CEO Ownership, Risk Management, and Bank Runs at Unlimited Liability Banks during the 1890s

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Abstract

Using unique data on California state banks with unlimited liability, we examine how the liability of bank presidents relates to 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. 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.

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1. Introduction

The collapse of Silicon Valley Bank (SVB) has reignited debate over 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 the bank's failure, SVB's CEO and directors cashed out $84 million worth of stock, including a $3.6 million sale by CEO Greg Becker mere days before the announcement of substantial losses that triggered a steep decline in the bank's share price in March 2023. Thus, executives benefited considerably while failing to manage effectively, ultimately causing shareholders of the bank to be wiped out.

This issue is not new. Prior to the Great Depression, bank regulators sought to discourage bank managers' excessive risk-taking by requiring ownership of bank shares (Frydman and Jenter (2010), Grossman (2001), Mitchener and Richardson (2013)). At the time, bank presidents were mandated to hold shares with features resembling restricted stock and clawback provisions of today. Other senior managers also often held substantial portions of bank stocks, although not legally required. Bank shares in the 1890s functioned similarly to restricted stock options of today because they were not easily traded (Calomiris and Carlson (2016)). The absence of a liquid market effectively forced managers to hold their shares for extended periods, thereby incentivizing them to prioritize long-term performance over short-term profits. These shares also carried clawback-like features because shareholders faced extended liability. Under the extended liability rule, shareholders were personally responsible—in proportion to their shareholdings—for covering some or all of the bank's unpaid debts to depositors and other creditors in the event of a bank default. These features ensured that bank presidents were personally exposed to downside risks (Esty (1998)).

In this paper, we document empirical evidence that the unlimited liability structure imposed on bank CEOs mitigated excessive risk-taking and reduced the likelihood of bank runs, suspensions, and failures during the Panic of 1893. We first construct measures of presidents' on-balance sheet capital as well as off-balance sheet guarantees originating from unlimited liability exposures. We then examine the relationship between presidents' liability exposures, bank risk-taking, and the likelihood of bank distress. To mitigate endogeneity concerns, we use instrumental variables (IVs) based on the personal characteristics of bank presidents drawn from census records to understand the variation in presidents' holdings of bank stocks.

Our results suggest that the effectiveness of executive liability hinges on its design and implementation. Importantly, we differentiate between off-balance sheet and on-balance liabilities. The off-balance sheet component reflects the unlimited liabilities tied to the bank's total deposits, while the on-balance sheet component captures only the paid-in equity capital held by bank managers (Acheson, et al. (2008), Hickson and Turner (2003), Kenny and Ögren (2021)). Before the Panic of 1893, for example, presidential share ownership (an on-balance sheet liability) was not associated with lower risk-taking. In contrast, extended liabilities (an off-balance sheet liability) were associated with lower risk-taking, highlighting the effectiveness of unlimited liability in enhancing risk management. We also find that the personal characteristics of bank presidents—such as their wealth and local community connections—were significantly associated with their decisions regarding share ownership and extended liability exposure.

Our analysis of bank distress also sheds light on the distinct economic mechanisms behind bank runs, suspensions, and failures. We depart from previous studies by drawing a distinction between bank suspensions and bank failures (Ramcharan and Rajan (2016), Calomiris and Mason (1997 and 2000), Calomiris and Carlson (2016, 2017, and 2023)). We study them separately because suspensions were a key instrument used to prevent broader financial contagion. However, suspensions have not been studied much due to the lack of data. We find that banks with lower credit risk were less susceptible to runs and suspensions. Meanwhile, banks with lower solvency risk were less prone to failures. In addition, most banks that experienced runs and suspensions did not fail. The banks with high credit risk were more likely to experience runs and suspend the convertibility of deposits, but the banks that ultimately failed had solvency problems. These findings challenge the conventional view that bank runs directly led to bank failures during panics in the National Banking Era.

The California (CA) state banking system during the 1890s offers a unique setting to examine the effect of bank presidents' liabilities on risk management, bank runs, and failures. First, the regulatory landscape was characterized by minimal oversight beyond the extended liability rule, sharply contrasting with today's more comprehensive regulatory framework. Unlike national banks, which were subject to capital and reserve requirements under the National Banking Act, California state banks operated without such constraints. Our analysis shows that only 30 percent of California state banks would have met the capital and reserve requirements imposed on national banks. This finding suggests that the risk profiles of state banks were primarily shaped by

the idiosyncratic risk preferences of bank managers rather than by regulatory mandates. The absence of binding regulatory constraints allows us to directly observe how managers independently chose to manage risk to mitigate bank runs and avoid failures.

Second, California state banks in the 1890s operated under the unlimited liability rule, which fully exposed shareholders to the downside risk of bank failure. Under this rule, shareholders were required to cover, in proportion to their shareholdings, all unpaid debts owed to depositors in the event of failure. This structure was distinct from the more common double liability rule. Under this rule, shareholders' obligation was capped at twice the par value of their stock. As a result, bank presidents and senior managers in California state banks faced significantly greater financial exposure in the event of failure than their peers in other states. Additionally, California banking law mandated that bank presidents retain ownership of bank stocks to ensure accountability in the event of a failure. This requirement introduced variation in the exposure of bank presidents to downside risk, enabling an analysis of how presidential liability influenced their risk management decisions.

Third, California experienced one of the most severe shocks during the Panic of 1893. Between January and July of that year, state bank deposits contracted by 22 percent. This contraction was more pronounced for rural California banks, where deposits shrank by 37 percent, compared to a relatively modest 12 percent decline in San Francisco banks. While deposits were nominally covered under the unlimited liability rule, practical limitations existed. In some cases, shareholder wealth proved insufficient to cover the shortfall between depositor claims and the liquidated value of bank assets. Given that the unobservable nature of shareholder wealth, the varying 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 analysis, we draw on several data sources. Our primary source is the *Report of the Board of Bank Commissioners of the State of California* from 1890 to 1896.[2] In the 1890s, the state banking department collected information on state-chartered banks and published their balance sheets biannually in January and July. The reports provide detailed balance sheet

[2] 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.

information on state banks, along with the names of bank board members and the quantity of stocks held by each member. They also identify the managers and their respective shareholdings. Using data from the July Reports, we compute the percentage of shares owned by managers. Our analysis shows that bank executives held substantial equity stakes during the 1890s. On average, senior managers (president, vice president, cashier, and vice cashier) of banks collectively owned 30 percent of outstanding shares. Among these managers, presidents held the largest share, averaging 18 percent. Given this concentration of ownership, we focus on their shareholdings to study the relationship between managerial ownership and banking stability.

To construct a dataset on bank presidents, we use the 1880 and 1900 U.S. Censuses, as the 1890 Census was destroyed in a 1921 fire. These census records provide personal details such as place of birth, home address, age, and occupation, familiarity with banking, and community ties. Using this information, we assess whether such characteristics help explain variation in balance sheet exposure. This approach contrasts with prior studies, which typically treat presidential liability as given and did not explore the factors driving its heterogeneity (Calomiris and Carlson, 2016).

Lastly, we compile a list of suspended banks using historical newspaper sources. Because official annual reports from regulators only recorded failed banks, identifying suspended banks requires a different approach. Although a substantial number of banks suspended operations during the Panic of 1893, many ultimately avoided failure. Excluding suspension could therefore understate the true severity of bank distress during that period. To address the absence of official records on suspensions, we meticulously gather information on suspended banks by reviewing local newspapers published during that tumultuous period.

To gain a more nuanced understanding of how managerial liability influences bank risk-taking, we categorize presidents' liability exposure into two parts: on-balance sheet capital holdings and off-balance sheet guarantees. The on-balance sheet component reflects the portion of paid-in capital recorded on the balance sheet that a manager stands to lose in the event of failure. The off-balance sheet guarantee represents the additional amount a manager may be required to cover under the unlimited liability rule. This off-balance sheet component, often referred to as contingent liability, is akin to modern clawback provisions, as it requires managers of failed banks to absorb losses using their personal wealth.

For empirical analysis, we compute dollar amounts of on-balance sheet capital holdings

and off-balance sheet guarantees. Using dollar amounts, rather than percentage ownership, avoids distortions arising from variations in bank size. In large banks, a president's liability can be considerable even with a small ownership stake. This distinction is particularly important under the unlimited liability rule, which imposes no limit on the dollar value of off-balance sheet obligations, Thus, for a precise analysis, we examine the relationship between managerial liability and bank risk management using dollar-based measures. We calculate the on-balance sheet capital by multiplying a president's stock ownership percentage by its bank's paid-in capital in a given year. To estimate the off-balance sheet guarantee, we multiply the president's percentage ownership by the total deposits minus cash assets. This represents the upper bound of a president's off-balance sheet guarantee, the amount a president would need to guarantee if the value of all risky assets were null at failure.

We present several novel findings. First, in evaluating the risk profile of the California state banking system in the 1890s, we find that state banks were generally more exposed to both solvency and liquidity risks than their national counterparts. Such heightened exposure stemmed from lower levels of capital and reserves than mandated by the National Banking Act. Specifically, only about 30 percent of state banks met both capital and reserve requirements, 40 percent fulfilled one of the two, and the remaining 30 percent met neither. Notably, banks that complied with capital requirements tended to hold fewer reserves than those that did not, while banks meeting reserve requirements often operated with lower capital than their noncompliant peers. These patterns suggest that banks viewed capital and reserves as substitutable tools for managing default risk.

Second, we show that credit risk and solvency risk exposures have differential effects on the likelihood of bank runs, suspensions, and failure. In particular, banks with risky loan portfolios (high credit risk exposures) were more likely to experience bank runs and suspensions, while banks with low equity holdings (high solvency risk exposures) were more likely to fail. These results indicate that runs, suspensions, and failures were not driven by a common type of risk exposure. Bank runs and suspensions were primarily associated with credit risk, whereas failures were more closely tied to solvency concerns.

Third, we examine the relationship between presidential liabilities and bank risk management. We find that presidential capital holdings (on-balance sheet capital) had no 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 risk and maintained safer loan portfolios prior to the Panic of 1893. Following the Panic, however, both capital holdings and guarantees were associated with reduced solvency risk, with capital holdings having a stronger effect. These findings suggest that on- and off-balance sheet liabilities have distinct effects on managerial behavior, and that the effectiveness of executive liability depends on the design and implementation of regulatory mechanisms.

Lasty, we explore the factors that may explain variation in presidents' liability exposures, focusing on personal characteristics such as age, birthplace, distance between a president's home and his bank, and homeownership. Among these, age and homeownership serve as proxies for personal wealth. The population of the president's county reflects the size of the local economy, while the bank's market share within the county captures local competition. Our results show that bank presidents tend to hold larger equity stakes when they are wealthier and when their banks are located in more populous areas. These presidential characteristics also serve as useful IVs to establish a causal link between bank risk management and the likelihood of runs and failures. To our knowledge, this is the first study to exploit detailed data on the personal characteristics of bank presidents to examine how these traits relate to bank ownership and liability exposure in the pre-1935 era—a period during which many state banks operated under extended liability regimes.

Our paper is related to several strands of literature. First, it contributes to 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)). A second line of research examines mandatory bonus clawbacks upon accounting restatements and financial losses (Chan et al. (2013), Chen et al. (2015)). A third line 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 contribute to this literature by investigating the extended liability rule that incorporates both restricted stock and clawback features and by 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 decisions – 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 including loans to businesses, noninterest-based banking activities, and investments in mortgage securitizations. Calomiris and Carlson (2016) using the 1890s banking data show that banks with higher managerial ownership relied more on cash than on 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 contributes to the literature on the relationship between extended liability rules and financial stability, a field 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 1930s find that it was less effective due to the broadening of stock ownership during economic booms (Macey and Miller (1992), Kane and Wilson (1998)). Unlike previous studies that compare banks operating under different liability regimes, we examine variation in presidents' exposure to unlimited liability and its relationship with presidential ownership and bank risk management during the 1890s.

Lastly, this study contributes to the literature on banking panics, with particular attention to 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 risk management under the unlimited liability system.

Our paper has important policy implications for today. Following the failure of Silicon Valley Bank, the Senate Banking Committee passed a bipartisan bill granting banking regulators the authority to claw back a portion of compensation from senior executives at failed banks. Our study provides evidence that bank executives with greater personal exposure to downside risks in the event of bank failure are more likely to adopt conservative risk management strategies. However, our study also shows that bank presidents' on-balance sheet capital holdings and off-balance sheet guarantees have different effects on bank risk levels and risk management

approaches. These findings suggest that the effectiveness of regulatory policy hinges on both its design and implementation.

