.D. 1845*. Augusta: Wm. T. Johnson, Printer to the State, 1845.

Maine. "List of Stockholders, Amount of Stock Held By Each, Jan. 1, 1849." *Documents of the Legislature of the State of Maine during Its Session A.D. 1849*. Augusta: xxx, Printer to the State, 1849.

Massachusetts

Massachusetts Bank (1785-1855, selected years). N. S. B. Gras. *The Massachusetts First National Bank of Boston, 1784-1934*. Cambridge: Harvard University Press, 1938.

Michigan

Bank of Michigan (1840). Michigan. House of Representatives. "Reports of the Majority and Minority of the Bank Investigating Committee, Together with the Minutes of the Committee." *Documents Accompanying the Journal of the Senate of the State of Michigan at the Annual Session of 1840*, vol. II. George Dawson, State Printer, 1840.

Other Michigan banks (1836-1839). Michigan. House of Representatives. *Documents Accompanying the Journal of the House of Representatives of the State of Michigan at the Annual Session in 1839*. Detroit: J. S. and S. A. Bagg, State Printers, 1839.

New Hampshire

New Hampshire Board of Bank Commissioners. "Bank Commissioners' Reports." *Journal of Honorable Senate of the State of New Hampshire, At Their Session Held at the Capitol in Concord, June 3, 1847.* Concord: Butterfield & Hill, State Publishers, 1847.

New Hampshire Board of Bank Commissioners. *Reports of the Bank Commissioners made to His Excellency the Governor, June Session, 1849*. Concord: Butterfield & Hill, State Printers, 1849.

New Hampshire Board of Bank Commissioners. "Bank Commissioners' Reports." *Journal of Honorable Senate of the State of New Hampshire, June Session, 1850.* Concord: Butterfield & Hill, State Publishers, 1850.

New Hampshire Board of Bank Commissioners. *Report of the Bank Commissioners made to His Excellency the Governor, June Session, 1855*. Concord: Amos Hadley, State Printer, 1855.

New York.

Bank of New York (1791). Henry W. Domett. *A History of the Bank of New York, 1784-1884* (4th ed.). New York: privately printed, 1884.

Merchants Bank (1803).

Bank of America, Bank of Washington & Warren, Chemical Bank, Dry Dock Bank (1826). Eric Hilt, "When Did Ownership Separate from Control? Corporate Governance in the Early Nineteenth Century." *Journal of Economic History* 68:3 (September 2008), 645-685.

Chemical Bank (1844). Chemical Bank. *History of the Chemical Bank, 1823-1913.* New York: Privately printed, 1913.

Eighth Avenue Bank, Lewis County Bank (1854): New York State Assembly. "Annual Report of the Superintendent of the Banking Department." Assembly Doc. No. 10. Albany: C. Van Benthuysen, 1855.

All other NY banks (1831-1832): New York State Assembly. "Report of the Bank Commissioners on the Resolution of the Assembly on the 28th March, 1832. Assembly Document No. 89. Albany: E. Croswell, state printer, 1833.

Ohio

Ohio. General Assembly. *Documents, Including Messages and Other Communications made to the Forthy-Seventh General Assembly of the State of Ohio*. Columbus: Chas. Scott, state printer, 1849.

Ohio. Auditor of State. *Appendix to Annual Report of Auditor of State. Series of Reports Made on the Condition of the Ohio Stock Banks as Ascertained by Charles Reemelin, Esq., Acting as Special Examiner under the Appointment of the Auditor and Secretary of State*. Columbus: Statesman Steam Press, 1855.

Pennsylvania

Bank of North America (1782). Lawrence Lewis, Jr. *A History of the Bank of North America, The First Bank Chartered in the United States*. Philadelphia: J. B. Lippincott, 1882.

Gertrude MacKinney, ed. *Pennsylvania Archives*, 9th series, vols. 5-6. 1931.

Vermont

Bank of Orleans (1865). Frederick W. Baldwin, ed. *History of "Bank of Orleans," "Irasburgh National Bank of Orleans," "Barton National Bank," "Barton Savings Bank," "Barton Savings Bank and Trust Company."* Burlington, VT: Free Press Printing Company, 1916.

