



# Restoring confidence in troubled financial institutions after a financial crisis<sup>☆</sup>

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## ARTICLE INFO

### JEL classification:

G21  
G28  
N21  
N41

### Keywords:

Banking panics  
Bank resolution  
Market discipline  
National banking era

## ABSTRACT

After an unprecedented number of banks suspended operations in the during Panic of 1893, the head regulator of banks chartered by the United States government allowed about 100 banks to reopen after certifying their solvency. We evaluate whether actions by bank owners to change management, contract with depositors to extend liability maturity structure, write off bad assets, and/or inject capital affected bank survival and deposit retention. This historical episode is particularly informative because there was no expectation of government intervention. We find that contracting with depositors provided short-term benefits while dealing with bad assets was key for long-run viability.

## 1. Introduction

Since 2010, considerable effort has been devoted to planning for the orderly resolution of failing banks and similar financial institutions by both financial regulators and bankers themselves amid reforms to the banking industry in the wake of the disruptive collapse of Lehman Brothers in 2008. These efforts have included requirements for, and development of, living wills for banks, bolstering the loss-absorbing capacity of banks, and other prudential measures (see, for instance, [Financial Stability Board 2014](#)). A key component for ensuring an orderly resolution of these levered institutions is maintaining the confidence of the banks' depositors and other liability holders. However, one aspect of such plans remains particularly hard to evaluate: gauging ex-ante which measures banks and regulators might undertake during a crisis would be most useful for promoting confidence in a resolution plan.

This paper sheds historical light on that question by using a prior crisis to identify actions that might be effective in maintaining market confidence. During the banking crisis of 1893 a large number of national banks were forced to suspend operations but were allowed to reopen

after the management and equity holders presented regulators with a credible plan for continued operation. The actions that the banks could take included agreements with depositors to extend the maturity of their deposits, equity injections, write-downs of bad assets, and replacing the management. We analyze which of these actions are most closely linked with the continued existence of the banks during the years following the panic and with the retention of deposits. We separately consider both the short- and long-run effects of the various actions.

The Panic of 1893 was one of the most severe panics of the National Banking Era, and indeed of US financial history. The panic featured both real economic challenges, as business bankruptcies rose and the economy started to tip into a severe recession, and notable financial frictions, as the New York Clearinghouse suspended operations in the midst of the panic and the interbank correspondent network froze. Loss of confidence in the banks by depositors resulted in heavy deposit withdrawals and widespread bank closures. To promote the recovery of the banking sector, the Comptroller of the Currency, the chief regulator for national banks (the banks chartered and examined by the national government), allowed national banks to reopen so long as their examiners determined that the banks were solvent and so long as they had a plan to maintain

<sup>☆</sup> We thank Ellis Tallman, Eric Hilt, participants in the Yale Conference on Fighting a Financial Crisis, the 2020 Economic History Association annual meeting, and the 2022 Economic and Business History Society annual meeting for valuable comments. The views expressed in this paper are those of the authors and do not necessarily reflect those of the Board of Governors of the Federal Reserve System or its staff.

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viability. Of the 113 national banks that closed in the panic, nearly 100 were allowed to reopen.

This episode is particularly illuminating about the effectiveness of various actions taken to promote confidence in banks being resolved because of the clear absence of any possibility of government protection or bailouts. Our sample of 96 banks is admittedly modest in size, especially given the complexity of the decisions regarding actions to take and how they are related subsequent outcomes. Nevertheless, this episode offers a compelling setting in which to study these issues.<sup>2</sup> There was no deposit insurance, no government capital support, and no lender of last resort (the Federal Reserve System was founded in 1913). In our case, confidence in the reorganization of the banks was due almost exclusively to actions taken by the management and equity holders of the banks. The role of the government was largely limited to bank examiners (or their superiors at the Office of the Comptroller of the Currency) expressing confidence that banks were solvent, reviewing action plans by bank owners, and in a limited number of cases requiring changes to the Board of Directors of the bank. In recent times, some argue that perceptions about public sector intervention policies not only affect bank failure risk at the time of the intervention, but also that these policies might encourage banks to take excessive risks during normal times. Furthermore, intervention policies, if perceived as unwarranted or unfair, may sour public opinion on actions that may be needed to avoid costly disruptions to the financial sector. By examining restructurings in a world without government interventions, all of those confounding influences are avoided, thereby helping one to more clearly identify which actions to support confidence during a resolution will be most consistent with the ex-ante expectation and ex-post realization of minimal government support.