2. Historical Background

2.1. Bank Managers of California State Banks

During the 1890s, managers of California state banks faced significant exposure to bank failure through managerial ownership. Each bank was required to have at least five directors, with each director holding a minimum of ten shares of the bank's capital stock. One of the directors was required to serve as the president of the board. In addition, banks were mandated to publicly disclose the names of directors and the number of shares held by each. Although not legally required, other bank executives also commonly held sizable equity stakes.

Bank stocks in this period featured characteristics similar to modern restricted stock options and clawback provisions, both of which are designed to promote long-term decision making and discourage excessive risk-taking by exposing managers to downside risk. While not legally prohibited, the sale of bank shares was limited by institutional, social, and legal barriers. Markets for bank stocks were illiquid, as shares were traded over the counter (OTC). Social norms among shareholders, who often regarded one another as partners and upheld strong norms of trust and loyalty, further discouraged trading. Legally, share transfers required approval by the board of directors, reflecting the fact that shareholders were subject to post-failure assessments under the extended liability rule. These constraints on transferring bank stock ownership contributed to long-term, stable ownership by bank managers (O'Sullivan, 2007).

Figure 1, which plots the percentage of ownership and the average dollar amount (in natural log) of bank stocks held by bank managers, supports this characterization. On average, presidents held over 15 percent, and managers collectively held over 30 percent of total shares throughout the period. Managerial ownership remained stable and invariant over time, even during the Panic of 1893. Ownership structures were persistent and stable across banks at the time.

The extended liability rules attached to bank stocks in the 1890s share important similarities with modern clawback provisions, as managers of failed banks were required to compensate for losses using their personal wealth, subject to the specific liability regime in place. Under extended liability, 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 shareholders helped mitigate moral hazard and encouraged banks to maintain adequate capital reserves. For example, it reduced incentives for excessively risky behavior—such as "go for broke" strategies—and encouraged early closure of distressed banks before their liabilities exceeded assets. Early closures in the form of voluntary liquidation helped minimize losses for both depositors and shareholders (Macey and Miller, 1992).

Enforcing extended liability was often costly and imperfect. Under the double liability regime applied to national banks, shareholders were assessed up to the par value of their stock upon failure. And yet, receivers of failed national banks recovered only 48.6 percent of the total assessments during this period, while 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 California state banks received approximately 70 percent of their deposits following bank failures (Report of the Board of Bank Commissioners of the State of California, 1890-1909).[3]

Nonetheless, stock ownership appears to have played an important role in promoting banking stability in California, where state banks operated with minimal regulatory oversight. 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 and unsecured loans, California state banks in the 1890s faced no such constraints.

While earlier research on bank stock ownership during this period predominantly focused on the behavior of banks under different liability regimes and their effect on the stability of the banking system, relatively little is known about 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 following changes to liability rules that increased their exposure to bank failures. Similarly, Calomiris and Carlson (2017) show that banks with high managerial ownership target lower default risk, even in weak governance environments. They find that high managerial ownership, rather than formal

[3] 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.

governance, is associated with increased reliance on cash holdings as a risk buffer. We contribute to this literature by investigating the corporate governance structure of unlimited liability banks in the 1890s and examining how the degree of presidential ownership influenced risk management strategies and bank runs during the Panic of 1893.

2.2. **The Panic of 1893**

The Panic of 1893 was the most severe financial crisis of the National Banking Era. Unlike other panics of the period, it began in the interior and then radiated outward to New York City, precipitating a large number of bank failures. Ending the panic required collective action by members of the New York Clearinghouse that 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 attribute the crisis to fears of depreciation and an attack on the exchange rate (Lauck (1907), Noyes (1909)). As U.S. Treasury gold reserves declined, concerns mounted—both domestically and internationally—over the federal government's ability to maintain gold parity. These fears prompted investors to convert bank deposits into gold, putting additional strain on the currency system. Other contemporaries—and most modern scholars—argue that concerns over gold parity played a limited role (Friedman and Schwartz, 2008; Sprague, 1910; Wicker, 2006)). Instead, they emphasize a deterioration in real economic conditions. According to this view, a slowdown in economic activity—marked by declining railroad investment, the failure of several major railroad companies, and a falling stock market—precipitated the collapse of a few major 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 crisis peaked in June and July, when 340 suspensions occurred. In June, bank runs swept through Midwestern and Western cities such as Chicago and Los Angeles. By the second week of July, suspensions intensified, with the highest concentration of suspended banks and liabilities in the Western states. As these banks came under pressure, they withdrew funds previously deposited in New York City banks, further straining liquidity in the financial center. To stabilize the banking system, the New York Clearinghouse issued clearinghouse loan certificates in June and partially suspended cash payments in August. This suspension led to the emergence of a currency premium in New York and other cities.

Table 1 reports the number of suspended and failed banks during the Panic of 1893, both nationwide and in California. California was one of the most severely affected states during the crisis, experiencing more bank failures than any other state except Kansas. Numerous national, state, and savings banks across California suspended payments, with several ultimately failing. By the third week of June, a total of 27 banks had shut their doors. While most reopened by the third week of July, five closed permanently. Of the six national banks that suspended payments, five resumed operations and one failed permanently. Among the 17 state banks that experienced temporary closures, two ultimately failed. Additionally, two California savings banks also failed. Although the number of suspensions in California represented a small fraction of the total suspensions nationwide, the state alone accounted for nearly one-third of the total liabilities of failed banks across the country.

Figure 2 maps the cities in California where banks were suspended. Bank runs in California began with the failure of Riverside Banking Company on June 14. Within days, the panic spread quickly to nearby cities, including San Francisco, San Bernardino, Los Angeles, and San Diego (see Appendix D for the complete list). San Francisco played a significant role, both as California's financial center and as its designation as a reserve city.

2.3. **How Risky Were State Banks in 1890s?**

To illustrate the riskiness of California state banks, we examine how many would have satisfied the regulatory requirements imposed on national banks at the time. As discussed in the previous section, California's state and national banks operated under distinct regulatory regimes. While state banks were not subject to capital and reserve requirements, national banks were required to comply with the standards specified in the National Banking Act. These include maintaining a minimum level of capital as well as holding a statutorily mandated level of cash and liquid assets relative to deposits and interbank liabilities. Appendix E provides detailed information on the capital and reserve requirements for national banks.

Regulatory requirements during the National Banking Era. The minimum capital requirements for national banks varied based on the population of the town in which the bank was located. Each bank was required to pay in cash at least half of the required capital as "paid-in-capital" before the beginning operation, and the remainder was allowed to be paid in monthly installments.

In addition, national banks were required to maintain reserves against their deposits. The National Banking Act established a tiered reserve system, classifying banks into three tiers. The top tier consisted of banks located in central reserve cities: New York, Chicago, and St. Louis. Banks in these cities were required to hold 25 percent of their deposits as reserves. The second tier included banks in reserve cities. The original act established 18 reserve cities, and by 1890, this number expanded to 19. These banks were also subject to the 25 percent reserve requirement but were permitted to hold up to half of their reserves as deposits in central reserve city banks. The lowest tier, country banks, consisted of banks outside of reserve cities. These banks were required to hold 15 percent of deposits as reserves, of which up to three-fifths could be held as deposits in reserve city or central reserve city banks.

Most banks in California chose not to operate as national banks, likely to avoid these regulatory constraints. During the 1890s, only 30 national banks operated in California, and they were primarily concentrated in larger urban centers.

Risk in state banks. How many California state banks would have satisfied the capital and reserve requirements specified in the National Banking Act? To answer this question, we first calculate the levels of capital and reserves state banks would have been required to hold had they been subject to these requirements.[4] We then compare these hypothetical requirements to actual capital and reserve holdings reported by the state banks.

Figure 3 illustrates the percentage of state banks that would have met these requirements between 1890 and 1896. Panel A shows that only about 30% of state banks would have met both requirements. Panel B reveals that compliance with capital requirements fluctuated between 49% and 54%, averaging 52% over the entire period. Approximately 63% of the banks satisfied the reserve requirement over the same timeframe. These findings suggest that many state banks would not have been qualified to operate as national banks, as over 50% failed to satisfy one of the two requirements. State banks were more vulnerable to liquidity and solvency risk than national banks.

Table 2 presents the capital and reserve ratios of compliant and non-compliant state banks in 1892. Columns (1) through (3) compare banks that would have met both capital and reserve requirements to those that would not. Among the 201 banks, only 65 would have been able to meet both requirements. In Columns (4) to (6), we examine state banks based on their ability to comply

[4] In California, San Francisco was designated as a reserve city, so we use reserve and capital requirements based on San Francisco.

with capital requirements in 1892. While both compliant and non-compliant banks, on average, held sufficient reserves to meet the reserve requirements, non-compliant banks maintained a higher share of their reserves in liquid form, particularly in the form of interbank deposits. In Columns (7)– (9), we examine the ratios of state banks based on their ability to meet reserve requirements in 1892. We find that compliant banks, on average, held significantly more liquid assets, but there was no statistically significant difference between the two groups in the capital-to-required-capital ratio.

Taken together, these results indicate that state banks faced greater solvency and liquidity risks than national banks, as they typically held less capital and smaller reserves than required by the National Banking Act. Only about 30 percent of state banks satisfied both requirements, 40 percent met one of the two, and 30 percent failed to meet either. Note also that banks that met capital requirements held less reserves than those that did not and banks that met reserve requirements operated with less capital than those that did not. Thus, these banks viewed capital and reserves as substitutes in managing default risk, highlighting the importance of both capital and reserve regulations in ensuring bank liquidity and solvency. Lastly, we note that the capital and reserve holdings of state banks may have been lower in the absence of unlimited liability. In the subsequent section, we study how the riskiness of the banking system is related to the president's liability exposure and banking distress.

3. Data and Descriptive Statistics

In this section, we describe our data sources, introduce key variables, and present summary statistics for banks that experienced runs, suspensions, or failures. Using president-level data, we also provide descriptive statistics on bank presidents' personal characteristics, including homeownership status and place of birth. In addition, we outline the construction of our measures for presidential liability exposure—specifically, on-balance sheet capital holdings and off-balance sheet guarantees.

3.1. Data Sources

Bank balance sheet data. Our bank-level data comes from the *Report of the Board of Bank Commissioners of the State of California* from 1890 to 1896.[5] The state banking department

[5] Our sample period ends in 1896 because the legislature did not allocate any funds for the printing of the reports in the years 1897, 1898, and 1901-1904. We collect data from the July reports.

collected and published information on state banks biannually, in January and July, and we use the July reports. These reports provide detailed balance sheet information, including the names of bank board members and the number of shares held by each. They also identify the names of bank managers, enabling us to track changes in bank leadership over time.[6] Appendix A Panel A presents a sample image of a bank balance sheet from the report for Security Savings Bank in Los Angeles. Our micro-sample consists of data on 241 state banks that operated for at least one year between 1890 and 1896 in California.

Bank suspension data. Banks facing large substantial deposit withdrawals could declare temporary suspension of convertibility of deposits to avoid outright failure. While several banks suspended during the Panic of 1893, most did not fail eventually. Although suspensions were common, they are difficult to identify from official records, as the Bank Commissioners' reports only listed banks that were ultimately placed in receivership.

To address this limitation, we compile a list of suspended banks from local newspaper accounts published during the panic. This newspaper-based approach allows us to capture temporary suspensions not recorded in the official data. Appendix D provides the list of suspended banks, accumulated from 1893 newspapers.

Bank president data. We collect personal information on state bank presidents from the U.S. Census, including age, place of birth, home address, occupation, and homeownership. These variables serve as proxies for presidents' personal wealth and community ties. Because the 1890 Census was destroyed in a fire in 1921, we use data from the 1880 and 1900 Censuses. Among the 313 individuals who served as state bank presidents between 1890 and 1896, we successfully matched 304 to at least one of the two censuses (278 matched to the 1880 census and 237 to the 1900 census).[7] Because the census questionnaires for the 1880 and 1900 censuses differ, we adjust or combine variables as needed. For example, the 1900 census introduced new fields, such as "Location," "Citizenship," and "Ownership of Home." Appendix A Panel B presents sample census images for J.F. Sartori, who served as president of Security Savings Bank in Los Angeles in 1896.

[6] Given our use 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.
[7] The number of matches is smaller for the 1900 census because many presidents had died and were no longer included.

