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Abstract

Using unique data on California state banks that were subject to the unlimited liability rule, we examine the relationship between liability of bank presidents, risk management, and bank runs during the panic of 1893. During this period, bank presidents were mandated to hold bank stocks with features resembling restricted stock option and clawback provisions of today. These measures were designed to discourage excessive risk-taking by holding managers personally accountable in the event of a bank failure. We find that banks whose presidents have a greater liability exposure adopt more conservative risk management strategies and are thus less likely to experience bank runs and failures. Our study implies that regulatory policies on bank executives affect the risk management methods and the default risk of banks.

JEL classification: G21, N12, N22, D82, E32.
Keywords: Managerial ownership, Managerial liability, Corporate governance, Bank Risk-taking, Panic of 1893

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1. Introduction

The collapse of Silicon Valley Bank (SVB) has reignited a debate concerning an effective regulatory framework that would create incentives for bank executives to pursue sound banking practices. In particular, the compensation of SVB's executives sparked sharp criticism from both the public and regulators. During the two-year period prior to failure, SVB's CEO and directors cashed out $84 million worth of stock, including a sale of $3.6 million by CEO Greg Becker mere days before the announcement of significant losses that triggered a stock slide in March 2023. Thus, executives benefited significantly while failing to effectively manage, ultimately causing shareholders of the bank to be wiped out. In response to these concerns, President Biden urged Congress to bolster regulations on bank executives.[2] In addition, Congress proposed new legislation, and bank regulators proposed new guidelines relating to bank executive compensation.[3]

This issue is not new. Prior to the Great Depression, bank regulators attempted to discourage bank managers' excessive risk-taking by requiring ownership of bank shares. At the time, bank presidents were mandated to hold stock that had features resembling restricted stock and clawback provisions of today. Other bank managers also often held a significant portion of bank stocks, although ownership was not required by law. Bank stocks in the 1890s possessed features analogous to restricted stock options of today because they could not be traded easily. The absence of a liquid market forced managers to hold stock for extended periods, thereby incentivizing them to prioritize long-term growth over short-term profit. Bank stocks also carried clawback features because shareholders faced extended liability. Under the extended liability rule, shareholders were obligated to cover (in proportion to their shareholdings) some or all of the unpaid debts owed to depositors and other creditors in the event of a bank default. These features ensured that bank presidents were personally exposed to the downside risks.

In this paper, we connect managerial liabilities to bank risk management and the occurrence of bank runs, suspensions, and failures during the panic of 1893. We construct

[2] "FACT SHEET: President Biden Urges Congressional Action to Strengthen Accountability for Senior Bank Executives." The White House, March 17, 2023, https://www.whitehouse.gov/briefing-room/statements-releases/2023/03/17/fact-sheet-president-biden-urges-congressional-action-to-strengthen-accountability-for-senior-bank-executives/.

[3] In the aftermath of the failure of SVB and two other regional banks, the Senate Banking Committee passed the RECOUP Act, which would give banking regulators the authority to claw back compensations of senior executives of failed banks in stipulated circumstances. The Federal Deposit Insurance Corporation (FDIC) also published guidelines on corporate governance of large banks that addressed, among other things, executive compensation.

measures of managerial liabilities and examine whether their variation across banks is associated with differences in bank risk management. Subsequently, we explore whether the variation in perceived riskiness of banks influenced the intensity of bank runs and the probability of bank suspensions and failures.

The California state banking system during the 1890s offers a unique opportunity to explore the effect of managerial liabilities on bank risk management, bank runs, and failure, for several reasons. First, the regulatory landscape during the period was characterized by minimal bank regulations other than the extended liability rule, in contrast to today's robust regulatory framework. This lack of regulatory constraints enables us to directly observe bank managers' preferred levels of bank risk to manage withdrawals and prevent failure. At the same time, regulators adopted the extended liability rule to influence bank presidents' risk-taking incentives. This allows us to measure the impact of managerial liability on bank risk-taking behavior.

Second, California state banks in the 1890s operated under the unlimited liability rule, which fully exposed shareholders to the downside risk of failure. Under the unlimited liability rule, shareholders were obligated to cover, in proportion to their shareholdings, *all* the unpaid debts owed to depositors in the event of a bank failure. This feature is unique because most banks during this period operated under the double liability regime where shareholder liability was limited to twice the value of the par value of the stock. Thus, bank presidents and senior managers in California state banks faced heightened vulnerability in the event of bank failures relative to their peers in other states. In addition, the California banking law required bank presidents to retain bank stocks to ensure accountability in case of bank failure. The resulting variation in bank presidents' exposures to downside risk allows for an analysis of how presidential liability influences bank risk management decisions.

Third, California experienced one of the most severe shocks during the panic,[4] with state bank deposits contracting by 22 percent between January and July of 1893. This contraction was more pronounced for rural California banks, where deposits shrank by 37 percent, compared to the relatively minor 12 percent decline experienced by San Francisco banks. While all deposits were nominally fully covered under the unlimited liability rule, practical limitations existed. In some instances, shareholder wealth proved insufficient to cover the gap between deposits and the liquidated value of bank assets. Given the unobservable nature of shareholder wealth, the varying

[4] California experienced more bank failures than any other state except Kansas during the Panic of 1893.

magnitude of deposit outflows across banks was likely contingent on the riskiness of banks, which served as indicators of potential bank failures. This circumstance enables an examination of the relationship between bank risk and deposit withdrawals.

For our study, we collected data from the *Report of the Board of Bank Commissioners of the State of California* from 1890 to 1896.[5] In the 1890s, the state banking department collected information on state banks and published this information biannually, in January and July of each year. The report provides detailed balance sheet information on state banks, along with the names of bank board members and the quantity of stocks held by each member. It also identifies the managers and their respective shareholdings. Using data from the July Call Reports, we compute the percentage of shares owned by managers. Our analysis shows that bank executives held a significant portion of shares in the 1890s. On average, senior managers (president, vice president, cashier, and vice cashier) of banks collectively owned 30 percent of all shares. Among these managers, the president held the largest share, averaging 18 percent of all shares. As presidents held absolute majority among senior managers on average, we use presidents' shareholdings to construct measures of managerial liability.

For a more nuanced understanding of the effect of managerial liability on bank risk-taking, we categorize presidents' liability exposure into two parts: on-balance sheet capital holding and off-balance sheet guarantee. On-balance sheet capital holding measures the portion of paid-in capital recorded on the balance sheet that a manager may lose in the event of failure. An off-balance sheet guarantee is the amount in excess of the paid in capital a manager *may* lose in the event of failure due to the unlimited liability rule. This part of managerial liability is often referred to as contingent liability and is akin to a compensation clawback of today, as it requires managers of failed banks to compensate for failure-related losses using their personal wealth.

Further, we compute dollar amounts of on-balance sheet capital holdings and off-balance sheet guarantees for empirical analysis. Dollar amounts are preferred over managers' percentage stock ownership due to potential distortions arising from variations in bank size. In the case of large banks, a president's liability can be considerable even if the ownership percentage is modest. This is particularly pronounced under the unlimited liability rule as there is no ceiling on the dollar

[5] The legislature did not allocate any funds for the printing of the reports in the years 1897, 1898, and 1901-1904. We do not use Call Report data from 1899 and 1900 due to its temporal distance from the Panic of 1893, which is the primary event of interest in this paper.

amount of off-balance sheet guarantees that can be imposed on management. Thus, for a precise analysis, we investigate the relationship between managerial liability and bank risk management using the dollar amount of presidential liability. We measure the dollar amount of a president's on-balance sheet capital by multiplying the percentage of a president's stock ownership by the total amount of paid-in capital each year. We compute a president's off-balance sheet guarantee, which measures the debt a president would owe to depositors if a bank were to fail, by multiplying the percentage of a president's stock ownership by the total deposits minus cash assets. This is the upper bound of a president's off-balance sheet guarantee and reflects the amount a president would need to guarantee if the value of all risky assets were null at failure.

In this paper, we examine the relationship between presidential liabilities and bank risk management. We find that presidential capital holdings (on-balance sheet capital holdings) did not have a significant effect on bank risk taking incentives before the panic of 1893, whereas presidential guarantees (off-balance sheet guarantees) did. Banks with higher presidential off-balance sheet guarantees were more proactive in managing credit and liquidity risk and maintained safer loan portfolios before the panic of 1893. Our analyses further show that presidential ownership contributed to a reduction in solvency and liquidity risk following the panic of 1893. These findings suggest that the president's on-balance sheet capital holding and off-balance sheet guarantee have disparate effects on bank risk management and suggest that the efficacy of management liability regulations depends on policy design and implementation.

Then, we examine the relationship between bank risk management and its effect on the probability of bank runs, suspensions, and failures. We find that banks with low cash holdings and risky loan portfolios (high liquidity risk and credit risk exposures) were more likely to experience bank runs. We also find that banks with low equity holdings and high cash reserves (high solvency risk and low liquidity risk exposures) were more likely to fail. Banks with high cash reserves were likely to fail because the quality of their loan portfolios was worse relative to their peers with low cash reserves. These results indicate that bank runs, suspensions, and failures were not outcomes of the same risk exposure. Bank runs were closely tied to the credit risk of banks and failures originate from the solvency issue.

Lastly, we examine the effect of presidential ownership on the recovery efforts following the panic of 1893. Our findings show that banks with large presidential on-balance sheet capital holdings and off-balance sheet guarantees had high equity ratios and restored their cash reserves

more rapidly in the years following the panic relative to their peers. This could be attributed to the heightened commitment of managers when they stand to lose more from bank failure. Thus, managers have greater incentives to reduce solvency risk and replenish cash assets that have been drained from the bank during the panic, keeping their bank better prepared to manage similar liquidity crises in the future.

Our paper is related to several strands of literature. First, it fits in the literature on the design of executive compensation and its impact on long-term performance. The literature proposes three approaches for regulating executive compensation packages to promote long-term performance. The first set of studies focuses on long-term deferred equity incentive compensation, such as restricted stocks and stock options (Bebchuk and Fried (2010), Bhagat et al. (2014), and Bhagat and Bolton (2014)). Another line of studies examines mandatory bonus clawbacks upon accounting restatements and financial losses (Chan et al. (2013), Chen et al. (2015)). The third line of studies examines debt-based compensation, such as pensions and deferred compensation (Bennett et al. (2015), Sundaram and Yermack (2007), Bolton et al. (2015), and Edmans and Liu (2011)). We add to this literature by investigating the extended liability rule that incorporates both restricted stock and clawback features and examining its effect on bank risk management and failures.

Our study is also related to an emerging literature that examines the impact of corporate governance on bank risk- taking. Pathan (2009) finds that CEO power (CEO's ability to control board decision) negatively affects bank risk management. Chen et al. (2006) find that option-based executive compensation induces risk taking. DeYoung et al. (2013) find that CEO incentives, created by compensation contract structures, lead to riskier business activities with respect to loans to businesses, noninterest-based banking activities, and investment in mortgage securitizations. Calomiris and Carlson (2016) show using the 1890s banking data that banks with higher managerial ownership exhibit greater reliance on cash than equity to mitigate risk. Anginer et al. (2018) find a positive relationship between shareholder-friendly corporate governance and systemic risk in the banking sector.