Restoring depositor confidence in the 1890s required more than convincing depositors that their bank was solvent (i.e., that the value of its assets exceeded the value of its liabilities). As several studies have shown (Calomiris and Wilson, 2004, Calomiris and Carlson, 2016A, Calomiris and Jaremski, 2019), depositors required that banks maintain very low risks of default on deposits, and would withdraw funds from banks that failed to do so, even if those banks were solvent. For a reopening bank to succeed in reestablishing depositor confidence, it had to meet a high hurdle of credibly signaling its resiliency. While, in today's world of deposit insurance, failing banks are resolved without loss or even inconvenience to retail depositors (typically by the transfer of deposits to an acquiring institution approved by the FDIC), interbank deposits and other contracts that entail counterparty risk (e.g., derivatives and swaps) still remain an important source of discipline that must be satisfied if a troubled or failed bank seeks to reopen. Thus, we believe that despite the presence of deposit insurance, the lessons from the reopening of national banks in the aftermath of the Panic of 1893 still hold important lessons for today.

Reports filed by the bank examiners describe actions taken by bank management and owners to promote the confidence in the reopened bank. One possible action was entering into agreements with depositors to temporarily convert some demand deposits into time deposits. Such agreements were intended to address the coordination problem among depositors to help prevent a counterproductive run on the bank immediately upon reopening. In theory, this could have provided crucial breathing room to stabilize the funding of the bank, at least for a time;

<sup>2</sup> It may also be a unique situation for an analysis of this question. There are three aspects that exist simultaneously here that, to our knowledge, did not coincide at any other point in U.S., and possibly world, history. First, the episode involves a large enough number of banks to be able to conduct statistical analysis (though the number is small enough to warrant some caution). Second, only some banks suspended in towns or states while other did not; thus the reopening banks had to compete with banks that never closed. Three, there was no government liquidity or solvency support; confidence needed to be restored through private actions alone.

however, resorting to these agreements might also have generated some resentment on the part of depositors and resulted in withdrawal once the agreements expired.

A second action was replacing the bank's managers – the president (in modern parlance, the chief executive office), the cashier (the chief operating officer), or both. To the extent that managerial skills or decisions were perceived as contributing to the suspension, then changing managers might promote confidence. However, the president and cashier also played a key role in a bank's relationship networks, so replacing them might have impaired the business of the bank.

A third action was to raise capital. More capital would bolster the ability of the bank to absorb losses, but raising large amounts might dilute the existing shareholders enough to reduce their incentive to exercise oversight of the bank.

Finally, the bank could write down losses. Doing so would reduce reported capital and possibly limit the ability to pay dividends, but on the positive side, it would allow the bank to present a cleaner balance sheet and perhaps allow management to focus more on good loans rather than trying to recover losses on bad loans.

While all four of these actions were available, there was considerable heterogeneity across banks regarding which actions were taken. Thus, we are able to examine whether different actions are associated with evidence that the bank was successfully resolved and retained confidence by the community. The specific outcome measures we consider are, first, whether the banks survived for several years after the panic, and, second, its degree of deposit retention, conditional on survival. While all the banks in our sample were allowed to reopen, a significant proportion of them were forced to shut their doors subsequently; only two-thirds were still in operation at the end of 1897, just 4 years after the crisis. (Note that 1896 saw another, milder recession and banking crisis.) For banks that did survive, deposit retention provides a continuous measure that reflects varying market perceptions about their viability. Deposits in nearly all the banks in the sample declined amid the panic and only recovered slowly; by 1895 deposits were only, on average, 68% of their levels in 1892. There was, however, considerable variation in banks' experiences, with some banks more than recovering all the deposits lost while others saw barely any depositors return.