3.2. **Measuring Managers' Personal Liability and Bank Risk Taking**

3.2.1. Measuring Presidential Liability

For a more precise understanding of the effect of managerial liability on bank risk-taking, we decompose liability into two components: on-balance sheet capital holdings and off-balance sheet guarantees. On-balance sheet capital refers to the portion of paid-in capital that a manager stands to lose in the event of failure. Off-balance sheet guarantee refers to additional liability—beyond the paid-in capital—that a manager may face under the unlimited liability rule.

We focus specifically on presidential liability for two reasons. First, as illustrated in Figure 1, presidents held the largest share among senior managers on average and played the central role in bank decision-making. Second, unlike other managers, bank presidents were legally obligated to possess bank shares. While other managers could avoid liability by holding shares, this was not an option for bank presidents.

To proxy for presidential liabilities, we compute the dollar amounts—rather than the percentage ownership—of on-balance sheet capital holdings and off-balance sheet guarantees. Relying on ownership percentages can be misleading, particularly under the unlimited liability regime, where a president's off-balance sheet exposure is proportional to the overall size of the bank. As a result, even a modest ownership percentage can translate into substantial dollar exposure when the bank is large. We thus focus on the dollar amount of presidential liability.

We measure a president's on-balance sheet capital holding by multiplying their ownership percentage by the bank's total paid-in capital. Notably, a president's absolute capital exposure may remain limited when the bank's total capitalization is small, regardless of their shareholding percentage. Given the highly skewed distribution of ownership values, we use the natural logarithm of the dollar amount.

We also construct a measure of a president's off-balance sheet guarantee. In the 1890s, when a bank became insolvent, state regulators seized the personal assets of shareholders to cover depositor losses if the liquidation value of the bank's assets was insufficient to meet its liabilities. To estimate the financial exposure of shareholders under the unlimited liability rule, three factors should be considered: the percentage of bank shares held, the size of bank deposits, and the liquidation value of assets. Among these, the liquidation value of assets is particularly difficult to

estimate, as assets were often sold at fire-sale prices during banking crisis.[8] We adopt a conservative approach by assuming a worst-case scenario for shareholders: the liquidation value of non-cash assets is minimal, and shareholders bear the entire cost of deposits less cash.

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

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

where $S_{off\text{-}B.S}$ denotes a shareholder's off-balance sheet guarantee, pS is the percentage of shares held by the shareholder, *Deposits* is the total deposits held by the bank, and *LA* is the liquidation value of assets. Assuming zero liquidation value for non-cash assets, the shareholder's maximum off-balance sheet guarantee, $S_{off\text{-}B/S}^{Max}$, is given as:

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

This expression provides an upper-bound estimate of the shareholder's liability exposure in the event of bank failure.

Despite the simplicity of this formulation, estimating $S_{off\text{-}B/S}^{Max}$ in practice is complicated by an inverse relationship between its two determining components. As a bank matures and expands, the shareholdings of initial investors (including managers) are typically diluted, while deposit levels increase. Figure 4 (a) illustrates this pattern, plotting a president's ownership share and total deposits against bank size and age. As banks grow, presidential ownership declines, but deposits increase. Figure 4 (b) further confirms a strong negative relationship between presidential ownership share and total deposits. Previous studies on the extended liability rule have focused on *pS*—the percentage of shares held by shareholders—as the primary measure of liability. However, this negative relationship documented in the figure suggests that neglecting the impact of deposit size in extended liability analyses may lead to incomplete or skewed conclusions.

Based on the identity outlined above, we construct a measure of presidential off-balance sheet guarantee:

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

[8] 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)

If $pP_{Deposits}$ is large, we expect the bank president to face a significant financial setback when the bank fails under the unlimited liability rule. As with capital holdings, the distribution of the presidential off-balance sheet guarantee is highly right-skewed. We use the natural logarithm of this value in our empirical analysis.

3.2.2. Measuring Bank Risk Management

In our empirical analysis, we focus on three dimensions of bank risk: credit risk, liquidity risk, and solvency risk. Drawing on extensive literature on bank risk management, we proxy each risk type using the following measures: the unsecured loan ratio for credit risk, the cash-to-asset ratio for liquidity risk, and the equity-to-asset ratio for solvency risk.

Credit risk is proxied by the ratio of unsecured loans to total loans. Banks in the 1890s paid close attention to the riskiness of their asset portfolios. Loans were risky assets but also yielded relatively high returns. The State Bank Commissioner's Report provides disaggregated data on four loan categories: (1) loans on real estate, (2) loans on stocks, bonds, and warrants, (3) loans on other securities, and (4) loans on personal security. The first three represent secured loans, whereas the last consists of unsecured loans, which were considered the riskiest and were prohibited for national banks during the National Banking Era. Thus, we use the ratio of unsecured loans to total loans as a proxy for credit risk, as it reflects higher-return, higher-risk lending.

Liquidity risk is measured using the cash-to-asset ratio. Banks during this period held two types of liquid assets: cash on hand and interbank deposits due from other banks and bankers. While both were considered liquid and eligible as legal reserves for national banks, their implications for liquidity risk differed. Banks generally preferred interbank deposits because they earned 2 percent interest. However, regulators discouraged overreliance on such deposits and imposed limits, given the systemic risks they posed. In periods of financial stress, rural banks might withdraw funds en masse from their city correspondents, potentially overwhelming those institutions and triggering suspensions in major financial centers. Conversely, rural banks themselves could face sudden liquidity shortfalls if their city correspondents suspended payments. We thus use the cash-to-asset ratio to measure liquidity risk. Hence, we only include cash on hand while calculating the cash-to-asset ratio.

Solvency risk is captured by the equity-to-asset ratio, where equity, or net worth, is calculated as the sum of paid-in capital and cumulative retained earnings (surplus or undivided

profits). Paid-in capital represents 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 represented 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 these 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.

3.3. **Descriptive Statistics: Bank Panics and Risk Taking**

3.3.1. California State Banks

Panel A of Table 3 report key characteristics of California state banks in 1892. Surprisingly, these banks held substantial capital, with an average equity ratio of 39%, suggesting that state banks provided depositor safety also through on-balance sheet capitalization. However, equity ratios varied considerably across banks: those in the bottom 5th percentile had ratios below 10%, while those in the top 5th percentile approached 70%. In terms of asset composition, state banks held relatively low levels of liquidity, with an average cash-to-asset ratio of just 7%, while the average loan-to-asset ratio exceeded 70%. Moreover, unsecured loans constituted 47% of all loans.

Panel B presents a breakdown for bank-run banks, which we define as those whose deposits declined by more than 20 percent from July 1892 to July 1893.[9] While bank-run banks held higher levels of on-balance sheet capital, they had lower off-balance sheet presidential guarantees, suggesting that presidential liability exposure may have served as a signal of credibility to depositors. On average, bank-run banks reported higher equity ratios (46%), compared with non-run banks (38%). This may seem counterintuitive, as higher equity ratios typically signal lower solvency risk. However, these banks had riskier portfolios—the unsecured loan ratio was 16 percentage points higher than non-run banks. This pattern suggests that credit risk, proxied by the riskiness of asset portfolios, was likely a primary driver of bank runs in 1893.

Table 3 Panel B also presents summary statistics by bank suspension. In response to severe deposit withdrawals, several banks opted to suspend the convertibility of deposits to avoid outright

[9] We choose this threshold because deposits held by state banks in California contracted by an average of 22 percent between January and July of 1893.

failure. According to the *1894 Biennial Report of the Attorney General of the State of California*, 19 state banks and two savings banks suspended operations during the crisis.[10] Although most of these institutions survived (only two of the nineteen suspended state banks eventually failed), suspension was likely instrumental in preserving their solvency.

In Panel B, we find that suspended banks, on average, had higher presidential on- and off-balance sheet liabilities. At first glance, this may seem counterintuitive, considering the findings in Panel A, which show that banks with higher off-balance sheet guarantees were less likely to experience a bank run. However, this pattern also suggests that greater managerial liability may have influenced managements' decisions to suspend convertibility. Faced with the potential personal financial consequences of a run, bank presidents with higher exposure may have acted more swiftly to suspend operations, thereby preventing a disorderly failure. Suspended banks had similar liquidity and equity ratios as non-suspended banks but held 14 percentage points more unsecured loans, again pointing to credit risk as a major factor behind bank suspension.

Panel B further provides a breakdown by bank failure. We define failed banks as those explicitly labeled as "failure" or "forced liquidation" in the Bank Commissioner's Report. This definition excludes banks that disappeared for non-failure reasons (e.g., when transitioning from a state charter to a national charter). Additionally, voluntary closures were far more common during this period.[11] In the three years prior to the panic, only one failure occurred annually. However, in the years following the panic (1893–1896), failures surged to nine.

We find that failed banks, on average, had higher presidential liabilities but lower presidential ownership compared with surviving banks. We continue to find a higher unsecured loan ratio for failed banks, as we did for bank-run and suspended banks. In addition, failed banks had substantially higher solvency risk than surviving banks. Before the onset of the panic, the average equity ratio of failed banks was over 10 percentage points lower than that of their non-failed peers.

Taken together, Table 3 offers several key takeaways. First, while bank runs and

[10] We exclude the Pacific Loan & Trust Company from Table 2 because its financial statements were not reported in the 1892 Bank Commissioners' Report. We include savings banks in our analysis of suspensions and failures, as they were chartered by the state government and supervised by the State Bank Commissioners, subject to the same regulatory standards and legal obligations as state commercial banks.

[11] For example, the July 1892 Bank Commissioner's Report notes that while nine banks retired over the prior year, "the only failure during the year has been that of the California Savings Bank of San Diego." Summary statistics for voluntarily retired banks are provided in Appendix F.

suspensions were largely driven by credit risk, failures reflected a combination of credit and solvency risk. Thus, bank runs and failures might arise from distinct sources of risk, underscoring the importance of analyzing different types of distress events separately. Second, managerial liability had different associations across these panic events. Among bank-run banks, presidents tended to have lower off-balance sheet guarantees but higher on-balance sheet capital holdings. Conversely, among failed banks, presidents had higher off-balance sheet guarantees and lower on-balance sheet capital, suggesting that excessive exposure may not have deterred failure once solvency deteriorated. This result suggests that regulations on managerial liabilities may have conflicting effects on the likelihood of bank runs and failures, depending on how the policy is designed. In our main empirical section to follow, we test these insights through formal empirical analysis.

4. Empirical Analysis on Bank Runs, Suspensions, and Failures

We analyze the relationship between presidential ownership and liabilities, bank risk management, and bank distress during the 1890s using regression analysis. We begin by examining the effects of bank risk management on the probability of bank runs and failures. Next, we investigate how presidential ownership and liabilities affect bank risk management around the Panic of 1893. Finally, using bank presidents' characteristics as IVs, we examine the extent to which variation in presidents' personal wealth and community ties influences bank risk management and the likelihood of runs and failures, thereby providing support for a causal interpretation of our results.

4.1. Bank Risk Taking and the Panic of 1893

Bank runs. We first examine the effect of bank risk-taking on bank runs. Specifically, we examine the relationship between the probability of a bank run and pre-crisis risk exposure using the following logit model:

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

The dependent variable is an indicator that equals one if a run occurred for bank i in 1893—defined as a drop of more than 20 percent in deposits between July 1892 and July 1893—and zero

otherwise. This period is the core of the Panic of 1893, which began in May and intensified through June and July. Independent variable $X_{i,1892}$ includes one-year lagged values of main risk measures: the equity-to-asset ratio, cash-to-asset ratio, and unsecured loan ratio. We also control for log total assets, bank age, and the loan-to-asset ratio.

In addition to the logit model in Equation (1), we estimate an alternative specification that captures heterogeneity in depositor behavior. In this specification, deposit outflows are the dependent variable, as bank runs typically arise from depositors' reactions to negative information that alters the perceived riskiness of a bank. Specifically, we estimate the following model:

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

The dependent variable, $\Delta\log\left(Dep_{i,1893}\right)$, is the log change in net deposits from July 1892 to July 1893, capturing the severity of a bank run.[12] We employ the same set of independent and control variables as in Equation (1). The results are displayed in Table 4.

Table 4 shows that during the Panic of 1893 both the probability of bank runs and the magnitude of deposit outflows increased for banks with high unsecured loan ratios. In Column (1), for example, the coefficient on the unsecured loan ratio is positive and statistically significant at the 5% level. The coefficient estimate indicates that a one percentage point increase in the unsecured loan ratio raises the odds of a bank run by 4.6 percentage point, an approximately 30% increase in the probability of a bank run. This result is not driven by large banks located in San Francisco. We find that our results are consistent when we run the regression only with rural banks as shown in Column (2).