Wisconsin

Wisconsin. Office of the Bank Comptroller. "Annual Report of the Bank Comptroller." *Governor's Message and Accompanying Documents*. Madison, WI: Beriah Brown, State Printer, 1855.

Wisconsin. Bank Comptroller. *Annual Report of the Banking Department of the State of Wisconsin for the Year 1856.* Madison, WI: Calkins & Proudfit, Printers, 1857.

Wisconsin. Bank Comptroller. *Annual Report of the Bank Comptroller of the State of Wisconsin for the Year Ending January 3d, 1858.* Madison: Calkins & Webb, 1858.

Wisconsin. Bank Comptroller. "Annual Report of the Bank Comptroller for the Fiscal Year Ending September 20th, 1864." *Message of the Governor of Wisconsin, Together with the Annual Reports of the Officers of the State for the Year A.D. 1864.* Madison, WI: Atwood & Rubles, state printers, 1865.

Table 1
Pre-1860 dates of adoption of double liability for banks in eastern US

	Marquis-Smith (1937)		Michener-Jaremski (2015)	Dates used here	
	(1)	(2)	(3)	(4)	(5)
State	**Year**	**Notes**	**Year**	**Year**	**Notes**
Connecticut	--		--	--	
Delaware	--		--	--	
Florida	1829		1829	1829	Double
	1843	Triple (one bank)	--	1843	Triple (one bank)
	1845	Unlimited	--	1845	Unlimited
Indiana	--		1851	1855	
Maine	1831	Mismanagement	1831	1831	Mismanagement
Maryland	1851		1851	1851-	Constitution
Massachusetts	1811	Mismanagement	1811	1811	Mismanagement
	1849	All failures	--	1849	Notes only
Michigan			1850	1855	
New Hampshire	--		--	1806	Unlimited
New Jersey	--		--	1851	Free banks only
New York	--		--	1827	All failures
	--		--	1829	Rescinded
	1850		1846	1850	Constitution
Ohio				1842/43	Unlimited
	1851		1851	1851	Double (large banks) Unlimited (small banks)
Pennsylvania	--		--	1808	All failures
	--		--	1810	Rescinded
	--		--	1850	Note holders only
Rhode Island	1818	Mismanagement	?	1818	Mismanagement
	1833	Unlimited	--	1833	Unlimited
Tennessee	--		--	--	
Vermont	--		--	1817	Unlimited
			--	1818	Rescinded
Virginia	?	Notes only	--	1851	Notes of new banks
Wisconsin	--		1800	1852	Free banks only

Notes: Maryland's constitutional amendment phased in double liability. It was imposed on newly chartered bank and existing banks rechartered after 1850. New York included double liability in its 1846 constitutional revision, but the law went into effect January 1, 1850. No banks were formed under Ohio's 1842 law and 1843 revision. Ohio's 1851 law imposed unlimited liability on banks with 6 or fewer shareholders. Michener and Jaremski (2015) report an end date for Rhode Island, but no start date.

Sources: New Jersey (1850); Wisconsin (1852); Angell and Ames (1871); Dewey (1910); Barnett (1911); Huntington (1915); Kimner (1927); Blandi (1934); Livermore (1935); Marquis and Smith (1937); Leonard (1940); Michener and Jaremski (2015).

Table 2
Discrete time hazard estimates of double liability adoption

Variable	(1) Mean [std dev]	(2) dy/dx (std error)	(3) dy/dx (std error)	(4) dy/dx (std error)
Assets to equity	2.201	0.082	0.047	0.062
	[0.505]	(0.067)	(0.067)	(0.068)
Banks per 1000	0.065	0.264	0.153	0.227
	[0.067]	(0.358)	(0.343)	(0.359)
Deposits to circulation	0.669	0.131	0.148	0.130
	[0.443]	(0.077)†	(0.072)*	(0.071)†
Free banking	0.085	0.170	0.175	0.160
	[0.281]	(0.082)*	(0.086)*	(0.077)*
Branch banks	0.256	-0.028		-0.167
	[0.439]	(0.104)		(0.035))**
State bank	0.061		0.136	0.663
	[0.241]		(0.158)	(0.040)**
Bank failures	0.536	0.027	0.026	0.009
	[0.502]	(0.092)	(0.090)	(0.091)
Constant		-6.516	-5.978	-5.793
		(2.247)**	(2.109)**	(2.141)**
Obs	82	82	82	82
Wald chi-square		20.95**	21.24**	311.63**
Log likelihood		-23.83	-23.64	-23.09