When studying the relationships between actions taken to restore the bank and the bank's subsequent outcomes, one challenge is that the actions taken were obviously endogenous to the condition of the bank.<sup>3</sup> For instance, shareholders may have only been willing to contribute additional equity in cases where they believed the prospects of the bank were already favorable. To account for the condition of the bank, we draw on other information from the examiner reports and from the Reports of Condition (Call Reports) filed with the Comptroller. We include a suite of balance sheet measures related to the dependence of the bank on various sources of funding as well as indicators of ownership structure. We also use assessments of the condition of the bank by the bank examiner, an outsider to the bank that nevertheless had access to inside information. Nevertheless, there could be relevant aspects of the bank condition that are unobservable to us and correlated with the actions chosen.

One approach to studying whether our OLS coefficient estimates reflect a causal impact from bank actions to bank outcomes rather than unobservable influences is based on a method developed by Altonji et al. (2005) and enhanced by Oster (2019). These authors argue that, if the unobservable factors are positively correlated with the observed

<sup>3</sup> It is worth noting however that this large-scale reopening of banks was itself quite novel. We are not aware of a preceding instance in the U.S. in which many banks individually decided to suspend but were then allowed to reopen as the result of a combination of actions and examiner approval. The use of depositor agreements, in particular, appears to have been fairly innovative. It is quite possible that the banks themselves did not have any clear sense of what would be the most successful strategy.

factors, then looking at how the coefficient of interest changes as the observable controls are added provides insight into how the coefficients would likely change if the unobserved factors were able to be included. In our case, that means that if the coefficients on the actions taken to promote confidence tend to increase in magnitude and become more significant when controls for condition and the local environment are added, then they are likely to become stronger if the unobserved factors were able to be included. And conversely, there would be more concern about the role of unobserved factors if the coefficients tend to diminish in size as more observables are added. We make use of this method in discussing our results. While this approach is reassuring, it cannot completely alleviate concerns; the assumption that the unobservables are correlated with observables in our particular case is inherently untestable. For a few actions, such as replacing the cashier, we also employ comparisons of matched samples of banks as an additional way to ensure that endogeneity issues and unobserved factors are not driving our results. All these exercises support our main results, but given the challenges in determining how shareholders might have assessed the prospects of these banks and how that might have affected the actions they took, we cannot be certain that endogeneity issues are fully resolved.

While keeping the cautions regarding endogeneity and modest sample size in mind, our results still provide support for the idea that the remedial actions available to banks were generally associated with improved outcomes. Dealing with bad assets by writing them off and removing them from the balance sheet is correlated with an increased likelihood of survival through at least 1897. Capital injections are also associated with positive outcomes; moreover, the resources obtained from raising additional capital were sometimes used to write-off the bad assets, so this action may have had indirect benefits captured by the inclusion of the write downs. We find that, conditional on survival, agreements with depositors to extend the maturity of deposits are correlated with greater deposits in the future, even after the agreements had matured. This is true even for banks that waived the agreements shortly after reopening, which suggests that the agreements may have been beneficial in solving coordination issues to prevent withdrawals immediately upon reopening.

Changing the bank president also appears to have been associated with deposit retention; however, this linkage depended on the perceived quality of the president. We are able to capture the quality of management by making use of examiners' evaluations of management in the examination reports. In cases where the examiner expressed no concerns about the quality of the president who was in place at the time the bank suspended, we find that replacing the president is associated with *lower* deposit retention. For banks where the examiner criticized the president, replacing the president had no discernable impact on deposit retention. Finally, we find that banks that replaced the cashier closed with greater frequency than other banks. These results suggest that there may be challenges associated with operational disruptions when trying to replace the day-to-day management of the bank in stressful situations. However, conditional on the bank's surviving, we do not find any relationship between replacing the cashier and deposit retention.