In Columns (3) and (4) of Table 4, we find that deposit outflows during the Panic of 1893 increase with the unsecured loan ratio of banks. In both Column (3) for all banks and Column (4) for rural banks, the coefficients on the unsecured loan ratio are negative and highly statistically

[12] Thus, we likely understate the magnitude of a bank run, as 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 still hold if the accumulation of deposits up to July 1892 accurately forecasts the accumulation between July 1892 and May 1893. This is not a far-fetched assumption, as most towns in California had only one or two banks at the time. Therefore, the relative deposit level of a state bank was unlikely to deviate significantly from past trends unless the town's economy experienced a substantial upturn or downturn in the nine months leading up to the bank run in May 1893.

significant, indicating that net deposit flows in 1893 declined more at banks with risky loans. Note also that the cash ratio is positively associated with deposit flows, suggesting that banks with liquidity cushions experienced fewer deposit outflows during the panic.

These results reinforce previous literature suggesting that bank runs reflect the rational and predictable behavior of depositors responding to the perceived riskiness of their banks (Calomiris and Mason (1997 and 2000). Depositors are highly sensitive to credit risk, as measured by unsecured loan ratios, when deciding to run on a bank. In the absence of a clear measure of bank failure probability, credit risk served as the most direct indicator of a bank's potential ability to repay depositors in the event of liquidation. This suggests that regulators can potentially mitigate bank run risk during periods of panic by limiting credit risk exposures. In the absence of direct bank failure probability metrics, credit risk may be the best proxy for assessing institutional solvency and depositor repayment capacity under liquidation scenarios.

Commented [JR1]: Perhaps add a sentence like "This may be because, in the absence of a clear measure of bank failure probability, credit risk served as the most direct indicator of banks' potential ability to repay depositors in the event of liquidation ."

Bank suspensions and failures. We estimate the probability of bank suspension and failure using Eq. (1), where the dependent variable, Y_i, is either a bank suspension or failure indicator. The bank suspension indicator equals one if bank i suspended operations in 1893, and zero otherwise. Likewise, the failure indicator equals one if bank i failed, and zero otherwise. The independent variables are bank characteristics measured immediately prior to failure or suspension. Accordingly, for bank suspensions in 1893, we use bank data from 1892, while for bank failures, we use data from the year directly preceding each failure. For robustness, we repeat the analysis using both the full sample of banks and the subsample of banks located outside San Francisco. We present the results in Table 5.

The results reported in Columns (1) and (2) of Table 5 indicate that the probability of suspension increases with the share of unsecured loans against total loans and decreases with the share of loan and lease against total assets. In Column (1), for example, the coefficient on the unsecured loan ratio is 2.1 and highly statistically significant, suggesting that risky loan portfolios, as proxied by unsecured loan ratio, are associated with higher likelihood of bank suspension. The economic magnitude is substantial: a one–percentage-point increase in the unsecured loan ratio raises the odds of suspension by roughly 8 percent. Given that suspended banks, on average, held 14 percentage points more unsecured loans than non-suspended banks, this finding suggests that reliance on unsecured lending contributed materially to suspension risk. We also find that the coefficient on the loan and lease share is negative and statistically significant at the 1% level.

Taken together with the results for bank runs reported in Table 4, these results provide useful insights into the factors that lead to bank runs and subsequent suspensions. Holding a large share of loans does not affect the probability of bank run but increases the probability of suspension. In contrast, the riskiness of a loan portfolio increases both bank run and suspension probabilities. These findings suggest that elevated credit risk, as measured by greater unsecured lending, can trigger a bank run, though it may not lead to suspension on its own. However, holding a large share of risky unsecured loans can result in substantial deposit withdrawals, which may ultimately necessitate the suspension of convertibility.

In Columns (3) and (4) of Table 5, we present the estimation results for bank failures. We find that the equity ratio, which has no significant effect on bank runs (Table 4) and suspensions (Columns 1 and 2 of Table 5), has a strong and significant negative effect on the probability of bank failure. In Column (3), for example, the coefficient estimate is –8.29 and statistically significant at the 1% level. This result suggests that, while the equity ratio is not a significant driver of bank runs or suspensions, it is a primary indicator for future bank failure.

Commented [JC2]: Again, economic magnitude?

Commented [JR3R2]: "The results suggest that a one–percentage-point increase in the equity ratio reduces the odds of bank failure by about 1 percent. Given that failed banks, on average, had roughly 11 percentage points less equity than surviving banks, our findings indicate a significant effect of solvency on the likelihood of bank failure."

The overall findings in Tables 4 and 5 suggest that bank runs, suspensions, and failures stem from different types of risk, highlighting the importance of analyzing each risk independently. In the following subsection, we examine how management incentives affect a bank's exposure to these distinct risk types.

4.2. **Presidential Liability and Bank Risk Management**

In this section, we examine the effect of presidential liability on bank risk management before and after the Panic of 1893. Although the Panic of 1893 itself was short-lived, it triggered a major shift in California's financial landscape, which likely led to changes in risk management strategy by bank managers. To assess whether the panic induced a change in managerial behavior, we conduct separate analyses for the pre- and post-panic periods.

4.2.1. Bank Risk Management Prior to the Panic of 1893

We examine how presidents' on- and off-balance sheet guarantees are associated with bank risk management prior to the Panic of 1893, using the following model:

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

The dependent variables, y_{it}, are the three measures of bank risk discussed in the previous section: the equity-to-asset ratio, cash-to-asset ratio, and unsecured loans-to-total loans ratio. As our focus is on understanding how much risk banks assumed before depositors became sensitive to bank-specific information, we examine bank risk measures during the pre-panic period.

The key independent variable, P_{it-1}, is the natural logarithm of presidents' on-balance sheet capital holdings or off-balance sheet guarantees, as described in Section 3.2. The on- and off-balance sheet liabilities enter the regression with a one-period lag. We include log bank assets, s_{it}, to control for bank size, and also include firm and year fixed effects, θ_i and ϑ_t, respectively.

Table 6, Panel A presents the results. In Columns (5)-(8), we find that presidents' on-balance sheet capital holdings are not meaningfully associated with bank risk measures before the Panic of 1893, as none of the coefficients are statistically significant. The results reported in Columns (1)-(4), however, indicate that off-balance sheet guarantees tend to decrease the riskiness of loan portfolios. In Column (4), for example, the coefficient on the lagged off-balance sheet guarantees is -0.0723 and statistically significant at the 5% level, indicating that a one-percentage-point increase in off-balance sheet guarantees reduces unsecured loans by roughly 7.2 basis points. This result indicates that presidents with greater liability for uncovered deposits —due to the unlimited liability rule—tended to maintain safer loan portfolios to limit their downside exposure in the event of bank failure.

4.2.2. Bank Risk Management Following the Panic of 1893

Although the Panic of 1893 was brief, it marked a turning point in California's financial landscape. The state's economy, previously driven by mining and agriculture, entered a prolonged depression lasting until 1897. Figure 5 highlights this shift: Panel A shows a spike in bank failures during the panic, while Panel B documents a collapse in new bank formations after 1892, with levels remaining low through 1896. These patterns suggest a structural break in the financial sector, which likely influenced bank managers' approach to risk management. In this sense, the Panic of 1893 was a wake-up call moment for many bank managers.

We examine whether banks' post-panic recovery—measured through their risk profiles—was influenced by presidents' on-balance sheet capital holdings and off-balance sheet guarantees. Focusing on the period from 1893 to 1896, we estimate Equation (3) to assess whether managerial risk-taking incentives shifted after the panic. Table 7 presents the results.

In Table 6, Panel B we find that banks with higher on-balance sheet capital holdings and off-balance sheet guarantees increased their equity ratio following the panic, suggesting that banks with large presidential liabilities were more proactive in managing solvency risk. In Column (1), for example, the coefficient on the off-balance sheet guarantee is positive and statistically significant at the 5% level, indicating that these banks held higher equity ratios. In Column (3), off-balance sheet liabilities have a weak but significant positive effect on the loan-to-asset ratio. While this latter result on the loan-to-asset ratio may seem counterintuitive, it reflects the fact that banks with large off-balance sheet liabilities were holding safer loan portfolios than their peers. Thus, expanding a loan portfolio does not necessarily raise overall risk, especially when loan quality is high.

Overall, our analysis shows that managers adjusted their risk management strategies after the Panic of 1893, with surviving banks facing large presidential liabilities reducing their exposure to solvency risk.

5. Presidential Characteristics as Instrumental Variables

Our previous results suggest that banks taking on greater risks are more likely to experience bank runs or failures, and that presidential liabilities help mitigate these risks. However, these relationships cannot be interpreted as causal. Presidential liabilities and bank risk measures are not randomly assigned, and unobservable president characteristics may influence both banks' risk taking and their susceptibility to runs and failures. For instance, a president with limited financial or reputational capital may be more inclined to take excessive risks. Facing poor performance prospects, such a president might engage in risk shifting—taking on even more risk for a turnaround—because he has little to lose. In this case, our measure for off-balance sheet liability is only a noisy proxy for the true liability structure of the president. Even on-balance sheet capital may be shaped by the president's risk appetite, further complicating causal interpretation. Omitted variable such as the president's risk appetite or personal capital can thus bias the OLS estimates.[13]

In this section, we use data on presidents' personal characteristics—such as age, homeownership, and birthplace, obtained from census records—as instruments for bank risk management. We begin by examining how these characteristics are related to presidents' on- and

[13] In other words, the difference between the short and long regression coefficients reflects the omitted variable bias (Angrist and Pischke, 2009).

off-balance sheet liabilities. We then conduct an IV analysis to establish a causal link between bank risk management and the likelihood of bank runs and failures.

5.1. **Bank Presidents' Characteristics**

Figure 6 presents the distribution of demographic characteristics of state bank presidents. Panel A shows their 1890 age distribution, extrapolated from 1880 data: the mean age was 52 years, ranging from 22 to 72. While many presidents served before age 50, the most common age group was 55–60. Panel B shows that 20% of presidents were born outside California. Only 18 out of 303 were California natives. While most foreign-born presidents immigrated from Europe, primarily Germany and the UK. We analyzed these presidents in depth. More detailed birthplace breakdowns are provided in Appendix B. In addition, we provide the occupational distribution of bank presidents in Appendix G.[15]

In Table 7, we provide summary statistics of bank presidents' characteristics. Panels A present breakdowns by place of birth. On average, presidents born abroad held higher on-balance sheet capital and off-balance sheet liabilities, and they tended to work for banks located in more urban areas with larger populations. Panel B reports breakdowns by homeownership status in 1900. Although not all presidents responded to this census question, roughly two-thirds of those in the sample did. Most bank presidents owned their homes, and, on average, renters were about ten years younger than homeowners. Table 7 also reports the distance between presidents' residence and their banks. While many presidents already lived relatively close to their banks in 1880, they did not necessarily reside in the same town. By 1900, however, most had moved to live in the same town as their banks.

Moved down [1]: More detailed birthplace breakdowns are provided in the Appendix B.[14]

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5.2. **Presidents' Characteristics and Their On- and Off-Balance Sheet Liabilities**

We examine which predetermined personal characteristics of bank presidents—serving as proxies for individual preferences and risk attitudes—help explain their on- and off-balance sheet liabilities. Specifically, we consider age, homeownership status (own vs. rent), mortgage status (mortgaged vs. free), birthplace (California-born or not), distance between a president's 1880 residence and her bank, and local town population (market size). These variables proxy for personal wealth, risk aversion, community ties, and market size. We also include each bank's market share (% of total county banks) as a proxy for market competition, measured as the total

[15] Appendix C also reports birthplace breakdowns by U.S. Census Bureau regions and divisions.

percentage of the market the bank occupies within the county (based on the number of banks in the county). Table 8 presents the regression results of presidential liabilities on these variables. Columns (1) and (2) report the main sample results, and Columns (3) and (4) present the results for the subsample with available data on homeownership, mortgage status, and home-bank distance.

The results in Columns (1) and (2) of Table 8 show that both types of presidential liability are positively associated with age and being born in California, suggesting that older and locally born presidents tended to have greater financial exposure to their banks. Presidents born locally, who likely have stronger community connections, may possess substantial social and reputational capital, making them more cautious in risk-taking and more inclined to provide personal financial guarantees when their banks are under stress. Liabilities also increase with local population size, indicating that presidents of banks in more populous areas assumed greater responsibility. In contrast, higher bank market share—particularly in less competitive, rural areas—is associated with lower off-balance sheet liabilities. This pattern may reflect the fact that low-competition areas are often rural, with smaller population and lower deposits. Many small rural counties in our sample had only one bank, resulting in virtually no local competition.