Notes: Dependent variable is dichotomous variable that equals one if state adopted any double liability rule in previous five years. ** implies p-value<0.01; * implies p-value<0.05. Standard errors clustered on state reported in parentheses. Empirical specification estimated by logistic regression techniques (logit). Reported estimates are average marginal effects (dydx) estimated in Stata. All variables measured at five-year intervals beginning with 1830. Sources: authors calculations from bank data reported in Weber (2015) and U.S. Comptroller of the Currency (1876); double liability adoption dates from Table 1.

Table 3
Summary statistics – bank shareholdings

	Obs	Full sample	Single liability	Double liability
Shareholders	470	92.64	292.68	43.74
		(228.45)	(453.66)	(53.89)**
ln(shareholders)	470	3.35	4.89	2.97
		(1.63)	(1.20)	(1.50)**
Single largest	610	0.21	0.09	0.23
		(0.23)	(0.08)	(0.24)**
Women and children	417	0.03	0.02	0.03
		(0.04)	(0.28)	(0.04)**
Common surname	417	0.35	0.39	0.34
		(0.24)	(0.19)	(0.25)*
Bank age	610	10.08	1.35	11.56
		(11.95)	(4.33)	(12.20)**
Capital ($000)	610	175.96	231.40	166.61
		(242.39)	(324.40)	(224.72)**
Year observed	610	1849.5	1825.1	1853.6
		(12.50)	(8.80)	(7.40)**
Year established	610	1839.4	1823.8	1842.0
		(14.80)	(8.70)	(13.90)**
ln(population)	610	8.85	8.75	8.87
		(1.41)	(1.93)	(1.30)

Notes: ** implies statistically significant difference between single- and double-liability banks (p-value < 0.01).
Sources: see Data Appendix B.

Table 4
Determinants of bank share ownership

	ln(shareholders)	Largest Shareholder	Women and children	Common Surname
Double liability	-2.079	0.273	-0.031	-0.096
	(0.528)**	(0.041)**	(0.009)**	(0.091)
Graduated voting	1.883	-0.229	0.049	0.159
	(0.475)**	(0.034)**	(0.013)**	(0.063)*
Bank age	-0.007	-0.000	0.001	0.000
	(0.011)	(0.000)	(0.001)	(0.002)
Capital ($000)	0.002	-0.000	0.000	0.000
	(0.001)**	(0.000)	(0.000)	(0.000)**
Free bank (0/1)	-0.963	0.140	-0.001	0.036
	(0.202)**	(0.041)**	(0.004)	(0.045)
ln(population)	0.161	-0.012	0.002	-0.019
	(0.053)**	(0.009)	(0.002)	(0.013)
Pennsylvania	1.158	0.041	-0.024	0.165
new bank	(0.279)**	(0.041)	(0.011)*	(0.063)**
New York	-0.169	0.008	-0.003	0.109
new bank	(0.199)	(0.020)	(0.004)	(0.052)*
Recession	0.956	-0.133	0.015	0.015
	(0.281)**	(0.043)**	(0.011)	(0.053)
Year	0.046	-0.004	0.001	0.004
	(0.024)*	(0.001)**	(0.000)*	(0.004)
Constant	-81.592	7.022	-1.995	-7.142
	(43.581)	(1.665)**	(0.856)*	(6.679)
Obs	470	610	417	417
F-stat	74.94**	35.13**	9.45**	9.15**
R-square	0.70	0.51	0.36	0.09

Notes: standard errors clustered on city/town. ** implies p-value < 0.01; * implies p-value < 0.05.
Sources: for shareholdings see Data Appendix B; balance sheet data from Weber (2011).