In addition, our paper adds to the literature on the relationship between extended liability rules and financial stability in which previous studies have yielded mixed findings. Studies focusing on the National Banking Era find that double liability was generally effective in constraining bank risk (Esty (1998), Grossman (2001), Mitchener and Richardson (2013), and

Koudijs et al. (2021)). However, studies examining double liability in the 1920s and 30s find that it was less effective due to the broadening of stock ownership during economic booms (Macey and Miller (1992), Kane and Wilson (1998)). We contribute to this literature by examining the relationship between presidential ownership and bank risk management of unlimited liability banks during the 1890s.

Lastly, this study contributes to the literature on banking panics during the panic of 1893. Existing research illustrates that bank runs were a rational and predictable manifestation of market discipline, driven by both insolvency and illiquidity (Carlson (2005), Calomiris and Carlson (2016), Calomiris and Carlson (2017), Calomiris and Carlson (2022), Calomiris and Carlson (2023)). We extend this literature by examining the role of bank executives in bank risk management under the unlimited liability system.

Our paper has an important policy implication for today. Following the failure of Silicon Valley Bank, the Senate Banking Committee passed a bipartisan bill that grants banking regulators the authority to clawback a portion of compensation from senior executives at failed banks.[6] Our study provides evidence that bank executives with greater personal exposures to downside risks in the event of bank failures are inclined to adopt more conservative risk management strategies. However, our study also shows that bank presidents' on-balance sheet capital holdings and off-balance sheet guarantees exert different effects on bank risk levels and risk management methods. Our findings suggest that the effectiveness of regulatory policy hinges on policy design and implementation.

The remainder of the paper is organized as follows. Section 2 gives a historical background. Section 3 introduces the data and provides summary statistics. We describe the structure of the bank board and bank balance sheets at unlimited liability banks. Section 4 describes empirical specifications and presents results. Section 5 concludes.

2. Historical Background

2.1. Bank Managers of California State Banks

During the 1890s, managers of California state banks faced significant exposure to bank failures through managerial ownership. Every bank was required to have at least five directors,

[6] Recovering Executive Compensation Obtained from Unaccountable Practices Act of 2023 or the RECOUP Act of 2023 (https://www.congress.gov/118/bills/s2190/BILLS-118s2190rs.pdf)

and each was required to hold at least ten shares of the bank's capital stock. Furthermore, one of the directors had to serve as the president of the board. The names of bank directors and the value of shares held by each director were required to be publicly disclosed by every bank. While not required, other bank executives also held a substantial percentage of bank shares.

In the 1890s, bank stocks had features resembling both restricted stock options and clawback policies of today, which are designed to promote long-termism and discourage excessive risk-taking by increasing shareholder exposure to downside risk.[7] Bank stocks in the late 1800s resembled restricted stocks or restricted stock options of today because they were not easily tradable. While the sale of bank shares was not legally prohibited, it was hindered by institutional, social, and legal barriers. Markets for bank stocks were illiquid because they were traded in the over-the-counter (OTC) market. Moreover, bank shareholders regarded each other as partners and upheld high levels of trust and loyalty, resulting in limited trading of bank stocks. Lastly, the sale of bank stocks had to be approved by the board of directors because the owners of bank stocks were subject to post-failure assessments[8] under the extended liability rule. Overall, various social and legal restrictions blocking easy bank stock ownership transfer led to long-term stable ownership by bank managers (O'Sullivan, 2007).

This is corroborated by figure 1, which plots the percentage ownership and the average dollar amount of bank stocks (in natural log) held by bank managers. On average, presidents held over 15 percent and managers held over 30 percent of total shares throughout the period. Managerial ownership remained stable and invariant over time, even during the Panic of 1893. The evidence presented in the figures aligns with the notion that enduring, stable managerial ownership was prevalent across banks at the time.

Extended liability rules attached to bank stocks in the 1890s share similarities with clawback rules of today because managers of failed banks were required to compensate for failure-related losses using their personal wealth, the extent of which depended on the regime in place.[9]

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[7] Long-termism is known to reduce excessive corporate focus on short-term results, which can lead to trade-offs with long-term growth. In 2017, McKinsey published empirical findings linking long-term management to superior financial performance using on an extensive survey on more than 1,000 executives (https://www.mckinsey.com/mgi/overview/in-the-news/the-case-against-corporate-short-termism).

[8] Under the extended liability rule, bank shareholders were assessed following a bank failure to cover remaining liability of a bank after liquidation.

[9] Extended liability was first adopted in the United States to provide protection for noteholders. It became institutionalized as solvency assurance to depositors and other creditors when the National Banking Act imposed

Under these rules, each shareholder was individually and personally liable for a proportionate share of the bank's unpaid debts and liabilities in the event of failure. This imposition of post-failure losses on bank stockholders incentivized banks to maintain adequate capital reserves and reduced moral hazard tendencies, such as a "go for broke" strategy. In addition, under extended liability, distressed banks had incentives to close before their liabilities exceeded their assets, as shareholders were disinclined to assume additional debt after failure. Early closures in the form of voluntary liquidations served to minimize depositor and shareholder losses (Macey and Miller, 1992).

Enforcing extended liability posed considerable challenges and incurred significant costs. For example, when national banks failed, shareholders were assessed up to the par value of the stock due to double liability. However, receivers of failed national banks recovered only 48.6 percent of the total assessments during this period. On the other hand, depositors and other creditors received 76.9 percent of their deposits (Bordo and Roberds, 2013). Similarly, although shareholders of California state banks were subject to unlimited liability, state banking reports reveal that depositors of failed California state banks received about 70 percent of their deposits (Report of the Board of Bank Commissioners of the State of California , 1890-1909).[10]

Nonetheless, stock ownership appears to have played an important role in promoting banking stability in California, where state banks operated with minimal regulations. Thus, bank managers primarily relied on three key risk metrics when managing risk: the riskiness of the bank's asset portfolio (loans and other risky assets), the (riskless) cash assets to total assets ratio, and the equity to assets ratio. Unlike national banks, which were subject to minimum capital and reserve requirements and prohibited from making risky loans such as real estate loans, California state banks in the 1890s operated without these constraints.[11]

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double liability on shareholders of national banks. Many states also imposed double liability on state bank shareholders. Some states imposed even more stringent laws. For example, Colorado imposed triple liability on shareholders whereas California adopted a system of unlimited liability (Vincens, 1957). By standing more fully behind its debts, a bank attracted depositors at lower interest rates. This means that depositors who chose limited liability banks chose to expose themselves to a higher degree of insolvency risk, in exchange for the comparative benefits limited liability banks offered them (White, 1995).

[10] The reports provided information on payout ratios to depositors in each year for the banks in liquidation. We looked for the last report for each bank to determine the payout ratio for each bank.

[11] Reserve requirements were not introduced until 1905. Even after 1905, there were no provisions to enforce the requirements until 1909. Capital requirements were introduced in 1895 due to losses in 1893 and 1894. They had limited effect, however, because bank owners raised the necessary capital without any actual cash being paid-in by making loans to shareholders collateralized by their stock. Banks were permitted to make loans secured with their own stock until 1903.

Earlier research on bank stock ownership around this period predominantly focused on the behavior of banks under different liability regimes and their effect on the stability of the banking system. However, there has been limited research on the extent of managerial ownership and its effect on banks' risk management strategies and default risk. One example is Koudijs and Salisbury (2020) who show how the risk-taking incentives of bank managers shifted when liability rules changed, making them liable for bank failures. Similarly, Calomiris and Carlson (2017) show that banks with high managerial ownership target lower default risk, even in low formal governance environments. They find that high managerial ownership, not formal governance, is associated with a greater reliance on cash to limit risk. We contribute to this literature by investigating the corporate governance structure at unlimited liability banks in the 1890s and examining how the degree of ownership by bank presidents influenced risk management approaches and bank runs during the Panic of 1893.

2.2. The Panic of 1893

The Panic of 1893 was the most severe panic during the National Banking Era. Unlike other bank panics during the era, the Panic of 1893 started from the interior and then radiated to New York City, precipitating a large number of bank failures. It required collective action by the members of the New York Clearinghouse to end the panic. During the panic, member banks withheld bank-specific information, issued clearinghouse loan certificates, and suspended cash payments.

While the immediate cause of the panic is still debated, two notable events preceded its onset. Some contemporary scholars claim that the crisis originated from a fear of depreciation and an attack on the exchange rate (Lauck (1907), Noyes (1909)). The falling gold reserves of the U.S. Treasury sparked concerns at home and abroad about the government's ability to maintain gold parity. Consequently, investors sought to convert their bank deposits into gold, generating an attack on the currency. Other contemporary and most modern scholars contend that concern over gold parity had little effect (Friedman and Schwartz (2008), Sprague (1910), Wicker (2006)) and put more emphasis on the slowdown in economic activity. They argue that concerns over the problems in the real sector, such as a slowdown in railroad investment, the failure of a few large railroad companies, and the declining stock market, precipitated the failure of a few large banks and triggered a system wide run in June 1893.

The panic began in May and ended in August after 503 banks suspended operations. The peak occurred in June and July when 340 banks suspended operations. In June, bank runs swept through mid-western and western cities such as Chicago and Los Angeles. In the second week of July, bank suspensions intensified, with the highest concentration of suspensions and liabilities in the western states. As these banks came under pressure, they withdrew funds that they deposited in New York City banks. To overcome liquidity shortages, the New York Clearinghouse issued clearinghouse loan certificates in June and partially suspended cash payments in August. This suspension of cash payments created a currency premium in New York and other cities.

Table 1 provides information on the number of suspended banks during the Panic of 1893, both nationwide and in California. California was one of the most severely affected states during the Panic of 1893. By the end of the panic, California had experienced more bank failures than any other state except Kansas. In California, numerous national, state, and savings banks suspended payments, resulting in several permanent bank failures. By the onset of the third week of June, a total of 27 banks shut their doors throughout the state. While most of these banks reopened by the third week of July, five of them closed permanently. Of the six national banks that suspended payments, five resumed operation and one failed permanently. Among the 17 state banks that experienced temporary closures, two ultimately failed. Finally, two California savings banks also failed. Although the number of suspensions in California represented a small fraction of the total suspensions nationwide, California alone accounted for one-third of the total liabilities of failed banks in the country.

Figure 2 plots the cities where banks were suspended. Bank runs in California began with the failure of Riverside Banking Company on June 14. In a few days, bank runs spread quickly to nearby cities including San Francisco, San Bernardino, Los Angeles, and San Diego (see Table A1 in the appendix). Among these cities, San Francisco held particular significance as the financial center in California, given its designation as a reserve city.[12]

3. Data and Summary Statistics

In this section, we introduce the historical data used in our analysis and measurement of managerial liabilities. We also explain the financial ratios used for bank risk measurement and provide summary statistics of the data used in the empirical analysis explained in Section 4.

[12] See Carlson and Wheelock (2018) for more information on the reserve pyramid.

3.1. Data

Our data comes from the *Report of the Board of Bank Commissioners of the State of California* from 1890 to 1896.[13] The state banking department collected information on state banks and published this information biannually, in January and July of each year. These reports offer detailed balance sheet information on state banks and include the names of bank board members and the number of shares of stock held by each member. Moreover, the reports identify the names of bank managers, which allows us to identify banks that changed presidents during the analysis period.[14] We collect data from the July reports. Our micro-sample consists of data on 241 state banks that operated for at least a single year between 1890 and 1896 in California. Using this information, we calculate the exact percentage or number of shares owned by bank managers.