In Column (3) of Table 8, we find that bank presidents' on-balance sheet capital increases with local population size and home ownership status, but decreases with the distance from their bank in 1880. Unlike in Column (1), the age variable and the "born in California" dummy are no longer statistically significant, likely due to multicollinearity. As shown in Table 7 Panel B, bank presidents who own their homes tend to be older, and those who lived farther from their bank in 1880 were less likely to have been born in California.

Column (4), which examines off-balance sheet liabilities, yields broadly similar patterns. Unlike Column (3), however, the born-in-California indicator is positively associated with presidential liabilities. The significance of California birth may reflect local confidence: presidents with local roots may have stronger community ties, which might encourage people to place more deposits with the bank due to greater trust in a president they have known for many years. The significance of home ownership —a proxy for presidents' wealth—in both Columns (3) and (4) suggests that wealthier presidents were more likely to commit capital to their banks and signal credibility to depositors.

5.3. **IV Analysis of Bank Runs and Failures with Presidential Characteristics**

In this section, we use IVs to identify causal relationships between bank risk management and the likelihood of bank runs and failures. We estimate two-stage least squares (2SLS) regressions, treating the unsecured loan ratio and equity ratio as endogenous and instrumenting them with presidential characteristics. Following Table 8, the IVs proxy for personal wealth, risk aversion, community ties, market size, and local competition: age, homeownership status, mortgage status, birthplace, distance between a president's 1880 residence and her bank, local town population, and the bank's market share. All regressions include year fixed effects, with standard errors clustered by year to account for heightened risk around the Panic of 1893.

First stage regressions. Table 9 Panel A presents the first-stage results, showing that the instruments are strongly correlated with the endogenous variables. In Columns (1) and (3), we find that both birthplace and market share significantly affect the unsecured loan ratio and the equity ratio. Presidents with deeper community ties (i.e., born in California) are less likely to expose their banks to excess credit risk but more likely to take on greater solvency risk. In contrast, greater market power tends to increase banks' exposure to credit risk while reducing their exposure to solvency risk. These contrasting effects highlight that the mechanisms through which banks managed overall risk were path-dependent, with distinct channels shaping credit and solvency risk in opposing ways. Additionally, age has a significantly positive effect on the equity ratio, suggesting that older presidents are more attuned to solvency risk.

In Columns (2) and (4), we incorporate additional president-level characteristics, such as home ownership, mortgage status, and the distance between a president's home and bank. Since these variables are available only for a subset of bank presidents, the sample size falls by about half. The results indicate that credit risk (Column 2) is more strongly linked to community ties and local market conditions, whereas solvency risk (Column 4) reflects presidents' personal characteristics and financial circumstances. For example, while home ownership does not significantly affect the unsecured loan ratio, it has a significant negative effect on the equity ratio. The negative relationship between home ownership and the equity ratio indicates that wealthier presidents tend to operate banks with higher solvency risk. However, this relationship is nuanced by the presence of mortgage debt: the coefficient on the mortgage dummy is also negative and substantially larger in magnitude than that of the homeownership dummy. This result indicates that bank presidents who pose the greatest solvency risk are those who have already borrowed against their homes. These individuals are likely both credit- and liquidity-constrained, which may

explain their limited ability to contribute higher equity capital to their bank.

To check for the validity of our instrument variables, we examine whether the F-statistics satisfy Stock and Yogo's (2005) criteria. In all our columns, we find that the F-statistics exceed Stock and Yogo's recommended benchmark of 10, which suggests that our instrument is statistically valid. These results show that the instruments are relevant and explain the risk measures consistently.

Second stage regressions. Table 9 Panel B shows that the instrumented risk measures are positively associated with run and failure probabilities. In Columns (1) and (2), for example, the coefficients on the unsecured loan ratio are 0.257 for the broader sample and 0.468 for the limited sample, both significant at the 1% level. These results indicate that banks led by presidents with strong community ties and operating in more competitive markets maintained safer credit portfolios, thereby reducing the likelihood of a run. We further find that, in Column (4) when proxies for presidential wealth are included, the equity ratio is significantly negatively associated with the probability of bank failure, but not in Column (3). Thus, financially stronger presidents tend to take on less solvency risk, which in turn lowers the probability of bank failure. Taken together, the results in Table 9 underscore the importance of managerial characteristics in shaping risk outcomes and suggest that policies aimed at increasing managerial liability and capital requirements can curb excessive risk-taking and enhance financial stability by reducing both the likelihood of runs and failures.

6. Discussions: Wealth Constraints and Effectiveness of Unlimited Liability

Our results so far suggest that extended liability, such as off-balance sheet liabilities, can be an effective policy tool. A natural question that arises is whether presidents' wealth is sufficiently large to provide meaningful "skin in the game." For the extended liability regime to be effective, presidents must be adequately exposed to downside risks. If they lack personal wealth, the practical effectiveness of extended liability is substantially diminished. If a bank fails and shareholders are called upon to cover additional losses, those with limited wealth cannot contribute beyond their means. In such cases, extended liability becomes de facto limited, as creditors cannot recover more than the shareholders' available assets.

In this section, we discuss the wealth constraints of bank presidents and the practical effectiveness of the extended liability regime. While we do not directly observe their wealth, we

infer it using three complementary approaches. First, we investigate the wealth of bank presidents at national banks in New York and New Jersey in 1929, where examiners recorded and reported managers' net worth. Because national banks were subject to double liability—which required shareholders to pay up to the par value of their stock in the event of failure—examiners assessed whether these obligations could realistically be collected. Panel A of Table 10 reports the ratio of a president's capital investment to his total wealth. The results reveal substantial heterogeneity: in some cases the ratio was less than 1 percent, while in others it exceeded 90 percent. On average, capital represented about 35.2 percent of total wealth, suggesting that presidents' liabilities in the case of bank failure would have been substantial, as liabilities often significantly exceeded the amount of capital investment.

Second, we exploit the fact that California state bank presidents often held shares in multiple banks simultaneously and examine how their ownership in failed banks affected their management of surviving banks. While we cannot directly observe presidents' total wealth, we can observe negative shocks to it when banks in which they held shares failed. Panel B of Table 10 lists bank presidents who held shares in banks that failed between 1890 and 1895. We find that all such presidents were removed from their managerial positions following a bank failure, even if they had no executive role in the failing institution. This pattern suggests that holding shares in failed banks imposed substantial financial burdens, and that the resulting wealth shocks were sufficient grounds for boards to remove presidents from office. These findings support our assumption that capital investments and liabilities represented non-negligible portions of presidents' wealth and highlight that ownership- and liability-based incentives had real effects on bank risk management.

Third, we draw on personal estate values reported in the 1880 census for five bank presidents in our sample. We calculate two ratios: one between the presidents' capital and their personal estate value (On-B/S Capital-to-Estate), and another between their off-balance sheet liabilities and personal estate value (Off-B/S Liabilities-to-Estate). These measures allow us to gauge the relative scale of presidents' financial commitments to their banks. Table 10 shows that, on average, on-balance sheet liabilities equaled 138% of personal estate value, while off-balance sheet liabilities averaged 622%. These measures suggest that bank presidents' investments represented substantial portions of their personal wealth and that bank failures posed severe threats to their financial well-being.

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7. 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 U.S. Senate Committee on Banking, Housing, and Urban Affairs passed the RECOUP Act of 2023, granting banking regulators the authority to claw back 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."[16]

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

We show that state banks were riskier than national banks. At the time, California state banks operated without capital and reserve requirements, whereas national banks were subject to the capital and reserve rules under the National Banking Act. We investigate the proportion of state banks that would have been able to meet the national bank regulatory standards and find that approximately 30 percent of state banks would have satisfied these requirements.

In addition, we show that the personal characteristics of bank presidents is associated with their on-balance sheet capital holding and off-balance sheet guarantees. For instance, bank presidents who are older and owned homes were more likely to have higher capital. Our findings suggest that personal net worth affects presidents' risk preferences.

Lastly, we examine how presidents' on-balance sheet capital holdings and off-balance sheet guarantees affected bank risk management and bank runs during the Panic of 1893. We find

[16] "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)

that banks with safer loan portfolios and higher equity ratios were less likely to experience runs or failures. In addition, we show that bank presidents' on-balance sheet capital and off-balance sheet guarantees significantly influenced the management of solvency, credit, and liquidity risks. Before the Panic of 1893, on-balance sheet capital had no significant effect on bank risk, whereas off-balance sheet guarantees did. After the panic, both on-balance sheet capital and off-balance sheet guarantees had a strong positive effect on equity holdings. Furthermore, banks whose presidents held more on-balance sheet capital and provided greater off-balance sheet guarantees restored their cash buffers more quickly than their peers. These findings support the notion that greater presidential liabilities contribute to banking system stability by incentivizing banks to maintain lower default risk.

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

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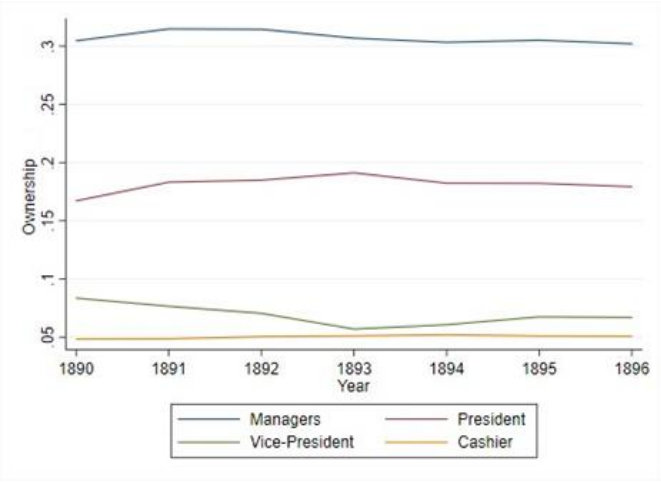
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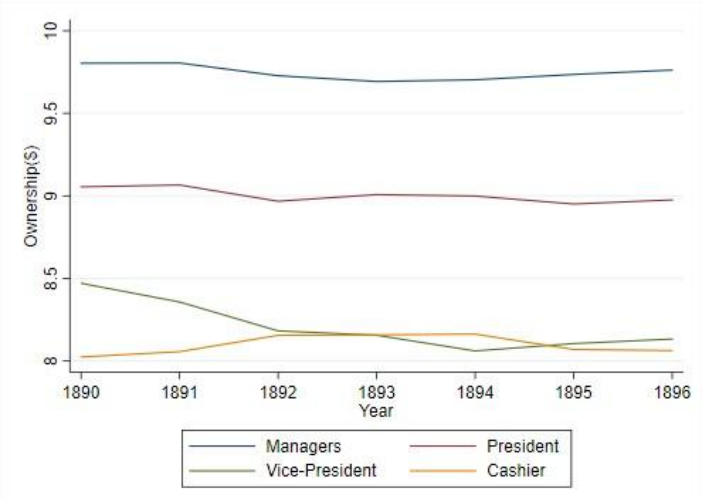
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Figure 1. Average Manager Ownership Trend Over Time (1890-1896)
(a) Percentage manager ownership (1890-1896)

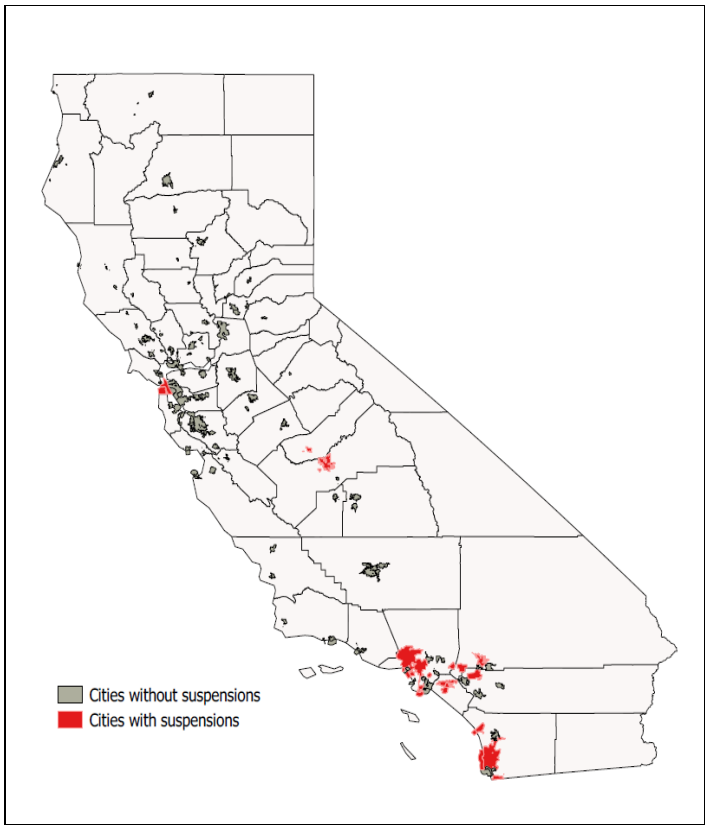


(b) Log dollar amount of manager capital (1890-1896)