Table 5
Average bid-ask spreads for New York bank stocks, 1846-48 and 1850-53

Bank	1846-1848			1850-1853		
	Spread	Std dev	Obs	Spread	Std dev	Obs
American Exchange Bank	0.012	0.009	17	0.015	0.019	61
Bank of America	0.009	0.008	48	0.008	0.009	113
Bank of Commerce	0.017	0.015	40	0.005	0.010	130
Bank of New York	0.019	0.010	29	0.033**	0.031	35
Bank of the State of New York	0.019	0.018	48	0.007	0.008	95
Butchers & Drovers Bank	0.019	0.015	19	0.028	0.019	15
City Bank	0.018	0.018	21	0.024	0.019	38
Manhattan Company	0.021	0.016	79	0.016	0.013	75
Mechanics Bank	0.012	0.013	70	0.015†	0.012	78
Mechanics Banking Assoc	0.023	0.026	19	0.026	0.024	30
Merchants Bank	0.014	0.012	33	0.019†	0.015	50
Merchants Exchange Bank	0.022	0.014	28	0.013	0.011	48
Phenix Bank	0.017	0.015	40	0.005	0.010	130
Union Bank	0.019	0.016	31	0.038	0.113	55

Notes: Spread = (Ask-Bid)/Ask on dates when both were reported. ** implies p-value<0.01; † implies p-value <0.10.
Source: author's calculations from data reported in Sylla, Wilson and Wright (2016).

Table 6
Difference-in-difference estimates of bank leverage ratios

	Assets / Capital		
	(1)	(2)	(3)
	RI-ME	RI-ME	RI-ME
	(1831/32-33/34)	(1831/32-33/34)	(1831/32-33/34)
Post*Rhode Island	0.203	0.206	0.095
	(0.104)*	(0.104)*	(0.075)
Post	-0.267	-0.267	-0.160
	(0.101)**	(0.101)**	(0.071)*
Rhode Island	-0.490	-0.456	0.181
	(0.126)**	(0.128)**	(0.075)*
Providence		-0.121	
		(0.105)	
Constant	2.023	2.023	1.572
	(0.117)**	(0.117)**	(0.071)**
Location Fes	No	No	Yes
Observations	294	294	294
F-statistic	9.57**	7.18**	4.04*
R-squared	0.18	0.19	0.56

Notes: dependent variable is bank leverage = total assets / total shareholder equity. Standard errors clustered on bank. ** implies p-value <0.01; * implies p-value<0.05; † implies p-value<0.10.
Sources: author's calculations from Weber (2011).

Table 7
Difference-in-difference estimates of bank leverage ratios
New York-New Jersey comparisons

	Assets/Capital				
	(1)	(2)	(3)	(4)	(5)
	NY-NJ	NY-NJ	NY-NJ	NY-NJ	NY-PA
	(1847-1850)	(1847-1850)	(1847-1850)	(1847-1850)	(1845-1850)
Post*New York	0.275	0.245	0.232	0.152	0.237
	(0.139)*	(0.137)†	(0.145)	(0.164)	(0.129)†
Post	0.127	0.127	0.127	0.085	0.008
	(0.109)	(0.109)	(0.109)	(0.153)	(0.091)
New York	-0.006	-0.166	-0.179	0.758	-0.297
	(0.149)	(0.152)	(0.156)	(0.835)	(0.135)*
Free bank		0.225	0.260	0.118	0.298
		(0.107)*	(0.121)*	(0.148)	(0.115)**
New York City		0.326	Excluded		0.338
		(0.110)**			(0.114)**
Philadelphia					0.575
					(0.215)**
Constant	2.439	2.439	2.439	1.123	2.649
	(0.137)**	(0.137)**	(0.137)**	(0.821)	(0.117)**
Location FEs	No	No	No	Yes	No
Observations	374	374	321	374	416
F-statistic	7.76*	7.12**	4.31**		6.32**
R-square	0.04	0.06	0.05	0.74	0.06

Notes: dependent variable is bank leverage = total assets / total shareholder equity. Standard errors clustered on bank. ** implies p-value <0.01; * implies p-value<0.05; † implies p-value<0.10.
Sources: author's calculations from Weber (2011).