3.2. Managerial Liability Measurement

For a more precise understanding of the effect of managerial liability on bank risk-taking we categorize managerial liability into two components: on-balance sheet capital holding and off-balance sheet guarantee. On-balance sheet capital holding is the portion of paid-in capital that a manager stands to lose in the event of failure. An off-balance sheet guarantee is the additional liability, beyond the paid-in capital, that a manager may incur in the event of failure due to the unlimited liability rule.

In this paper we use presidential liability to analyze the effect of managerial liability on bank risk management decisions. This choice is motivated by two factors. First, as shown in figure 1, the president held a majority among senior managers on average during this period and was the key decision maker in bank management. Second, unlike other managers, bank presidents were legally obligated to possess bank shares, thereby ensuring accountability. Theoretically, other managers could hold zero shares to evade responsibility in case of failure, but this was not feasible for bank presidents.

To proxy for presidential liabilities, we compute dollar amounts of on-balance sheet capital

[13] The legislature did not allocate any funds for the printing of the reports in the years 1897, 1898, and 1901-1904.
[14] Given our utilization of lagged presidential liability values in our empirical analysis to mitigate endogeneity, it becomes crucial to identify and exclude banks that underwent changes in their bank presidents throughout the sample period. Neglecting this step could lead to a flawed association of ex-presidential liability with a new president.

holdings and off-balance sheet guarantees for bank presidents. Using the percentage of bank ownership to examine a bank president's exposure to downside risk from bank failure can yield misleading results. Under the unlimited liability regime, a president's off-balance sheet guarantee in the event of failure is proportional to the bank's size. Thus, even if the percentage of bank stock owned by a president appears modest, their exposure can be sizable in dollar amount. As such, we focus on the dollar amount of presidential liability in our analysis.

We construct a measure of a president's on-balance sheet capital holding by multiplying the percentage of shares owned by a president by the total amount of capital each year. It is worth noting that even if bank managers hold a significant portion of shares, their capital holding would remain minimal if the bank did not hold a large amount of capital. As the distribution of presidential stock holdings are highly skewed to the right, we use the natural logarithm of the value to obtain a normal distribution.

We also construct a measure of a president's off-balance sheet guarantee. In the 1890s, when a bank became insolvent, state bank regulators seized personal assets of shareholders to cover deposits when the liquidation value of assets was not adequate to cover the liabilities. Thus, in determining the financial impact of shareholders' off-balance sheet guarantee under the unlimited liability rule, three variables should be considered: the percentage of shares held, the size of bank deposits, and the liquidation value of assets. Among the three, the liquidation value of assets is particularly challenging to estimate, as assets are often sold at fire sale prices during bank runs.[15] Thus, we study the effect of the unlimited liability rule assuming the worst-case scenario for shareholders: the liquidation value of assets other than cash is minimal, and shareholders bear the entire cost of deposits less cash. For robustness, we repeat the exercise assuming a 50 percent recovery of asset value in a fire sale.

The following equation illustrates the relationship between shareholder off-balance sheet guarantee and its determinants, as outlined in the above paragraph:

$$S_{off-B/S} = pS * (Deposits - LA)$$

$S_{off\text{-}B.S}$ is shareholder off-balance sheet guarantee under the unlimited liability rule. pS denotes the

[15] This is well exemplified in the more recent case of Silicon Valley Bank. In the press release following the purchase and assumption agreement with First–Citizens Bank & Trust Company, the FDIC stated "Today's transaction included the purchase of about $72 billion of Silicon Valley Bridge Bank, National Association's assets at a discount of $16.5 billion". See FDIC press release "First–Citizens Bank & Trust Company, Raleigh, NC, to Assume All Deposits and Loans of Silicon Valley Bridge Bank, N.A., From the FDIC" March 26, 2023. (https://www.fdic.gov/news/press-releases/2023/pr23023.html)

percentage of shares held by a shareholder, *Deposits* is the amount of deposits held by a bank, and *LA* is the liquidation value of assets. Assuming that the liquidation value of assets other than cash is zero, the following identity holds:

$$S_{off\text{-}B/S}^{Max} = pS*(Deposits\text{-}Cash)$$

$S_{off\text{-}B/S}^{Max}$ is the maximum off-balance sheet guarantee that a shareholder can be held accountable for under the unlimited liability rule.

Despite the simplicity of this equation, the estimation of $S_{off\text{-}B/S}^{Max}$ is complicated by the inverse relationship between the two factors determining the variable. As a bank matures and expands, the shareholdings of initial investors (including managers) are likely to be diluted, while the size of deposits is expected to increase. This is well illustrated in Figure 3(a), which plots a president's ownership shares and total deposits against total assets and the age of a bank. As a bank grows and matures, a bank president's ownership shares declines, but total deposits increase. Figure 3(b) illustrates a significant negative relationship between a president's ownership shares and total deposits. While most papers on the extended liability rule have focused on the *pS*, the percentage shares held by shareholders, as the measure of liability, there has been relatively little study on the effect of deposit size on liability. However, the negative relationship documented in the graph shows that ignoring the effect of the latter variable in extended liability analyses can lead to incomplete or skewed results.

Based on the above identity, we conduct our analysis on presidential off-balance sheet guarantee ($pP_{Deposit}$) using the following measure:

$$pP_{Deposit} = pP * (Deposits - Cash)$$

Instead of using presidential ownership percentage and bank liabilities separately, we create a measure that reflects their combined effect. In the above equation, pP, which measures a president's percentage ownership, decreases with asset size, while $Deposits$ increases with asset size. The net effect of this dynamic will be captured in the above measure. If $pP_{Deposits}$ is large, then we expect the bank president to face a significant financial setback when a bank fails under the unlimited liability rule. Much like the value of stock holdings, the value of presidential off-balance sheet guarantee is highly skewed to the right. Hence, we use the natural logarithm of this value in our empirical analysis.

3.3. Bank Risk Management

In this paper we focus on three risk types: credit risk, liquidity risk and solvency risk. Drawing from extensive literature on bank risk management, we proxy for each risk type using the following: the unsecured loan ratio for credit risk, the cash-to-asset ratio for liquidity risk, and the equity-to-asset ratio for solvency risk. It is important to note that we directly observe bank managers' preferred risk exposure due to the absence of capital and reserve requirements.[16]

Equity, or net worth, is calculated as the sum of paid-in capital and cumulative retained earnings held as surplus or undivided profits. Two major components of equity are paid-in capital and surplus capital. Paid-in capital is the on-balance-sheet capital initially invested by stockholders upon the establishment of the bank. For national banks (and state banks in other states) subject to capital requirements, paid-in capital was referred to as legal capital, as it was the minimum on-balance sheet equity shareholders were obligated to maintain. Surplus capital is the sum of additional paid-in capital and undistributed profits not allocated to the par account. The distinction between the two types of capital was important for governance, as under the extended liability rule shareholders of banks were assessed based on the par value of their stock.

Cash reserves are calculated as the sum of vault cash and reserves in other banks. During this period, banks held two types of liquid assets: money on hand and interbank deposits due from banks and bankers. The composition of liquid assets was important in a banks' liquidity management during the financial crisis. While California state banks were not subject to reserve requirements, national banks adhered to mandated requirements that dictated the composition of their reserves. While both assets were considered liquid assets and served as legal reserves for national banks, banks preferred to hold interbank deposits due from banks and bankers because these deposits paid a 2 percent interest. Bank regulators encouraged banks to hold cash assets and restricted the amount of interbank deposits banks could hold as they could lead to contagion in adverse economic conditions. Rural banks suffering liquidity problems could simultaneously withdraw from city bank correspondents, overwhelming the ability of city bank correspondents to meet withdrawal demands. Thus, large withdrawals by rural banks could precipitate a liquidity crisis of city banks and a suspension of deposit convertibility in major cities. Conversely, rural

[16] While California state banks were not subject to capital and reserve requirements, national banks in California faced certain restrictions. National banks were subject to minimum capital requirements (not equity ratio requirements) and cash reserve requirements. Cash reserve requirements specify a certain level of cash and deposits in reserve banks relative to deposits and net due to banks.

banks that rely on interbank deposits due from city banks might suddenly face liquidity challenges if their city correspondent banks decide to suspend payments. National banks in San Francisco received legal reserves from other national banks in the rural areas.

Banks also paid close attention to the riskiness of their asset portfolios. Loans were relatively risky assets, but they also yielded relatively high earnings. Hence, the share of loans in the asset portfolio was often used to capture both risk and earning potential. The state bank commissioner's report provides information on four loan categories: loans on real estate, loans on stocks, bonds, and warrants, loans on other securities, and loans on personal security. The first three were secured loans, whereas the last was unsecured loans. This distinction between secured and unsecured loans allows us to assess the riskiness of loan portfolios. During the National Banking Era, unsecured loans were considered the riskiest, such that national banks were prohibited from holding them. Thus, we use the ratio of unsecured loans to total loans to proxy for credit risk.

3.4. Summary Statistics

In this section, we present summary statistics of bank financials and managerial liabilities in 1892, a year before the Panic of 1893. By comparing summary statistics, we examine the disparities between banks that experienced bank runs, suspensions, or failures in the following years and those that did not. To illustrate the differences between the two groups, we provide a county-level case study along with a state-wide breakdown.

Table 2 reports summary statistics from banks in Riverside County in 1892. Understanding the banks in Riverside County is important since bank runs began here and spread to nearby areas in California during the Panic of 1893. The table summarizes bank ownership and balance sheet information for Riverside Banking Company, which was suspended in 1893 following a bank run, and other banks in the same county. By doing so, we compare the bank that experienced a bank run and those that did not. We find that managers at Riverside Banking Company held a lower percentage of shares compared to their counterparts at other Riverside County banks. While managers (President, Vice President, Cashier, and Assistant Cashier) of Riverside Banking Company held 16 percent of total shares, top managers of other Riverside County banks held an average of 35 percent of total shares. Particularly noteworthy is the fact that the president of Riverside Banking Company held only seven percent of total shares, significantly below the

county industry average of 19 percent.

As described previously, however, a small percentage of ownership does not necessarily suggest that bank managers were shielded from bank failures because they were subject to the unlimited liability rule, which tied shareholders' liability to the size of deposits. To gain a better understanding of managers' exposure to bank failures, we report our two measures of presidential liabilities, the natural logarithm of the off-balance sheet guarantee and the natural logarithm of the on-balance sheet capital. Table 2 shows that the president of Riverside Banking Company had a greater exposure to bank failures compared to presidents of other banks in Riverside, when we consider the dollar amounts. The president of Riverside Banking Company invested more capital and offered greater off-balance sheet guarantee. This is because Riverside Banking Company was substantially larger relative to other banks in the county. As mentioned earlier, drawing conclusions about presidential liability based solely on ownership percentage without considering balance sheet size can potentially lead to misleading results. We also examine the differences in balance sheet ratios among banks in Riverside County in 1892. While there are no notable differences in cash-to-asset, loan-to-asset, and capital-to-liability ratios, Riverside Banking Company held more unsecured loans than other banks. In other words, Riverside Banking Company had riskier loan portfolios.