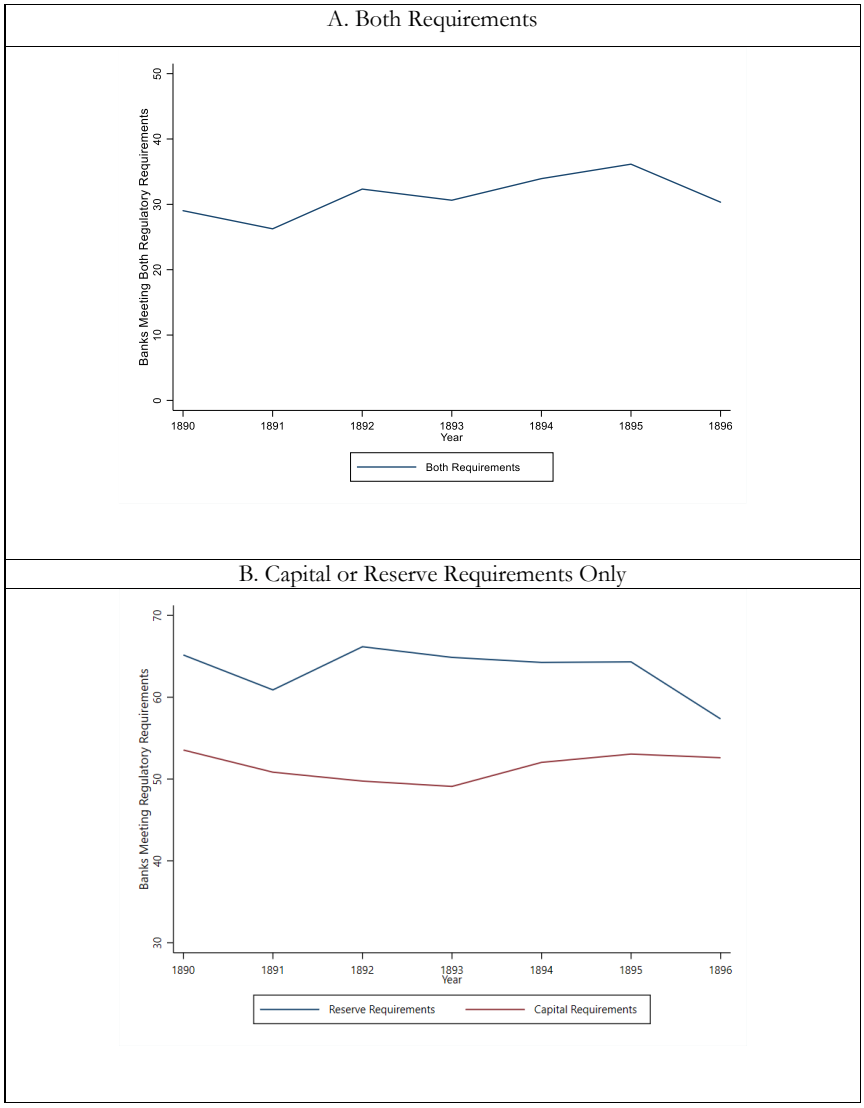
Note: This figure shows the percentage ownership and the average dollar amount (in natural log) of bank stocks held by bank managers between 1890 and 1896. Managers' stock holdings represent the total bank stocks owned by the president, vice-president, cashier, and assistant cashier.
Source: Authors'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

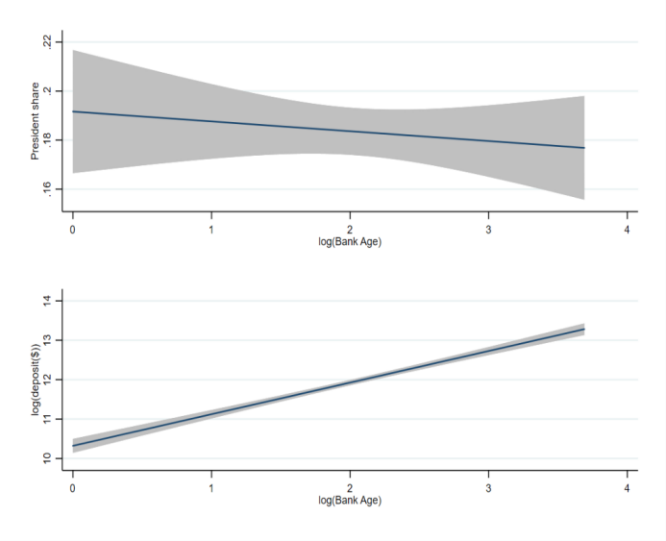
Figure 3. State Banks Meeting Reserve and Capital Requirements under the National Banking Act.



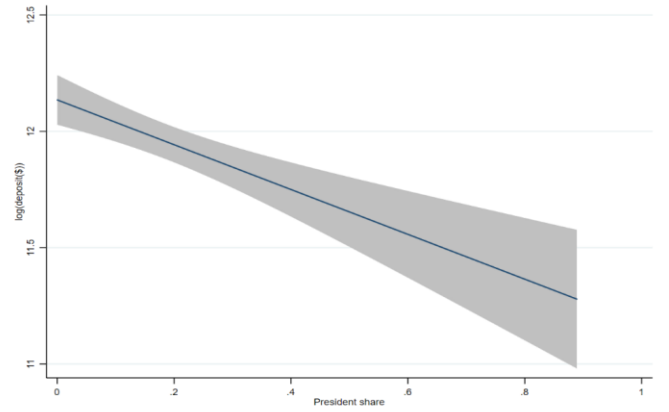
Note: This figure illustrates the percentage of state banks that would have met reserve and capital requirement under the National Banking Act between 1890 and 1896. Panel A plots the percentage of state banks that would have satisfied both capital and reserve requirements. Panels B show the percentage of banks that would have met only one of the two requirements.

Figure 4. Presidential Share and Deposits

(a) Presidential share and deposits vs. bank age



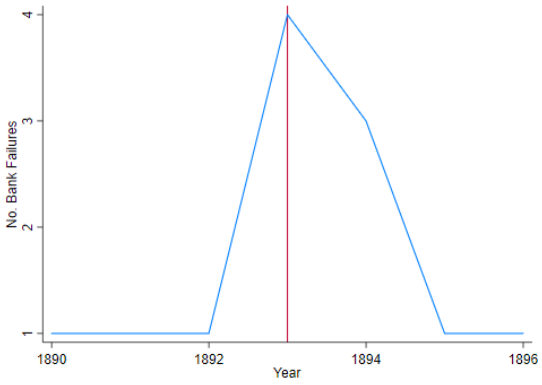
(b) Presidential share and deposits



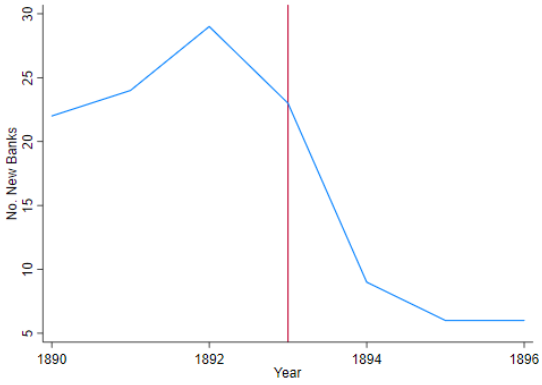
Note: This figure illustrates the inverse relationship between presidential percentage stock ownership and deposits. The shaded area represents the 95 percent confidence interval. Panel (a) plots a president's ownership shares and total deposits against total assets and the age of a bank, and panel (b) 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).

Figure 5. Number of Bank Failures and New Banks (1890-1896)

Panel A. Number of Bank Failures



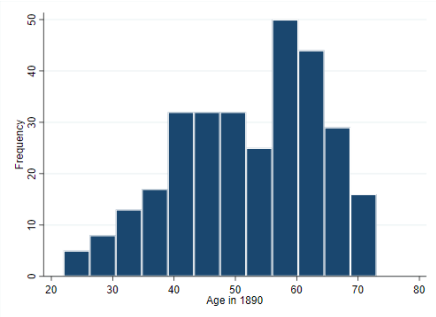
Panel B. Number of New Banks



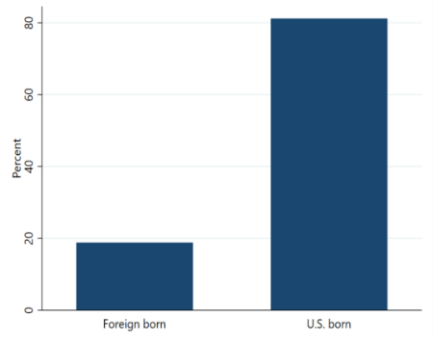
Source: Board of Bank Commissioners of the State of California 1890-1896

Figure 6. Bank President Demographics

Panel A. Bank President Age Distribution in 1890



Panel B. Percentage of Foreign born versus U.S. born Bank Presidents



Source: 1880 and 1900 U.S. Censuses

Table 1. Number of Suspended and 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. U.S. includes the number of failed banks in all other states excluding California.
Source: Biennial Report of the Attorney-General of the State of California (1893-1894)

Table 2. State Banks' Ability to Meet Bank Regulations Specified in the National Banking Act (1892)

	Both Requirements			Capital Requirements Only			Reserve Requirements Only		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Non-CPL	CPL	Diff	Non-CPL	CPL	Diff	Non-CPL	CPL	Diff
Capital to Required Capital	1.285	3.510	-2.197***	0.539	3.492	-2.934***	1.962	2.011	-0.0296
	(1.651)	(3.222)	-0.338	(0.327)	(2.842)	(0.281)	(2.076)	(2.693)	(0.367)
Cash to Required Reserve	2.044	2.760	-0.716***	2.423	2.116	0.307	0.886	3.013	-2.126***
	(2.024)	(1.158)	-0.27	(2.193)	(1.331)	(0.257)	(0.660)	(1.814)	(0.225)
Observations	136	65	201	101	100	201	70	131	203

Note: The table reports California state banks' compliance to capital and reserve ratio required for national banks in 1892. Non-CPL and CPL represent compliant and non-compliant banks, respectively. To assess capital adequacy, we examine bank capital as a percentage of the required amount. To assess reserves, we use total reserves (cash and interbank deposits) as a percentage of required reserves. Standard errors are reported in parenthesis with * p<0.1, ** p<0.05, and *** p < 0.01.