The associations between the measures of the condition of the bank that we use and bank outcomes are also of interest. Perhaps most importantly, the examination reports contain information on the examiners' estimates of expected losses on the banks' assets, as well as the amount of assets on the banks' balance sheets that reflect loans that previously went bad (i.e., other real estate owned). Banks for whom these indicators of condition were worse tended to have worse survival outcomes. Banks that were suspended for a greater length of time, which may have been related to their condition or their complexity, also generally had poorer outcomes. With respect to funding dependence, greater reliance on individual depositors (as opposed to interbank deposits or rediscounts) is associated with a higher likelihood of survival and tendency to retain more deposits. After including all the other controls, we find that the ownership structure in place prior to the bank

suspensions appears to be only weakly associated with bank outcomes (or with decisions on actions taken).<sup>4</sup>

We do find that bank location mattered for survival, after controlling for other observables. Banks that reopened were less likely to survive in counties where competition with other banks was more intense. It is possible that, if they had more options, customers moved away from banks that suspended in the panic and toward banks that remained open throughout. We find that there were more deposits in reopening banks when another bank in the town failed. Presumably those depositors shifted funds away from the closed banks, and moved to other banks, including those in our sample.

The paper is organized as follows. [Section 2](#) describes the historical episode that we study. [Section 3](#) describes the data used in the analysis and the particular variables that we consider. [Section 4](#) reviews whether the actions taken were related to the initial condition of the bank. [Section 5](#) analyzes whether the actions taken affected the likelihood of survival to 1895 and 1897. [Section 6](#) considers the effect of the actions on deposit retention. [Section 7](#) presents analysis demonstrating robustness to concerns about unobserved variables. [Section 8](#) concludes.

## 2. The Panic of 1893

The banks in our sample reopened following the Panic of 1893, arguably the worst financial crisis of the National Banking Era (1863-1913). Numerous factors were at play in this episode, and it is helpful to understand them to get a better sense of why banks might have gotten into trouble. One often-mentioned contributing factor was a concern about an effective change in the US commitment to the gold standard (see, for instance, [Friedman and Schwarz, 1963](#)). The Sherman Silver Purchase Act of 1890 increased the production of silver-denominated currency. There were fears that silver issues (which were valued up to that point as "tokens" of gold-denominated currency) might become large enough to displace gold coins and become a new, depreciated unit of account for the dollar, resulting in a large exchange rate devaluation and price inflation ([Calomiris, 1994](#)). Those concerns deepened in early 1893 as gold reserves hit critical levels. Subsequent capital outflows resulted in a tightening of financial conditions and strains in the financial sector.

Another factor identified as contributing to the crisis was the deterioration in economic fundamentals as business activity slowed and bankruptcies rose. Indeed, the next few years were marked by particularly poor economic performance. Amid this deterioration in the outlook, creditors might well have worried about the condition of the banks.

Third, the pyramidal structure of the banking system created liquidity risks that, in the event, resulted in some banks being cut off from their usual sources of liquidity during the panic of 1893. The reserve requirements in this period allowed banks in smaller cities to count deposits in banks located in designated reserve cities as part of their legal reserve. In normal times, banks held sizeable balances in reserve city banks, especially banks in New York City, as these balances were useful for clearing payments and making investments. Once the panic started however, this aspect of the structure of the banking system exacerbated the problems. During the panic, banks across the country simultaneously sought to withdraw their balances and the reserve city banks, including the New York Clearinghouse, suspended convertibility and froze those deposits. Consequently, the liquidity of the banking system collapsed and contributed to the elevated level of bank closures

<sup>4</sup> This may reflect the fact that governance was endogenous. [Calomiris and Carlson \(2016A\)](#) show that banks used formal governance when they wanted to expand their shareholder base beyond management, as part of an asset growth strategy. Informal governance (high internal ownership) and formal governance practices were substitutes. That endogeneity may explain why formal governance practices appear not to add much to depositor confidence.

(Calomiris and Carlson, 2017).