Table 3 provides summary statistics of all state banks in California in 1892, along with a breakdown for bank runs, suspensions, and failures. We provide separate summary statistics for each event to 1) identify whether these events were driven by the same risk factors, and 2) analyze structural differences between banks that experienced these events and those that did not. In Panel A, we show summary statistics of banks that experienced a bank run during the first half of 1893. In this paper, we define bank run banks as those whose deposits declined by more than 20 percent from July 1892 to July 1893. We choose this threshold because deposits held by state banks in California contracted by 22 percent on average between January and July of 1893.[17] Panel B provides a breakdown by bank suspension. In 1893, some banks suspended the convertibility of deposits to prevent failure when they faced severe bank runs. Overall, fifteen banks suspended during the panic. Most of the suspended banks survived (only two of the fifteen suspended state

[17] While we do not have January 1893 deposit numbers, we expect deposits to have grown between July 1892 and January 1893, along with the booming economy. Thus, those banks with above 20 percent drop in deposit between July 1892 and July 1893, likely had above average drops in deposits between January and July of 1893.

banks eventually failed), but they would have failed if they did not declare the temporary suspension of convertibility. Panel C provides breakdown by bank failure. Unlike the banks that temporarily suspended, failed banks permanently closed and went into liquidation. Few banks failed during the Panic of 1893, but more banks failed in the following years due to the impact of the crisis. In the three years prior to the Panic of 1893, only one bank failed. However, the number of failures jumped to 18 in the post-crisis years between 1893 and 1896. In our summary statistics table, we define failed banks as those that failed in any period between 1893 and 1896.

Summary statistics presented in the first three columns of Panel A of Table 3 highlight several key characteristics of California state banks in 1892. Surprisingly, state banks held a significant amount of capital on balance sheet for safety, even though they already offered a significant off-balance sheet protection through the unlimited liability rule. These findings suggest that state banks provided safety for depositors in the form of both on-balance sheet capital protection and off-balance sheet guarantee. In their asset portfolio, state banks held a small amount of liquid assets (cash assets and interbank deposits), and a large amount of loans. The average cash-to-asset ratio was only 6 percent, while the loan-to-asset ratio was over 70 percent. Moreover, unsecured loans constituted almost 50 percent of all loans.

In Panel A of Table 3, we also compare the summary statistics of banks that experienced a bank run in the first half of 1893 and those that did not. We removed from our sample state banks that did not fully report ownership or financials in 1893. A comparison of bank run and non-bank run banks reveals that the two groups had a similar percentage of presidential ownership. However, banks experiencing runs were, on average, smaller in size and had lower presidential liabilities, both in terms of on-balance sheet capital holdings and off-balance sheet guarantees. This suggests that significant presidential liabilities may have served as a signal to depositors, providing assurance regarding the safety of a bank. Comparisons of balance sheet summary statistics show that the banks that experienced bank runs had higher equity and cash ratios on average relative to those that did not. This may seem counterintuitive as higher equity and cash ratios indicate lower exposure to solvency and liquidity risk. However, these banks had riskier portfolios—the ratio of unsecured loans to total loans was almost 30 percentage points higher for the banks that experienced runs relative to those that did not. These summary statistics suggest that credit risk, proxied by the riskiness of asset portfolios, was likely a primary driver of bank runs in 1893.

In Table 3 Panel B, we provide summary statistics for suspended and non-suspended banks.

The table shows that top managers of California state banks held a significant portion of shares in both groups. We find that the percentage presidential ownership was four percent higher for suspended banks relative to non-suspended banks. However, when we compare the dollar amount of presidential liabilities for the two groups, we find a conflicting result. On average, presidential on-balance sheet capital holdings was higher, but off-balance sheet guarantees was lower for suspended banks. This suggests that on-balance sheet capital holdings and off-balance sheet guarantees may have a differential effect on bank suspension decisions. Table 3 Panel B also reports the balance sheet ratios for 1892. As in Panel A, we find a significant difference in the quality of loans between banks that suspended and those that did not. Suspended banks had slightly higher equity and cash ratios relative to unsuspended banks, but also held over 30 percentage points more unsecured loans than unsuspended banks. This suggests that suspended banks had greater exposure to credit risk and were likely more affected by a deterioration of credit market during the Panic of 1893.

In Table 3 Panel C, we compare the managerial liabilities and balance sheet ratios of banks that failed after 1893 and those that did not. We find that failed banks, on average, had a higher percentage of presidential ownership and higher presidential liabilities, both in terms of on-balance sheet capital holdings and off-balance sheet guarantees, relative to surviving banks. We do not find a significant difference in the unsecured loan ratio between the two groups, as we did for suspended banks. However, we find that the failed banks had a substantially lower equity ratio relative to surviving banks in 1892. Before the onset of the panic, the average equity ratio of failed banks was over 20 percent lower relative to their non-failed peers.

The summary statistics provide several interesting insights into bank runs, suspensions, and failures and the effect of managerial liabilities on these events. The table suggests that bank runs, and suspensions were primarily driven by credit risk that is proxied by the riskiness of banks' loan portfolio. On the other hand, bank failures were primarily influenced by solvency risk, which is proxied by the equity ratio. This implies that bank failures and suspensions arose from distinct risks and highlights the need for separate empirical analysis to gain a more precise understanding of the banking crisis outcome. The effect of presidential liabilities also varies across the three events. We find that a presidents' on-balance sheet capital holdings and off-balance sheet guarantees were lower among the banks that experienced runs relative to the banks that did not. Conversely, we find that a presidents' on-balance sheet capital holdings and off-balance sheet

guarantees of failed banks were larger relative to the ones that did not fail. Suspended banks represent a mix of the two, as presidents' off-balance sheet guarantees for suspended banks were greater than those of non-suspended banks, but on-balance sheet capital holdings were smaller. This suggests that regulations on managerial liabilities may have a conflicting effect on the probability of bank runs, suspensions, and failures, depending on the design of the policy. In the following section, we conduct an empirical analysis to formally validate the insights obtained in this section.

4. Empirical Analysis and Results

In this section, we analyze the relationship between presidential ownership and liabilities, bank risk management and bank distress during the 1890s using regression analysis. During the Panic of 1893, many banks experienced bank runs, some of which resulted in temporary suspensions or permanent failures. Based on our findings from the previous section, we examine bank runs, suspensions, and failures separately.

4.1. Bank Runs, Suspensions, and Failures

We first examine the effect of bank risk-taking on bank runs, suspensions, and failures using probit and OLS regressions. We start by analyzing bank runs. The Panic of 1893 began in May of 1893 and ended three months later and was most severe in June and July. We begin by examining the relationship between the probability of a bank run and pre-crisis risk exposure using the following probit equation:

$$P\left(Y = 1 \middle| X_{i,1892}\right) = \Phi(\alpha_0 + \beta X_{i,1892}) \quad (1)$$

The dependent variable is an indicator variable that measures the probability of a bank run, which is defined as an over 20 percent drop in deposits between July 1892 and July 1893. Thus, the dependent variable is equal to 1 if a bank run occurred at bank i in 1893, and 0 otherwise. The vector $X_{i,1892}$ is the one-year lagged values of bank risk proxies, which are the equity-to-asset ratio, cash-to-asset ratio, and unsecured loans-to-total loans ratio. As a control, we include (log) total assets, bank age, and the loan-to-asset ratio. As described earlier, bank size is closely related to presidents' off-balance sheet guarantees, and bank age measures bank management experience. To control for bank age, we take the log of the years since a bank's establishment. As San Francisco

was a reserve city, banks in San Francisco operated differently. Hence, we run separate regressions for all banks and banks outside San Francisco to avoid results being driven by large city banks. All the ratios are winsorized at the one percent level by year, and standard errors are clustered at the bank level.

Bank runs normally reflect heterogeneity in depositor behavior in response to negative information that changes the perceived riskiness of a bank. However, the probit analysis using an indicator variable may not fully capture the heterogeneity in depositor behavior. We therefore estimate another specification using net deposit outflows. Specifically, we use a continuous variable to measure the severity of deposit withdrawals.

$$\Delta\log(Dep_{i,1893}) = \alpha_0 + \beta X_{i,1892} + \varepsilon_{i,1893} \quad (2)$$

For a dependent variable, we use the severity of a bank run, proxied by the change in deposits from July 1892 to July 1893. [18] The independent variables, controls, and other specifications remain unchanged from the previous equation. The results of equations (1) and (2) are displayed in Table 4. Columns (1) and (2) present the results from probit analysis, while columns (3) and (4) present the results from OLS regressions. Column (1) and (2) show that the probability of a bank run increases with the unsecured loan ratio and decreases with the cash-to-asset ratio. Columns (3) and (4) reveal that the magnitude of deposit outflows increases with both bank age and the unsecured loan ratio but decreases with the cash-to-asset ratio. These results reinforce previous literature that bank runs reflect rational and predictable behavior of depositors that respond to the perceived riskiness of their banks. It further shows that depositors are particularly sensitive to credit and liquidity risks when deciding to run on a bank. This suggests that regulators can potentially mitigate bank run risk by imposing rules that limit banks' credit and liquidity risk exposures.

In addition, we estimate the probability of bank suspension and failure using a probit analysis. We replace the dependent variable in equation (1) with an indicator variable to measure the predicted probability of bank suspension and failure. For the analysis on bank suspensions, the

[18] Thus, we will likely understate the magnitude of a bank run since we do not observe the accumulation of deposits that occurred between July 1892 and May 1893. However, cross-sectional analysis of the deposit change should continue to hold assuming the accumulation of deposits until July 1892 accurately forecast the accumulation of deposits between July 1892 and May 1893. This is not a farfetched assumption as most towns in California only had one or two banks at the time. Thus, the relative deposit level of a state bank was unlikely to deviate from the past unless that town's economy saw significant up/downturn in the nine months leading up to the bank run in May of 1893.

dependent variable is equal to 1 if a bank suspension occurred at the bank i in 1893, and 0 otherwise. For the analysis on bank failure, the dependent variable is equal to 1 if bank i failed between 1893 and 1896, and 0 otherwise. We predict the outcomes using balance sheet characteristics from 1892. We repeat the analysis with all banks and banks outside San Francisco for robustness.

Table 5 presents the results of this baseline regression. Columns (1) and (2) present the regression results for the predicted probabilities of bank suspension, and columns (3) and (4) show the results for the predicted probabilities of bank failure. Columns (1) and (2) show that suspension probability increases with the riskiness of a loan portfolio and decreases with the loan and lease share, and the equity ratio. Coupled with the results in columns (1) and (2) of Table 4, this provides an interesting insight on the factors that lead to bank runs and subsequent suspensions. While bank runs are likely to happen to banks with low cash holdings and risky loan portfolios, not all bank run banks face suspension. In fact, the cash-to-asset ratio has an insignificant effect on the suspension probability.

Conversely, the riskiness of a loan portfolio has a significant positive effect on both the bank run and suspension probabilities. It may be that banks with robust loan portfolios can leverage their assets as collateral when in need of liquidity, making it less susceptible to bank runs and suspensions. Columns (3) and (4) show the regression results for the predicted probability of bank failures. The results show that the equity ratio has a significant negative effect on the bank failure probability, and the cash-to-asset ratio has a significant positive effect. This may seem counterintuitive, as greater liquidity is typically associated with safer banks, as demonstrated in Table 4. However, a high cash-to-asset ratio can lower liquidity risk but can also reduce capital income if a bank refrains from generating profits through lending activities. This highlights a potential trade-off in risk exposures that bank management faces when managing risk. The equity ratio is not a significant driver of bank runs but is a primary driver of a bank failure. The riskiness of bank loan portfolios, which is a primary driver of both bank runs and suspensions, has an insignificant effect on bank failure. These results show that bank runs, suspensions and failures stem from different risks, and highlight the importance of analyzing each risk independently. In the following subsection, we examine how management incentives affect a bank's exposure to different risk types.