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

Panel A. Ownership and Balance Sheet Information

	All Banks						
	Mean	SD	p5	p25	p50	p75	p95
log(Assets)	12.66	1.36	10.78	11.72	12.59	13.39	15.06
Bank Age	9.87	8.14	2.00	3.00	6.00	18.00	25.00
Equity Ratio	0.39	0.18	0.09	0.27	0.40	0.52	0.68
Cash	0.07	0.05	0.01	0.04	0.06	0.09	0.16
Loan & Leases	0.74	0.15	0.45	0.65	0.78	0.85	0.93
Unsecured Loans	0.47	0.34	0.00	0.02	0.56	0.74	0.92
Deposit-to-Capital	3.64	5.70	0.53	0.95	1.71	3.51	12.48
President share	0.19	0.19	0.01	0.05	0.13	0.26	0.54
Manager share	0.32	0.24	0.03	0.15	0.26	0.45	0.83
log(Off-B/S Liability)	9.55	1.89	6.15	8.40	9.54	10.80	12.85
log(On-B/S Capital)	9.04	1.70	6.21	8.01	9.10	10.17	11.84
N	201						

Panel B. Ownership and Balance Sheet Information Breakdown Based on Run, Suspension and Failure

	Bank Run				Suspension				Failures			
	No Bank Run		Bank Run		No Suspension		Suspension		Non-Failed		Failed	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
log(Assets)	12.67	1.39	12.6	1.18	12.68	1.37	12.45	1.24	12.65	1.36	12.91	1.49
Bank Age	9.65	8.12	11.03	8.27	10.09	8.3	7.8	6.34	9.83	8.11	10.67	9.14
Equity Ratio	0.38	0.18	0.46	0.13	0.39	0.18	0.38	0.18	0.4	0.18	0.29	0.13
Cash	0.07	0.05	0.07	0.03	0.07	0.05	0.08	0.05	0.07	0.05	0.09	0.04
Loan & Leases	0.74	0.16	0.72	0.13	0.75	0.15	0.62	0.15	0.74	0.15	0.68	0.11
Unsecured Loans	0.45	0.35	0.61	0.22	0.46	0.33	0.6	0.35	0.47	0.33	0.59	0.36
Deposit-to-Capital	3.99	6.12	1.69	1.17	3.54	5.28	4.52	8.8	3.48	5.16	7.08	12.84
President share	0.18	0.18	0.23	0.22	0.19	0.19	0.22	0.17	0.19	0.19	0.19	0.19
Manager share	0.3	0.23	0.39	0.27	0.31	0.24	0.37	0.22	0.31	0.24	0.39	0.24
log(Off-B/S Liability)	9.57	1.92	9.45	1.74	9.53	1.89	9.73	1.87	9.53	1.89	9.99	1.93
log(On-B/S Capital)	8.99	1.67	9.3	1.83	9.03	1.69	9.07	1.86	9.04	1.68	8.94	2.21
N	170		31		181		20		192		9	

Note: The table summarizes ownership and financial ratios of California state banks in 1892. We removed from our sample state banks that did not fully report ownership or financial information in 1892. Bank run banks are those that experienced a greater than 20 percent decline in total deposits between July 1892 and July 1893. Suspended banks are those that experienced bank suspension in 1893, and failed banks are those that failed in the years between 1893 and 1896. 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. Regressions of Deposit Withdrawals on Bank Risk Measures (1892)

VARIABLES	(1) Logit All banks	(2) Logit Rural banks	(3) OLS All banks	(4) OLS Rural banks
Equity Ratio	1.669	1.670	0.124	0.194
	(1.329)	(1.370)	(0.191)	(0.208)
Cash Ratio	-7.898	-8.134	1.449*	1.807*
	(5.174)	(5.159)	(0.866)	(0.937)
Loan & Leases Ratio	-1.503	-1.687	0.0810	0.132
	(1.360)	(1.416)	(0.185)	(0.203)
Unsecured Loans Ratio	1.978**	1.798**	-0.451***	-0.432***
	(0.864)	(0.835)	(0.121)	(0.123)
Constant	-3.178	-4.258	0.712**	0.567
	(2.657)	(3.094)	(0.276)	(0.380)
Bank-level Controls	Y	Y	Y	Y
Observations	194	178	194	178
R-squared			0.273	0.279

Note: The table reports estimates from both a logit model and an OLS regression. Because San Francisco was a reserve city where banks operated differently, we run separate regressions for all banks and for banks outside San Francisco (rural banks) to ensure the results are not driven by large city institutions. Columns (1) and (2) present logit estimates, where positive coefficients indicate a higher probability of bank runs. The dependent variable is a binary indicator equal to 1 if a bank run occurred at bank i in 1893 and 0 otherwise. Columns (3) and (4) report OLS results, using bank-level characteristics as predictors. These include (log) total assets, (log) bank age (measured as the number of years since establishment), equity ratio (equity-to-assets), cash holdings (cash-to-assets), loan ratio (loans-to-assets), and unsecured loan ratio (unsecured loans-to-total loans). All ratios are winsorized at the 1 percent level by year. Standard errors are clustered at the bank level. *** p<0.01, ** p<0.05, * p<0.1.

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Table 5. Bank Suspension and Failure Probabilities (1892).

	(1)	(2)	(3)	(4)
	Bank suspension	Bank suspension	Bank failure	Bank failure
	All banks	Rural banks	All banks	Rural banks
Equity Ratio	-3.202*	-2.665	-8.285***	-9.650***
	(1.667)	(1.803)	(1.780)	(2.302)
Cash Ratio	-6.928	-6.922	5.715	0.551
	(6.357)	(6.416)	(5.270)	(9.080)
Loan & Leases Ratio	-6.153***	-5.464***	-4.015*	-1.400
	(1.660)	(1.586)	(2.106)	(2.040)
Unsecured Loans Ratio	2.119**	1.961*	1.188	2.495*
	(0.989)	(1.008)	(0.969)	(1.298)
Constant	1.898	1.583	1.687	0.893
	(3.202)	(4.360)	(4.577)	(6.720)
Bank-level Controls	Y	Y	Y	Y
Year FE			Y	Y
Observations	203	183	1,197	941
Number of newid2			246	219

Note: The table is estimated using a logit 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. Logit standard errors are robust.

Table 6. Regressions of Bank Risk Measures on Presidential Liability Exposure.

	(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
Panel A: Pre-1893 Panic (1890-1892)								
Lag log(Off-B/S Guarantee)	0.00404	-0.00170	-0.0170	-0.0723**				
	(0.00484)	(0.00638)	(0.0407)	(0.0290)				
Lag log(On-B/S Capital)					0.00506	-0.00959	0.00439	-0.0452
					(0.00768)	(0.0109)	(0.0217)	(0.0338)
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
Panel B: Post-1893 Panic (1893-1896)								
Lag log(Off-B/S Guarantee)	0.00539**	0.000700	0.00741*	-0.00280				
	(0.00243)	(0.00150)	(0.00422)	(0.00591)				
Lag log(On-B/S Capital)					0.00644**	0.00182	-0.00185	-0.00978
					(0.00306)	(0.00157)	(0.00459)	(0.00632)
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
Bank-level Controls	Y	Y	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y

Note: We measure the value of a president's on-balance sheet capital holdings as the product of total on-balance sheet capital and the president's ownership share. Similarly, we calculate the value of off-balance sheet guarantees as the product of deposits net of cash and the president's ownership share. log(Off-B/S Guarantee) is defined as the natural logarithm of this off-balance sheet guarantee measure, while log(On-B/S Capital) is the natural logarithm of the value of on-balance sheet equity holdings. The latter captures the president's on-balance sheet guarantees. To address potential reverse causality and endogeneity, we use lagged values of presidential liabilities. Risk management tools are captured by the balance sheet ratios discussed earlier: leverage (equity-to-assets), cash holdings (cash-to-assets), loan holdings (loans-to-assets), and loan portfolio risk (unsecured loans-to-total loans). Firm and year fixed effects are included to control for unobserved heterogeneity.

Table 7. Summary Statistics of President Characteristics (1892)
Panel A. Presidential Characteristic Breakdown Based on Place of Birth

	All Presidents			Place of Birth					
				US born			Foreign born		
	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD
log(On-B/S Capital)	9.04	9.15	1.67	9.01	9.17	1.67	9.21	8.91	1.70
log(Off-B/S Liability)	9.58	9.64	1.88	9.45	9.64	1.80	10.26	9.81	2.14
Age	56	58	11	56	58	11	56	57	8
Distance 1880	506	1	1,053	525	8	1,087	408	0	873
Population 1890	37,469	2,917	88,212	28,901	2,885	77,084	80,591	11,165	123,521
% of Market	0.51	0.33	0.36	0.55	0.50	0.36	0.31	0.25	0.31
N	181			151			30		

Panel B. Presidential Characteristic Breakdown Based on Home Ownership in 1900

	All Presidents			Home Ownership					
				Home Rented			Home Owned		
	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD
log(On-B/S Capital)	9.10	9.17	1.74	8.77	8.90	1.78	9.15	9.17	1.73
log(Off-B/S Liability)	9.60	9.64	1.96	8.94	9.15	1.90	9.70	9.67	1.96
Age	55	56	11	46	42	11	56	57	11
Distance 1880	544	1	1,081	1,416	1,232	1,474	408	0	946
Distance 1900	140	0	382	201	17	534	131	0	355
Population 1890	34,753	2,894	85,677	46,039	2,772	100,062	33,000	2,894	83,645
% of Market	0.52	0.50	0.36	0.56	0.42	0.42	0.52	0.50	0.35
N	119			16			103		

Note: The table shows 1892 summary statistics of personal characteristics of people who served as presidents of California state banks between 1890 and 1896. 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. Age refers to the presidents' age in 1892.

Table 8. Regressions of Presidential Liabilities on Presidential Characteristics (1890-1896)

	(1) log(On-B/S Capital)	(2) log(Off-B/S Liability)	(3) log(On-B/S Capital)	(4) log(Off-B/S Liability)
Born in CA	0.584***	0.831***	0.161	1.233**
	(0.123)	(0.151)	(0.157)	(0.334)
Age	0.0289***	0.0261***	-0.000143	0.00453
	(0.00131)	(0.00365)	(0.00219)	(0.00340)
% of Market	-0.122	-0.999***	-0.418***	-1.320***
	(0.0704)	(0.0490)	(0.0849)	(0.0904)
Population 1890	4.108***	5.440***	3.412***	4.501***
	(0.507)	(0.448)	(0.504)	(0.330)
Distance 1880			-0.361***	-0.244***
			(0.0259)	(0.0274)
Home Ownership			0.660**	0.815***
			(0.222)	(0.157)
Mortgage			-0.144	0.417***
			(0.157)	(0.0980)
Constant	7.370***	8.430***	8.684***	9.116***
	(0.115)	(0.198)	(0.261)	(0.254)
Bank-level Controls	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	1,378	1,368	719	711
R-squared	0.094	0.195	0.140	0.248

Note: The table analyzes how bank president characteristics influence their decisions regarding on-balance sheet capital and off-balance sheet liabilities, using data from the 1880 and 1900 censuses. Columns (1) and (2) report results for bank presidents who were identified in either the 1880 or 1900 census. Columns (3) and (4) present results for presidents who were recorded in both 1880 and 1900 censuses and for whom rent, and mortgage status information is available.

Table 9: Instrumental Variable Regressions of Bank Distress Probability

Panel A: First Stage Regression	(1)	(2)	(3)	(4)
	Unsecured Loan Ratio	Unsecured Loan Ratio	Equity Ratio	Equity Ratio
Born in CA	-0.0984***	-0.193**	-0.0333***	-0.199***
	(0.0296)	(0.0903)	(0.0091)	(0.0393)
Age	-0.00127	-0.0025*	0.00205***	-0.000579*
	(0.0009)	(0.0014)	(0.0002)	(0.0003)
% of Market	0.2975***	0.257***	0.117***	0.132***
	(0.0262)	(0.0245)	(0.0105)	(0.0175)
Population 1890	0.00026	-0.0900	0.0727	0.0725
	(0.0348)	(0.1110)	(0.0723)	(0.0910)
Distance 1880		0.0011		-0.0355***
		(0.0132)		(0.0030)
Home Ownership		-0.00494		-0.0818*
		(0.0573)		(0.0482)
Mortgage		-0.00539		-0.0957***
		(0.0335)		(0.0058)
Constant	0.442***	0.370***	0.589***	0.700***
	(0.0351)	(0.1350)	(0.0548)	(0.1195)
F-statistics	654.737	112.162	515.805	110.499
Panel B: Second Stage Regression				
	Bank Run	Bank Run	Bank Failure	Bank Failure
Unsecured Loan Ratio	0.257***	0.468***		
	(0.0902)	(0.135)		
Equity Ratio			-0.0458	-0.0928*
			(0.0383)	(0.0560)
Constant	-0.192	-0.344**	0.0405***	0.0591
	(0.121)	(0.163)	(0.00952)	(0.0521)
Bank-level Controls	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Observations	1,169	598	1,170	599

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 10. Net-worth of Bank Presidents.

Panel A. New York and New Jersey National Bank President capital-to-net wealth

	Mean	Std. Dev.	p25	p50	p75
Capital-to-Net Worth ratio	35.224%	44.194%	10.012%	20.094%	42.093%
Net Worth ($)	184,454	459,800	40,000	60,000	125,000
Capital ($)	32,815	67,577	5,019	12,823	27,603
N	218				

Panel B. California State Bank Presidents with shares in failed banks.

Director	Year	Bank Name	Position	Fail Date	Share	On-capital liabilities	Off-balance sheet liabilities
BRYANT HOWARD	1893	BANK OF OCEANSIDE	P		0.11	8.61	7.95
BRYANT HOWARD	1893	SAVINGS BANK OF SAN DIEGO COUNTY	P	1894	0.04	6.71	9.91
J. W. COLLINS	1891	BANK OF ESCONDIDO	P		0.25	8.92	9.40
J. W. COLLINS	1891	CALIFORNIA SAVINGS BANK		1892	0.20	8.52	10.31
WILLIAM COLLIER	1891	EXCHANGE BANK OF ELSINORE/CONSOLIDATED BANK OF ELSINORE	P		0.03	7.31	6.90
WILLIAM COLLIER	1891	CALIFORNIA SAVINGS BANK		1892	0.00	3.91	5.71

Panel C. Sample of presidential on-and off-balance sheet liabilities as percentage of total estate value

	Mean	Median	SD
Personal Estate Value	29,060	20,000	21,609
On-B/S Capital	23,237	10,350	31,982
Off-B/S Liabilities	121,355	63,209	152,917
On-B/S Capital-to-Estate	1.38	0.67	1.64
Off-B/S Liabilities-to-Estate	6.22	3.08	7.51
N	5		

Appendix A. Historical Balance Sheet and Census Data Sample

Panel A. Balance Sheet Data: Security Savings Bank – Los Angeles, 1896

SECURITY SAVINGS BANK—LOS ANGELES.

(Incorporated January 11, 1889.)

Showing its Financial Condition at Close of Business on July 31, 1896.

J. F. SARTORI, President. W. D. LONGYEAR, Cashier.

Resources.		Liabilities.	
Real estate taken for debt	$20,720 43	Capital paid in coin	$100,000 00
United States bonds	555 00	Reserve fund	30,000 00
Miscellaneous bonds	47,823 36	Profit and loss and contingent fund	7,339 42
Loans on real estate	765,611 91	Due depositors	856,258 92
Money on hand	39,018 93	Dividends unpaid	190 00
Checks and other cash items	7,520 18	Other liabilities, interest collected	3,433 40
Due from banks and bankers	108,971 71		
Furniture and fixtures	5,200 00		
Expenses	502 20		
Taxes	477 23		
Other assets	820 79		
Total resources	$997,221 74	Total liabilities	$997,221 74

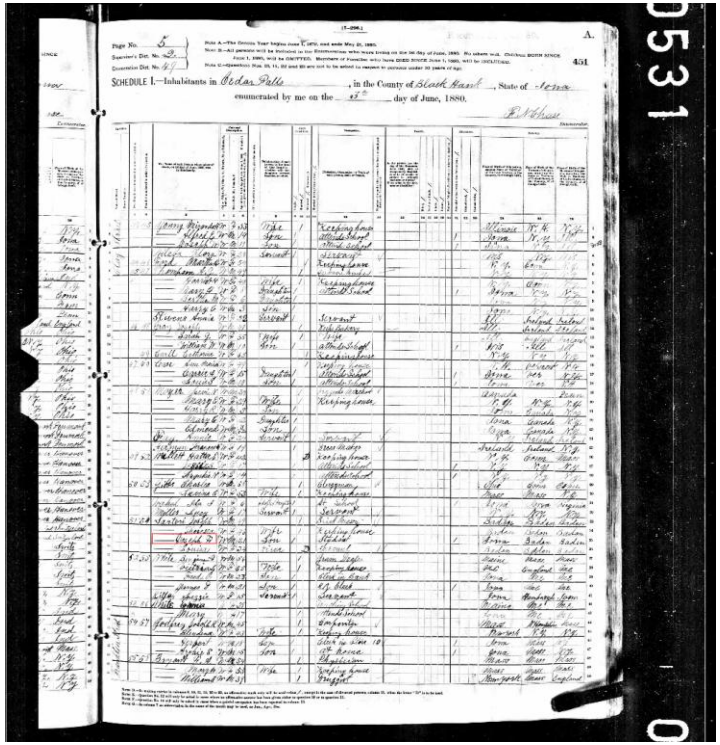
The amount of capital stock is $200,000; amount subscribed is $200,000; amount paid in coin is $100,000. The total number of shares of stock issued is 2,000 shares; the amount paid on each share of stock is $50.

The names of the Directors, and number of shares of stock held by each, are as follows: J. A. Graves, 25; Maurice S. Hellman, 274; M. L. Fleming, 474; H. J. Fleishman, 25; J. H. Shankland, 20; C. A. Shaw, 5; F. O. Johnson, 10; W. L. Graves, 10; J. F. Sartori, 294; H. W. Hellman, 50; W. D. Longyear, 115. Total number of shares held by the Directors is 1,302 shares.



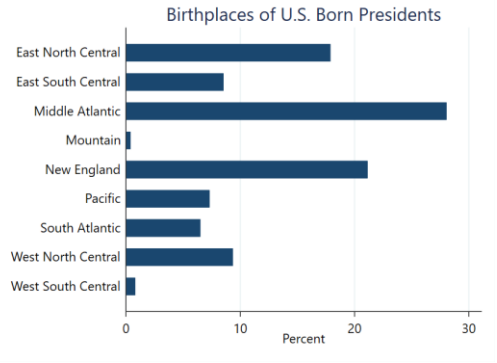
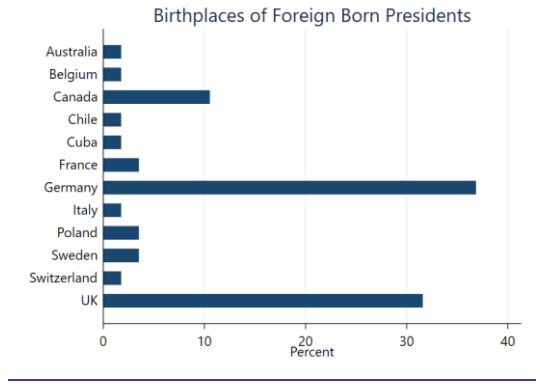
JOSEPH FRANCIS SARTORI

Panel B. Data from Census (J.F. Sartori, 1880 census)


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Appendix B. Birthplaces of State Bank Presidents during the 1890s

Panel A plots birthplaces by Census Bureau regions and divisions (provided in Appendix C). Most bank presidents were born outside California, with only 18 out of 303 being California natives. The Middle Atlantic states produced the most bank presidents, followed by the New England and East North Central regions. Panel B examines the birthplaces of foreign-born presidents. The majority of foreign-born presidents immigrated from Europe, primarily from Germany and the UK.

Panel A: Birthplaces of U.S. Born Presidents	Panel B: Birthplaces of Foreign-Born Presidents
	

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Appendix C. U.S. Census Bureau Regions and Divisions

	Region I: Northeast	
Division I: New England		Division 2: Middle Atlantic
Connecticut (09) Maine (23) Massachusetts (25) New Hampshire (33) Rhode Island (44) Vermont (50)		New Jersey (34) New York (36) Pennsylvania (42)
	Region 2: Midwest	
Division 3: East North Central		Division 4: West North Central
Illinois (17) Indiana (18) Michigan (26) Ohio (39) Wisconsin (55)		Iowa (19) Kansas (20) Minnesota (27) Missouri (29) Nebraska (31) North Dakota (38) South Dakota (46)
	Region 3: South	
Division 5: South Atlantic	Division 6: East South Central	Division 7: West South Central
Delaware (10) District of Columbia (11) Florida (12) Georgia (13) Maryland (24) North Carolina (37) South Carolina (45) Virginia (51)	Alabama (01) Kentucky (21) Mississippi (28) Tennessee (47)	Arkansas (05) Louisiana (22) Oklahoma (40) Texas (48)

West Virginia (54)		
	Region 4: West	
Division 8: Mountain		Division 9: Pacific
Arizona (04) Colorado (08) Idaho (16) Montana (30) Nevada (32) New Mexico (35) Utah (49) Wyoming (56)		Alaska (02) California (06) Hawaii (15) Oregon (41) Washington (53)

Appendix D: 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.

Appendix E. Bank Regulations specified in the National Banking Act for National Banks.

Panel A. Minimum Capital Requirements by Location

Population of Location	Minimum Capital
< 6,000	50,000
6,000-49,999	100,000
> 50,000	200,000

Panel B. Reserve Requirements by Classification of Banks

	Reserve Ratios	Max deposits in upper tiers
Central Reserve City Banks	25%	0
Reserve City Banks	25%	1/2
Country Banks	15%	3/5

Note: Panel A describes the minimum capital requirements for national banks. Half of the required capital had to be paid in cash before a national bank could commence operations, and the rest could be paid in monthly installments. Panel B provides information on reserve requirements that national banks were required to maintain relative to their deposits.

Appendix F. Summary Statistics of California State Banks in 1892 - Ownership and Balance Sheet Information Based on Closures

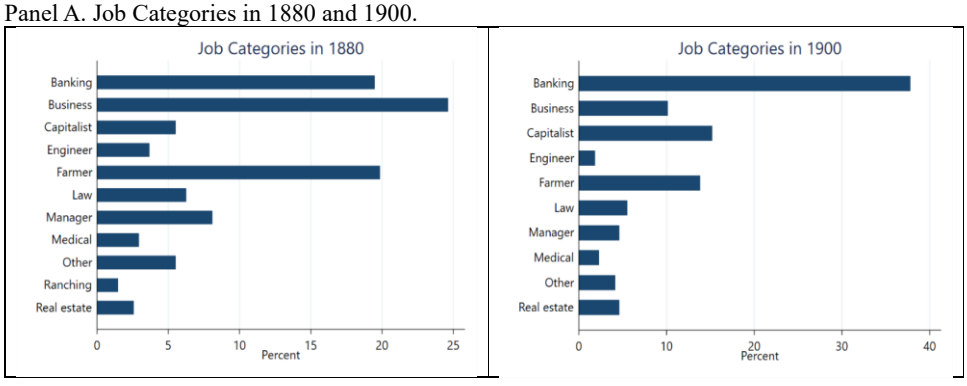
	All Banks			Active Banks			Closed Banks					
							Voluntary Closure			Failed		
	Mean	p50	SD	Mean	p50	SD	Mean	p50	SD	Mean	p50	SD
log(Assets)	12.66	12.59	1.36	12.67	12.59	1.36	12.28	11.63	1.39	12.91	12.63	1.49
Bank Age	9.87	6.00	8.14	9.84	6.00	8.21	9.69	6.00	6.98	10.67	7.00	9.14
Equity Ratio	0.39	0.40	0.18	0.39	0.40	0.18	0.47	0.50	0.15	0.29	0.27	0.13
Cash	0.07	0.06	0.05	0.07	0.06	0.05	0.08	0.06	0.05	0.09	0.08	0.04
Loan & Leases	0.74	0.78	0.15	0.74	0.78	0.15	0.71	0.76	0.17	0.68	0.69	0.11
Unsecured Loans	0.47	0.56	0.34	0.46	0.53	0.34	0.56	0.69	0.32	0.59	0.69	0.36
Deposit-to-Capital	3.64	1.71	5.70	3.57	1.71	5.26	2.14	1.29	3.34	7.08	2.83	12.84
President share	0.19	0.13	0.19	0.18	0.11	0.18	0.32	0.23	0.22	0.19	0.10	0.19
Manager share	0.32	0.26	0.24	0.30	0.25	0.23	0.46	0.41	0.22	0.39	0.43	0.24
log(Off-B/S Liability)	9.55	9.54	1.89	9.50	9.50	1.88	9.91	10.11	1.96	9.99	10.49	1.93
log(On-B/S Capital)	9.04	9.10	1.70	8.99	8.97	1.67	9.80	10.04	1.65	8.94	9.18	2.21
N	201			179			13			9		

Appendix G. President Census Report: Job Categories & Home Locations

Appendix G shows the occupational distribution and home locations of bank presidents. Panel A displays the jobs bank presidents reported to the Census. In addition to their banking roles, most engaged in other business ventures or professional careers. As a result, they often reported occupations other than "banker" in the census. For instance, Thomas Douglas Stimson, president of Columbia Savings Bank, also ran a successful lumber business and was listed in the 1880 census as working in "lumber manufacturing," which we categorize under the "business" sector. By 1900, however, more presidents reported banking as their primary occupation. The business sector was the most commonly reported occupation among bank presidents in 1880, but by 1900, banking had become the most prevalent. While many presidents were involved in agriculture (farming and ranching), the proportion reporting agriculture as their primary occupation declined significantly from 1880 to 1900. Similarly, the share of presidents in the business sector also decreased. At the same time, the proportion of those reporting occupations in banking and finance (such as “banker” or “capitalist”) increased substantially.

Panel B shows the home addresses of bank presidents. While most presidents were already residing in California in 1880, about 20 percent were still living outside the state. In contrast, by 1900, over 95 percent of presidents lived in California. It is important to note that the homes of presidents in 1880 and 1900 were not always close to the location of the banks they presided over during the 1890s. While many presidents already lived relatively close to their banks in 1880, they did not necessarily live in the same town. By 1900, however, most had moved to reside in the same town as their bank.

Panel A. Job Categories in 1880 and 1900.



Panel B. Home Locations in 1880 and 1900.