4.2. Bank Risk Management

In this section, we examine the effect of presidential liability on bank risk management before and after the Panic of 1893. We run separate analyses for the pre-and post-panic periods to assess whether the panic prompted a shift in risk management behavior among managers.

4.2.1. Bank Risk Management Prior to the Panic of 1893

First, we examine the effect of president's on-balance sheet capital holdings and off-balance sheet guarantees on bank risk management before the panic of 1893 using the following equation:

$$y_{it} = \beta_0 + \beta_1 P_{it-1} + \gamma s_{it} + \theta_i + \vartheta_t + \varepsilon_{it} \quad (3)$$

As our dependent variables, we use the three ratios of bank risk measurement discussed in the previous section: the equity-to-asset ratio, the cash-to-asset ratio, and the unsecured loans-to-total loans ratio. These variables measure banks' exposure to solvency, liquidity, and credit risks, respectively. In this subsection, we focus on how much risk banks take before depositors become sensitive to bank specific information. Therefore, we analyze bank risk-taking during the pre-panic period, when banks had more latitude to operate at their preferred risk levels.

P_{it} is the natural logarithm of presidents' on-balance sheet capital holdings or off-balance sheet guarantees. As described in section 3.2, we measure the value of a president's on-balance sheet capital holdings by multiplying the total amount of on-balance sheet capital by the percentage of shares owned by a president. Similarly, we derive the value of presidents' off-balance sheet guarantees by multiplying the difference between total deposits and cash by the percentage of shares owned by a president. On-balance sheet capital holding and off-balance sheet guarantee enter our regression with a one period lag. s_{it} is a control for bank size, which is a significant factor that affects the dollar amounts of presidential liabilities, as documented in the earlier section. For this analysis, we use firm and year fixed effects to control for unobservable factors that can potentially affect the outcome.

Table 6 presents the results of our analysis. We find that a president's on-balance sheet capital holdings did not have a significant effect on bank risk before the Panic of 1893. However, the president's off-balance sheet guarantees had a significant effect on the riskiness of loan portfolios. This is likely because presidents were liable for the portion of deposits that were not

covered after the liquidation of bank assets in the event of bank failure. Thus, unlimited liability rule incentivized bank presidents to maintain a relatively safe asset portfolio to reduce their liability in case of a failure.

4.2.2. Bank Risk Management Following the Panic of 1893.

In this section, we study the effect of the president's on-balance sheet capital holdings and off-balance sheet guarantees on the recovery activities following the Panic of 1893. We analyze bank risk management during the years between 1894 and 1896 when deposit withdrawals stabilized. We analyze this period to check whether the managers' risk management incentives shifted after the panic.

Table 7 shows the effect of presidential liabilities on bank risk management following the Panic of 1893 using equation (3). Both on-balance sheet capital holdings and off-balance sheet guarantees have a positive effect on the equity ratio following the panic, suggesting that banks with large presidential liabilities were more proactive in managing solvency risk. Off-balance liability also has a positive significant effect on the percentage of loans. This may seem counterintuitive, but it is important to note that banks with large off-balance sheet liability were holding safer loan portfolios compared to their peers with less off-balance sheet liability. Thus, expanding a loan portfolio does not necessarily imply an elevated risk level for banks, especially if a bank's loan quality is superior compared to its peers with less presidential off-balance sheet guarantees. Overall, our analyses show that managers shifted their risk management behaviors following the Panic of 1893 and suggest that the surviving banks with large presidential liabilities reduced their exposure to solvency risk.

The preceding regression indicates that surviving banks with significant presidential liabilities decreased their exposure to solvency risks in the years following the crisis. However, this could potentially be attributed to an immediate adjustment post-panic. As economic conditions improved, bank managers might have reverted to pre-panic risk management strategies. To investigate whether the decline in exposure to solvency risks is a persistent trend, we proceed to estimate the following equation:

$$y_{it} = \beta_0 + \beta_1 P_{it} + \tau_t P_{it} \times \boldsymbol{C}_t + \beta_2 s_{it} + \theta_i + \vartheta_t + \varepsilon_{it} \quad (4)$$

$\boldsymbol{C}_t$ is a vector of indicator variables that takes the value of one for a year in the post-crisis period.

Since we are analyzing the post-crisis period, the vector includes indicator variables for 1894, 1895, and 1896. The equation also includes a separate interaction term between post-crisis years and presidential liabilities to examine the effect of on-balance sheet capital holdings and off-balance sheet guarantees on bank risk choices during the post-crisis period.

Table 8 shows the results of equation (4). Overall, we do not observe a significant reversion to pre-panic levels of risk exposure. We find that the presidential capital holding, and off-balance sheet guarantee persistently have a significant effect on the equity ratio in general. The interaction coefficients are positive for the cash-to-asset ratio, indicating a positive *incremental* effect of on-balance sheet capital holdings and off-balance sheet guarantees on the cash-to-asset ratio for banks during the post-crisis period. In other words, banks with large presidential liabilities not only maintain higher equity ratios in the years following a bank run, but also restore their cash reserves quicker relative to their peer banks. This may be because managers who have a greater liability are more committed to securing the bank against bank runs and failures. Thus, they rapidly replenish the cash assets that have been drained during the panic, keeping the bank better prepared to manage a similar liquidity crisis in the future.

4.3. Instrumental Variable (IV) Analysis

The results in section 4.1 and 4.2 suggest that regulators can potentially mitigate bank failures and runs by imposing greater liabilities on management. If greater presidential liabilities reduce bank risk taking, this, in turn, can reduce the likelihood of bank runs and failures, promoting banking stability. To directly test this hypothesis, we use a two-stage approach to estimate the effect of the president's on-balance sheet capital holding ($P_{capital}$) and off-balance sheet guarantee ($P_{deposit}$) on the probability of failure or bank run. Bank suspensions are dropped in this analysis due to a lack of observations. If the IV probit suggests a significant effect of the presidential liabilities on the probability of a bank run or failure, this would suggest that implementing regulatory tools to increase presidential liabilities can enhance banking stability. Formally, we estimate the following regression equation:

$$IV_{i,t} = \beta_0 + \beta_1 P_{it-1} + s_{it} + \theta_i + \vartheta_t + \varepsilon_{it} \quad \text{if t <1893} \tag{5}$$

$$P\left(Y|IV_{i,1893} = 1\middle|X\right) = \Phi\left(\alpha_0 + \beta IV_{i,1892}\right)$$

$P\left(Y|IV_{i,1893} = 1\middle|X\right)$ is an indicator variable equal to 1 if the bank experienced a run in 1893, or if the bank failed during the period between 1893 and 1896. IV_{it} is an instrumental variable, which

can be either the unsecured loan ratio or the equity ratio. We choose these variables as instruments as our results from the previous section show that these are the key variables affecting bank run and failure probability. s_{it} is a bank size metric that is measured as the log of total assets. θ is a vector of bank fixed effects to control for unobservable heterogeneity at the bank level, and ϑ is a vector of time fixed effects. Error terms are clustered at the bank level to account for serial correlation.

Table 9 shows the results of our IV analysis. Panel A shows the IV regression result, and panel B shows the regression result using the risk proxies as instrumental variables. In Column (1) of panel A, we again find that presidential off-balance sheet guarantees have a negative effect on the unsecured loan ratio. In panel B, we further find that the predicted unsecured loan ratio, derived from the instrumental variable analysis, has a significant positive effect on the probability of a bank run. This suggests that increasing off-balance sheet guarantees offered by presidents can lead to lower credit risk for banks, which in turn reduce the bank run probability. In Column (2), we find that on-balance sheet capital does not significantly affect the unsecured loan ratio, which is a significant predictor of the bank run probability. Columns (3) and (4) show that both on-balance sheet capital and off-balance sheet guarantees have significant positive effects on the equity ratio of a bank. In panel B, we also find that the predicted equity ratios have a significant negative effect on the failure probability, though the magnitude of the predicted effect is greater for on-balance sheet capital holdings relative to off-balance sheet guarantees. These findings suggest that the regulations increasing managerial liabilities can have a significant effect in reducing bank runs and failures by reducing the risk-taking incentives of banks.

5. Conclusion

Following the failures of Silicon Valley Bank and Signature Bank, President Biden called on Congress to impose tougher penalties on senior officials of banks that fail due to managerial malpractice. In June, the US Senate Committee on Banking, Housing and Urban Affairs passed the RECOUP Act of 2023 to give banking regulators the authority to clawback compensation from senior executives of failed banks. Senator Sherrod Brown, chairman of the committee, emphasized the necessity of the bill, stating, “it’s time for CEOs to face consequences for their actions, just

like everyone else."[19]

In this paper, we connect corporate governance, risk management, and bank runs of California state banks during the 1890s. At the time, California state bank shareholders were subject to the unlimited liability rule. Thus, in the event of a failure, bank shareholders were personally liable for the portion of liabilities exceeding the liquidated assets, in proportion to their percentage shareholdings. Because bank presidents were required to hold bank stocks, they faced direct exposure to the downside in case of a failure. Due to the paucity of bank regulation at the time, the unlimited liability rule served as an important tool for bank regulators in upholding banking stability.

We examine how presidents' on-balance sheet capital and off-balance sheet guarantees affect bank risk management and bank runs during the Panic of 1893. We find that banks with safer loan portfolios and higher equity ratios are less likely to experience runs or failures. In addition, we show that bank presidents' on-balance sheet capital and off-balance sheet guarantees significantly impact banks' management of solvency, credit, and liquidity risks. Before the panic of 1893, presidents' on-balance sheet capital did not have a significant effect on bank risk, but off-balance sheet guarantees did. After the Panic of 1893, both on-balance sheet capital and off-balance sheet guarantees have a strong positive effect on equity holdings. In addition, banks whose presidents held more on-balance sheet capital holdings and offered more off-balance sheet guarantees restored cash buffers faster than their peers after the crisis. Our findings support the notion that higher presidential liabilities contribute to the stability of the banking system by encouraging banks to target lower default risk.

Our study suggests that regulatory policies on bank executives can influence risk management practices and reduce the default risk of banks. Our study also shows that managers' on-balance sheet capital holdings and off-balance sheet guarantees have heterogeneous effects on banks' exposure to different risk types. These findings suggest that the effectiveness of a regulatory policy depends on policy design and implementation.

[19] "Bipartisan bill to claw back executives' pay when banks fail passes out of Senate Banking Committee." CNBC June 21, 2023 (https://www.cnbc.com/2023/06/21/senate-banker-pay-clawback-bill.html)

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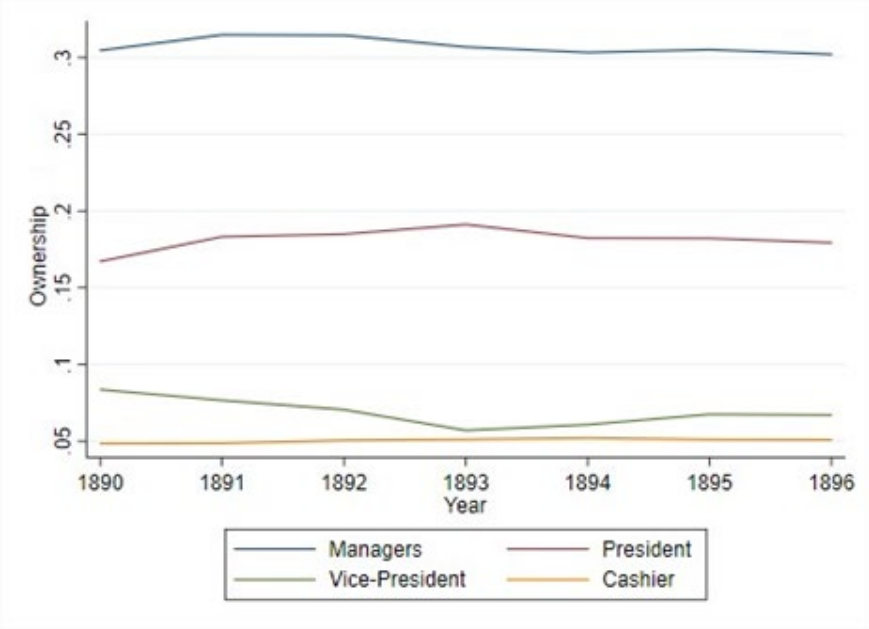
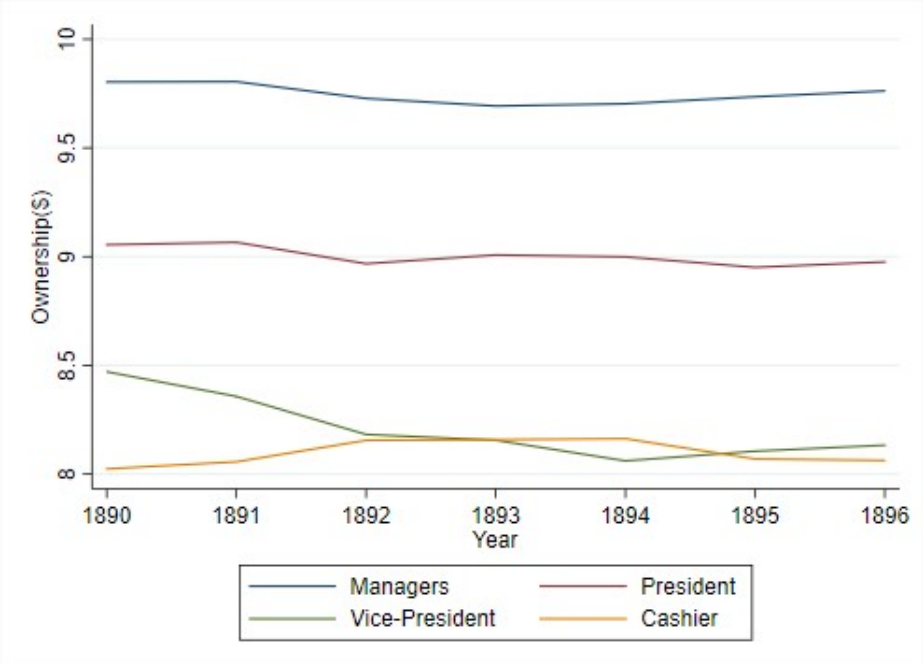
Figure 1. Average Manager Ownership Trend Over Time (1890-1896)
(a) Percentage manager ownership (1890-1896)

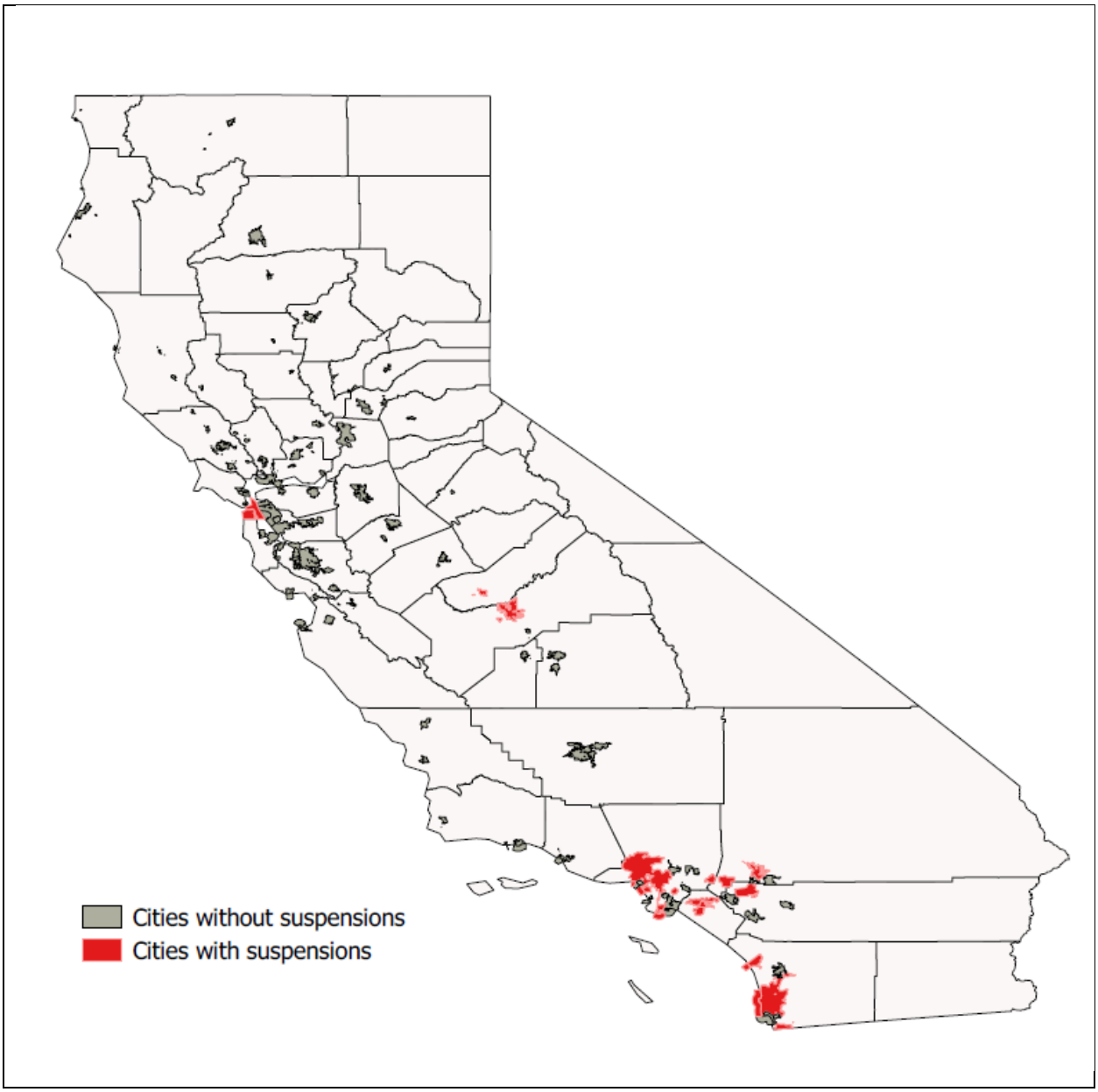


(b) Log dollar amount of manager capital (1890-1896)



Note: This figure shows the percentage ownership and the average dollar amount of bank stocks (in natural log) held by bank managers between 1890 and 1896. Managers' stock holdings is an aggregate holdings of president, vice-president, cashier and assistant cashier.
Source: Authors' calculations.

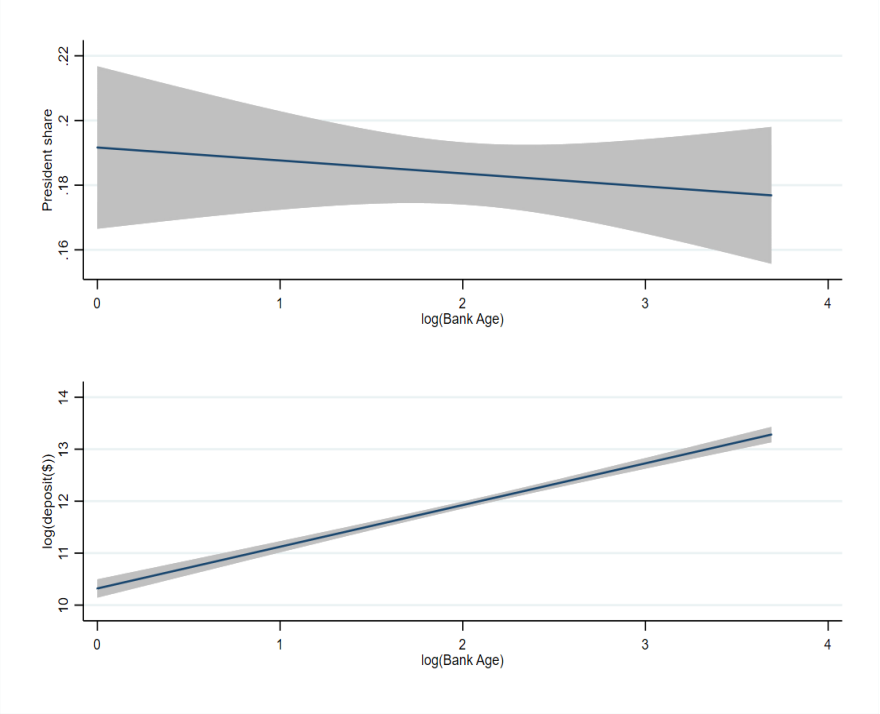
Figure 2. Cities with Bank Suspensions.



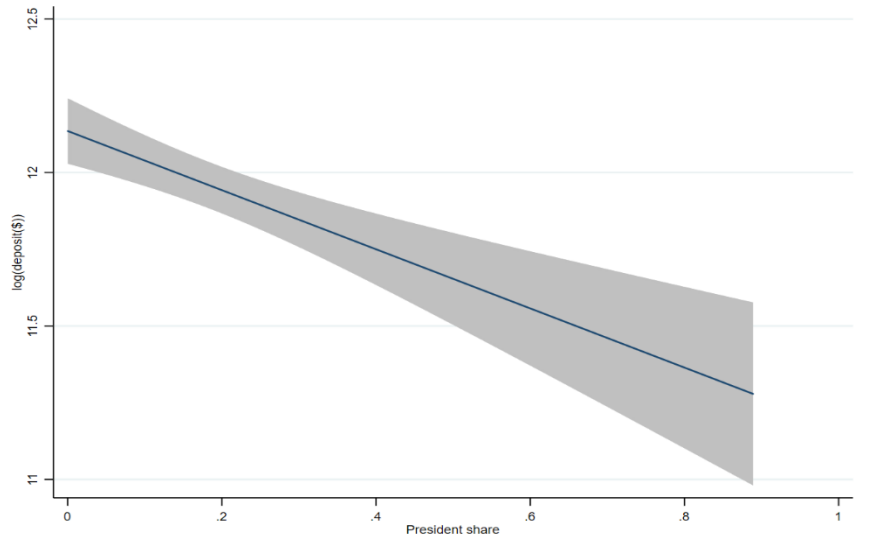
Note: This figure plots the cities in California where banks suspended cash payments during the Panic of 1896. During the panic, numerous national, state, and savings banks suspended payments. While most of the suspended banks reopened by the third week of July, five of them closed permanently.
Source: Report of the Board of Bank Commissioners of the State of California (1890-1896).

Figure 3. Presidential Share and Deposits

(a) Presidential share and deposits vs. bank age



(b) Presidential share and deposits



Note: This figure illustrates the inverse relationship between presidential percentage stock ownership and deposits. The shaded area represents the 95 percent confidence interval. Panel (a) plots a president's ownership shares and total deposits against total assets and the age of a bank, and panel (b) illustrates a significant negative relationship between a president's ownership shares and total deposits.
Source: Report of the Board of Bank Commissioners of the State of California (1890-1896).

Table 1: Number of Failed Banks in the United States During the Panic of 1893.

	National		State		Savings		Private		Total		Grand Total
	U.S.	CA	U.S.	CA	U.S.	CA	U.S.	CA	U.S.	CA	
Suspensions	158	6	172	19	47	2	198	0	575	27	602
Resumptions	86	5	49	17	10	0	0	0	145	22	167
Failures	71	1	123	2	37	2	198	0	430	5	435

This table shows the number of failed banks in the United States and the state of California due to the Panic of 1893 as of December 31, 1893.
Source: Biennial Report of the Attorney-General of the State of California (1893-1894).

Table 2. Banks in Riverside, California (1892).

	Banks in Riverside, CA (excluding Riverside Banking Company)			Riverside Banking Company		
	mean	p50	sd	mean	p50	sd
President share (%)	0.190	0.120	0.213	0.073	-	-
Vice President share (%)	0.057	0.071	0.032	0.073	-	-
Cashier share (%)	0.100	0.000	0.173	0.018	-	-
Assistant Cashier share(%)	0.000	0.000	0.000	0.000	-	-
Manager share(%)	0.347	0.200	0.401	0.165	-	-
log(Off-B/S Guarantee)	9.098	9.538	0.935	10.885	-	-
log(On-B/S Capital)	8.081	7.496	1.342	10.166	-	-
log(Assets)	11.825	11.813	0.478	13.922	-	-
log(Bank Age)	0.963	1.099	0.234	2.079	-	-
Equity Ratio	0.320	0.308	0.184	0.339	-	-
Cash Ratio	0.073	0.027	0.088	0.069	-	-
Loan & Leases Ratio	0.711	0.672	0.125	0.758	-	-
Unsecured Loans Ratio	0.497	0.638	0.443	0.817	-	-
Deposit-to-Capital Ratio	3.759	2.444	3.487	2.052	-	-
N	3			1		

Note: The table shows summary statistics of banks in Riverside County, California in 1892. Riverside Banking Company is summarized separately as it was suspended in 1893 following a bank run. log(Off-B/S Guarantee) is the natural logarithm of the value of off-balance sheet guarantees, computed by multiplying the total amount of total deposits less cash by the percentage of shares owned by the president. log(On-B/S Capital) is the natural logarithm of the value of the president's equity holdings, computed by multiplying the total amount of on-balance sheet capital by the percentage of shares owned by the president. It measures the amount of president's on-balance sheet guarantees. Manager share (%) is defined as the sum of the president, vice president, cashier, and assistant cashier share.

Table 3. Summary Statistics of California State Banks in 1892.

Panel A. Ownership and Balance Sheet Information Based on Bank Runs

	All Banks			Bank Run					
				No Bank Run			Bank Run		
	mean	p50	sd	mean	p50	sd	mean	p50	sd
log(Assets)	12.66	12.59	1.36	12.69	12.59	1.40	12.32	12.39	0.75
Bank Age	9.87	6.00	8.14	9.86	6.00	8.29	9.89	6.50	6.61
Equity Ratio	0.39	0.40	0.18	0.38	0.39	0.18	0.47	0.46	0.14
Cash	0.07	0.06	0.05	0.07	0.06	0.05	0.08	0.07	0.03
Loan & Leases	0.74	0.78	0.15	0.74	0.78	0.15	0.68	0.70	0.18
Unsecured Loans	0.47	0.56	0.34	0.45	0.52	0.34	0.71	0.70	0.18
Deposit-to-Capital	3.64	1.71	5.70	3.84	1.77	5.93	1.56	1.19	1.16
President share (%)	0.19	0.13	0.19	0.19	0.12	0.19	0.19	0.14	0.17
Manager share (%)	0.32	0.26	0.24	0.32	0.26	0.23	0.34	0.26	0.25
log(Off-B/S Liability)	9.55	9.54	1.89	9.61	9.56	1.90	8.96	9.22	1.69
log(On-B/S Capital)	9.04	9.10	1.70	9.04	9.15	1.72	8.98	8.91	1.54
N	201			183			18		

Panel B. Ownership and Balance Sheet Information Based on Bank Suspensions

	All Banks			Bank Suspensions					
				No Suspension			Suspension		
	mean	p50	sd	mean	p50	sd	mean	p50	sd
log(Assets)	12.66	12.59	1.36	12.68	12.60	1.37	12.28	11.78	1.27
Bank Age	9.87	6.00	8.14	9.96	6.00	8.18	8.46	6.00	7.67
Equity Ratio	0.39	0.40	0.18	0.39	0.40	0.18	0.41	0.39	0.16
Cash	0.07	0.06	0.05	0.07	0.06	0.05	0.09	0.09	0.05
Loan & Leases	0.74	0.78	0.16	0.75	0.79	0.15	0.61	0.63	0.12
Unsecured Loans	0.47	0.56	0.34	0.45	0.52	0.34	0.76	0.81	0.18
Deposit-to-Capital	3.64	1.71	5.70	3.73	1.70	5.87	2.38	1.77	1.62
President share (%)	0.19	0.13	0.19	0.19	0.12	0.19	0.23	0.23	0.16
Manager share (%)	0.32	0.26	0.22	0.31	0.25	0.24	0.37	0.35	0.24
log(Off-B/S Liability)	9.55	9.71	1.85	9.71	9.66	1.84	9.69	10.45	2.11
log(On-B/S Capital)	9.04	9.10	1.71	9.02	9.08	1.71	9.07	9.31	1.84
N	201			188			13		

Panel C. Ownership and Balance Sheet Information Based on Bank Failures

	All Banks			Bank Failure					
				Non-Failed			Failed		
	mean	p50	sd	mean	p50	sd	mean	p50	sd
log(Assets)	12.66	12.59	1.36	12.62	12.55	1.36	13.11	13.31	1.40
Bank Age	9.87	6.00	8.14	9.70	6.00	8.12	12.07	8.50	8.31
Equity Ratio	0.39	0.40	0.18	0.40	0.40	0.18	0.31	0.34	0.14
Cash	0.07	0.06	0.05	0.07	0.06	0.05	0.09	0.07	0.05
Loan & Leases	0.74	0.78	0.16	0.74	0.78	0.16	0.71	0.73	0.12
Unsecured Loans	0.47	0.56	0.34	0.47	0.56	0.34	0.49	0.57	0.35
Deposit-to-Capital	3.64	1.71	5.70	3.47	1.63	5.17	5.93	2.07	10.59
President share (%)	0.19	0.13	0.19	0.19	0.12	0.19	0.24	0.21	0.18
Manager share(%)	0.32	0.26	0.24	0.32	0.25	0.24	0.34	0.32	0.15
log(Off-B/S Guarantee)	9.55	9.71	1.85	9.62	9.61	1.84	10.86	10.84	1.71
log(On-B/S Capital)	9.04	9.10	1.71	8.97	8.98	1.68	9.78	9.67	1.96
N	201			187			14		

Note: The table summarizes ownership and financial ratios of California state banks in 1892. Suspended banks are those that experienced bank suspension in 1893, and failed banks are those that failed in the years between 1893 and 1896. Bank run banks are those that experienced a greater than 20 percent decline in total deposits between July 1892 and July 1893. log(Off-B/S Guarantee) is the natural logarithm of the dollar amount of a president's off-balance sheet guarantee, and log(On-B/S Capital) is the natural logarithm of the dollar amount of a president's on-balance sheet capital holding. Manager share (%) is defined as the sum of the president, vice president, cashier, and assistant cashier share.

Table 4. Effect of Bank Risk Management on Deposit Withdrawals.

VARIABLES	(1) Probit All banks	(2) Probit Rural banks	(3) OLS All banks	(4) OLS Rural banks
log(Assets)	0.00169	0.0899	-0.0259	-0.019
	(0.106)	(0.130)	(0.0203)	(0.031)
log(Bank Age)	0.145	0.0823	-0.149***	-0.166***
	(0.152)	(0.158)	(0.0354)	(0.041)
Equity Ratio	0.978	1.052	0.124	0.194
	(0.705)	(0.750)	(0.191)	(0.208)
Cash Ratio	-4.735*	-5.014*	1.449*	1.807*
	(2.814)	(2.860)	(0.866)	(0.937)
Loan & Leases Ratio	-0.796	-1.018	0.0810	0.132
	(0.753)	(0.806)	(0.185)	(0.203)
Unsecured Loans Ratio	1.063**	0.955**	-0.451***	-0.432***
	(0.430)	(0.430)	(0.121)	(0.123)
Constant	-1.412	-2.139	0.712**	0.567
	(1.433)	(1.655)	(0.276)	(0.380)
Observations	203	183	194	178
R-squared			0.273	0.279

Note: The table is estimated using both a probit model and an OLS regression. Columns (1) and (2) present results using a probit model, where positive coefficients indicate that the variable increases the probability of bank runs. The dependent variable is an indicator variable that measures the predicted probability of bank runs. It is equal to 1 if bank run occurred at bank i in 1893, and 0 otherwise. Columns (3) and (4) are estimated using an OLS regression using bank-level characteristics as predictors. These include (log) total assets, bank age, equity ratio (equity-to-asset), cash holding (cash-to-asset), loan & leases ratio (loan-to-asset), and unsecured loan ratio (unsecured loans-to-total loans). We add bank and year fixed effects to control for unobservable factors. *** p<0.01, ** p<0.05, * p<0.1. Standard errors are clustered at the bank level. Probit standard errors are robust.

Table 5. Bank Suspension and Failure Probabilities During the Panic of 1893.

	(1)	(2)	(3)	(4)
	Bank suspension	Bank suspension	Bank failure	Bank failure
	All banks	Rural banks	All banks	Rural banks
log(Assets)	-0.0268	-0.0449	-0.032	-0.128
	(0.177)	(0.244)	(0.138)	(0.235)
log(Bank Age)	0.113	0.0150	0.370*	0.371
	(0.235)	(0.258)	(0.217)	(0.262)
Equity Ratio	-1.934*	-1.836	-2.599**	-2.678*
	(1.161)	(1.173)	(1.234)	(1.550)
Cash Ratio	-4.386	-5.262	6.125*	7.548**
	(3.914)	(3.942)	(3.158)	(3.452)
Loan & Leases Ratio	-3.086***	-2.921***	-0.274	0.406
	(0.913)	(0.900)	(1.010)	(0.996)
Unsecured Loans Ratio	2.544***	2.291***	0.326	0.345
	(0.640)	(0.566)	(0.582)	(0.694)
Constant	0.241	0.729	-1.329	-0.810
	(2.224)	(2.888)	(1.694)	(2.776)
Observations	203	183	203	183

Note: The table is estimated using a probit model. Positive coefficients indicate that the variable increases the probability of bank suspension or failure. For the analysis on bank suspensions, the dependent variable is equal to 1 if bank suspension occurred at bank i in 1893, and 0 otherwise. For the analysis on bank failures, dependent variable is equal to 1 if bank i failed between 1893 and 1896, and 0 otherwise. Bank-level characteristics that are used as predictors are (log) total assets, bank age, equity ratio (equity-to-asset), cash holding (cash-to-asset), loan & leases ratio (loan-to-asset), and unsecured loan ratio (unsecured loans-to-total loans). We add bank and year fixed effects to control for unobservable factors. *** p<0.01, ** p<0.05, * p<0.1. Standard errors are clustered at the bank level. Probit standard errors are robust.

Table 6. Effect of Presidential Liability Exposure on Bank Risk Management, 1890–1892.

	(1) Equity Ratio	(2) Cash Ratio	(3) Loan & Leases Ratio	(4) Unsecured Loans Ratio	(5) Equity Ratio	(6) Cash Ratio	(7) Loan & Leases Ratio	(8) Unsecured Loans Ratio
log(Assets)	-0.247***	0.011	0.094	-0.000	-0.246***	0.015	0.058	-0.075
	(0.035)	(0.0243)	(0.0926)	(0.117)	(0.032)	(0.022)	(0.074)	(0.098)
Lag log(Off-B/S Guarantee)	0.004	-0.002	-0.0170	-0.072**				
	(0.005)	(0.006)	(0.0407)	(0.029)				
Lag log(On-B/S Capital)					0.005	-0.009	0.004	-0.045
					(0.008)	(0.011)	(0.022)	(0.034)
Constant	3.530***	-0.052	-0.317	1.120	3.501***	-0.044	-0.057	1.812
	(0.447)	(0.289)	(1.032)	(1.397)	(0.413)	(0.255)	(0.931)	(1.292)
Observations	326	326	326	326	328	328	328	328
R-squared	0.375	0.032	0.028	0.072	0.397	0.045	0.015	0.040
Number of Banks	178	178	178	178	178	178	178	178
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y

Note: log(Off-B/S Guarantee) is the natural logarithm of the value of off-balance sheet guarantees, computed by multiplying the amount of deposits less cash by the percentage of shares owned by the president. log(On-B/S Capital) is the natural logarithm of the value of the president's equity holdings, computed by multiplying the total amount of on-balance sheet capital by the percentage of shares owned by the president. It measures the amount of president's on-balance sheet guarantees. We use the lagged values of presidential liabilities to control for potential reverse causality and endogeneity. The tools of risk management are the balance sheet ratios discussed in the previous analysis: leverage ratio (equity-to-asset), cash holding (cash-to-asset), total loan holdings (loan-to-asset), and riskiness of loan portfolio (unsecured loans-to-total loans). For this analysis, we use firm and year fixed effect to control for other unobservable factors that can potentially affect the outcome.

Table 7: Effect of Presidential Liability Exposure on Bank Risk Management, 1893–1896.

	(1) Equity Ratio	(2) Cash Ratio	(3) Loan & Leases Ratio	(4) Unsecured Loans Ratio	(5) Equity Ratio	(6) Cash Ratio	(7) Loan & Leases Ratio	(8) Unsecured Loans Ratio
log(Assets)	-0.248***	-0.012	-0.0192	0.016	-0.240***	-0.011	-0.013	0.014
	(0.026)	(0.011)	(0.0283)	(0.035)	(0.025)	(0.010)	(0.028)	(0.033)
Lag log(Off-B/S Guarantee)	0.005**	0.001	0.007*	-0.003				
	(0.002)	(0.002)	(0.00422)	(0.006)				
Lag log(On-B/S Capital)					0.006**	0.002	-0.002	-0.009
					(0.003)	(0.002)	(0.005)	(0.006)
Constant	3.481***	0.224	0.934**	0.292	3.379***	0.202	0.944***	0.376
	(0.329)	(0.137)	(0.360)	(0.431)	(0.309)	(0.132)	(0.356)	(0.421)
Observations	825	825	825	825	830	830	830	830
R-squared	0.444	0.108	0.165	0.053	0.446	0.108	0.164	0.055
Number of Banks	232	232	232	232	233	233	233	233
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y

Note: log(Off-B/S Guarantee) is the natural logarithm of the value of off-balance sheet guarantees, computed by multiplying the amount of deposits less cash by the percentage of shares owned by the president. log(On-B/S Capital) is the natural logarithm of the value of the president's equity holdings, computed by multiplying the total amount of on-balance sheet capital by the percentage of shares owned by the president. It measures the amount of president's on-balance sheet guarantees. We use the lagged values of presidential liabilities to control for potential reverse causality and endogeneity. The tools of risk management are the balance sheet ratios discussed in the previous analysis: leverage ratio (equity-to-asset), cash holding (cash-to-asset), total loan holdings (loan-to-asset), and riskiness of loan portfolio (unsecured loans-to-total loans). For this analysis, we use firm and year fixed effect to control for other unobservable factors that can potentially affect the outcome.

Table 8. Yearly Effect of Presidential Liability Exposure on Bank Risk Management, 1893–1896.

VARIABLES	(1) Equity Ratio	(2) Cash Ratio	(3) Loan & Leases Ratio	(4) Unsecured Loan Ratio	(5) Equity Ratio	(6) Cash Ratio	(7) Loan & Leases Ratio	(8) Unsecured Loan Ratio
Lag log(Off-B/S Guarantee)	0.007**	-0.000	0.009*	-0.010				
	(0.003)	(0.001)	(0.005)	(0.007)				
Yr1894 × Lag log(Off-B/S Guarantee)	-0.002	0.003**	0.003	0.005				
	(0.002)	(0.0013)	(0.003)	(0.004)				
Yr1895 × Lag log(Off-B/S Guarantee)	0.000	0.003***	0.000	-0.002				
	(0.003)	(0.001)	(0.004)	(0.005)				
Yr1896 × Lag log(Off-B/S Guarantee)	0.001	0.000	0.004	-0.001				
	(0.003)	(0.001)	(0.005)	(0.005)				
Lag log(On-B/S Capital)					0.016***	-0.002	0.005	-0.015*
					(0.004)	(0.002)	(0.005)	(0.009)
Yr1894 × Lag log(On-B/S Capital)					-0.001	0.003**	-0.001	0.002
					(0.002)	(0.002)	(0.003)	(0.005)
Yr1895 × Lag log(On-B/S Capital)					-0.003	0.004***	-0.004	-0.003
					(0.003)	(0.001)	(0.005)	(0.005)
Yr1896 × Lag log(On-B/S Capital)					-0.006**	0.002	-0.002	-0.003
					(0.003)	(0.002)	(0.006)	(0.006)
Constant	3.333***	0.183	0.232	-0.0550	3.203***	0.159	0.182	0.177
	(0.255)	(0.112)	(0.302)	(0.463)	(0.227)	(0.104)	(0.298)	(0.450)
Observations	1,100	1,100	1,100	1,100	1,107	1,107	1,107	1,107
R-squared	0.429	0.094	0.153	0.039	0.447	0.095	0.146	0.041
Number of newid2	222	222	222	222	223	223	223	223
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y

Note: The table is estimated using the interaction of post-crisis year dummies and lagged logarithm of On-B/S Capital and Off-B/S liabilities. log(On-B/S Capital) is the natural logarithm of the value of president' equity holdings, computed by multiplying the total amount of on-balance sheet capital in each year by the percentage of shares owned by the president. Similarly, log(Off-B/S Guarantee) is the natural logarithm of the value of off-balance sheet guarantees, computed by multiplying the amount of deposits less cash by the percentage of shares owned by the president. We use the lagged value of presidential liabilities to control for potential reverse causality and endogeneity. The tools of risk management are the balance sheet ratios discussed in the previous analysis: leverage ratio (equity-to-asset), cash holding (cash-to-asset), total loan holdings (loan-to-asset), and riskiness of loan portfolio (unsecured loans-to-total loans). For this analysis, we use the firm and year fixed effect to control for unobservable factors that can potentially affect the outcome.

Table 9: Effect of On-Balance Sheet Capital and Liability on Bank Distress, IV Probit Model

	(1)	(2)	(3)	(4)
Analysis Period	1890-1892	1890-1892	1892-1896	1892-1896
Panel A: IV Analysis	Unsecured Loans Ratio	Unsecured Loans Ratio	Equity Ratio	Equity Ratio
log(Assets)	-0.064	-0.149	-0.240***	-0.230***
	(0.133)	(0.110)	(0.026)	(0.024)
Lag log(Off-B/S Guarantee)	-0.061*		0.007**	
	(0.035)		(0.003)	
Lag log(On-B/S Capital)		-0.050		0.011***
		(0.035)		(0.004)
Constant	1.254	2.176	3.213***	3.078***
	(1.536)	(1.389)	(0.325)	(0.302)
Firm FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Panel B: Main Analysis	Bank Run	Bank Run	Bank Failure	Bank Failure
Unsecured Loans Ratio	1.628**	2.004*		
	(0.670)	(1.183)		
Equity Ratio			-1.793**	-1.854**
			(0.797)	(0.788)
log(Assets)	-0.065	-0.024	-0.059	-0.056
	(0.094)	(0.130)	(0.094)	(0.094)
Constant	-1.335	-2.024	-0.281	-0.299
	(1.410)	(2.120)	(1.308)	(1.294)
	(0.134)	(0.160)	(0.0983)	(0.098)
Observations	326	328	1000	1005

Note: The table is estimated using the instrumental variable (IV) probit model. Panel A describes the results of the first stage regression, checking the use unsecured loan and equity ratio as an instrument for on-balance sheet capital and off-balance sheet guarantee in a given IV probit model. Panel B shows the second stage result estimate using the instrumented ratios from the previous panel. log(On-B/S Capital) is the natural logarithm of the value of president' on-balance sheet liability and log(Off-B/S Guarantee) is the natural logarithm of the value of off-balance sheet guarantees. We use lagged values of presidential liabilities to control for potential reverse causality and endogeneity. The tools of risk management are the balance sheet ratios discussed in the previous analysis: leverage ratio (equity-to-asset), cash holding (cash-to-asset), total loan holdings (loan-to-asset), and riskiness of loan portfolio (unsecured loans-to-total loans). For this analysis, we use the firm and year fixed effects to control for unobservable factors that can potentially affect the outcome.

Table A1: California Banks that Suspended Convertibility During the Panic of 1893

Bank	Date of Suspension
Riverside Banking Company	6/14/1893
Farmers Exchange Bank - San Bernardino	6/17/1893
Savings Bank of San Bernardino	6/17/1893
Bank of Oceanside	6/20/1893
Southern California National Bank - Los Angeles	6/20/1893
Consolidated National Bank of San Diego	6/21/1893
Savings Bank of San Diego	6/21/1893
Pacific Loan & Trust Company	6/21/1893
The Bank of Commerce - San Diego	6/21/1893
The First National Bank of San Diego	6/21/1893
Broadway Bank - Los Angeles	6/21/1893
City Bank (Savings) - Los Angeles	6/21/1893
East Side Bank - Los Angeles	6/21/1893
First National Bank - Los Angeles	6/21/1893
University Bank - Los Angeles	6/21/1893
Bank of Anaheim - Anaheim	6/21/1893
Bank of Orange - Orange	6/22/1893
Citizens Bank - Ontario	6/22/1893
The Commercial Bank - Santa Ana	6/22/1893
The First National Bank - Santa Ana	6/22/1893
The Los Nietos Bank - Downey	6/22/1893
The People's Bank - Pomona	6/22/1893
Bank of Madera - Madera	6/23/1893
Pacific Bank - San Francisco	6/23/1893
Peoples Home Savings Bank - San Francisco	6/23/1893
The First National Bank of San Bernardino	6/23/1893
The Loan and Savings Bank of Fresno	6/24/1893

Source: Various newspapers.