The Comptroller of the Currency was concerned about the impact of the closure of so many banks. In response, he announced a policy to allow banks which “under ordinary circumstances would not have closed, and whose management had been honest, an opportunity to resume business. (Report of the *Comptroller of the Currency*, 1893, p. 10).” Banks that had closed were visited by an examiner who made a special investigation of their condition. Banks needed to be in sound condition to reopen; insolvent banks were closed permanently. Only banks that would be able to maintain an unimpaired capital balance and be able to repay their debts after dealing with expected losses were permitted to reopen. Some banks were allowed to reopen if their capital was impaired so long as they were taking actions to replenish their capital stock. Banks were not allowed to resume based on extensive use of non-deposit funding (such as funds borrowed from other banks, which paid very high interest rates and were seen by examiners as a sign of fundamental bank weakness). A couple newspapers reporting on the bank reopenings indicated that the Comptroller had required changes in the banks’ Boards of Directors; that action is not discussed in the Comptroller’s Annual Report nor in other newspapers that provided reports of reopening negotiations, leading us to conclude that such actions affected only a very limited number of banks. Typically the role of the examiner was to analyze the condition of the bank, and, if the bank was solvent and the owners wanted to reopen, make sure that the reopening was proceeding smoothly.

The examination reports make clear that both liquidity and solvency issues played a role in the closures of banks. Some banks, especially in cities in which multiple banks were closed, were described as closing amid deposit runs that were sweeping the city, though the banks’ fundamental condition—and the perception of their condition—appear to have played a role, as banks that were described as older and more reputable often did not suffer runs (Carlson 2005). In some cases, such as in Louisville, Kentucky, the runs appear to have been initiated by (presumably well-informed) other banks at least as much as by depositors; Wicker (2000) provides a detailed description of this episode. In other cases, the examiners would report that the banks were suffering from serious asset quality issues and were forced to suspend. Although even here, liquidity often played a role. A number of these banks were described as relying on borrowed funds (money borrowed from other banks, often in the form of rediscounts or bills payable) and the inability to roll over funds in interbank markets was the immediate trigger for some suspensions.

### 2.1. Alternatives to reopening

There were a number of banks that closed permanently during the panic and it is important to understand what the alternatives to reopening were. If the examiners believed that the bank was insolvent, or very nearly so, they would place the bank into receivership. For the banks studied in Calomiris and Carlson (2014) that were placed in receivership, the examiner estimated that, on average, losses amounted to 60% of the net worth of the bank. In this case, an appointed official—the receiver—would oversee the liquidation of the bank. The owners of the bank had to pay for the administration costs of the receiver and this was viewed as an expensive option which the bank owners preferred to avoid if possible.

If the examiner believed that the bank was still solvent and its capital was not significantly impaired (meaning that the bank’s losses had not been large enough to eliminate the entire amount of surplus and undivided profit as well as most of the paid-in capital), the owners were able

to play a greater role in determining what would happen to the bank. If the examiners did not have cause to close the bank, but if the owners wanted to close the bank permanently rather than seek to reopen it, then the owners could vote to put the bank into voluntary liquidation.<sup>5</sup> For the banks studied in Calomiris and Carlson (2014) that went into voluntary liquidation, the examiners estimated that, on average, losses amounted to about 15% of the net worth of the bank. (This number is quite comparable with the banks in our sample of suspending and reopening banks where the average of examiner estimates of losses relative to net worth was 20%.) In a voluntary liquidation, the bank was wound down under the supervision of the existing management and ownership. It appears that the banks that used this option were those for which the owners did not believe the bank had favorable prospects or believed it was otherwise unlikely to return to profitability.

It is important to remember that in this period, bank equity holders were subject to “double liability.” This means that in a bank failure shareholders could not only see the value of the shares they had purchased wiped out, but a receiver or court could assess the shareholders additionally for an amount as high as the par value of the stock that they held (typically each share had a par value of \$100).<sup>6</sup> This double liability helped reduce the incentive for owners to “gamble for redemption” even when the capital stock of the bank was deeply impaired. Indeed, double liability likely contributed to the incentives to shut down weak banks via voluntary liquidation.

These alternatives highlight important aspects of our sample. (Additional statistical comparisons are provided below in Section 3.5.) As noted above, the fact that the banks were allowed to reopen means that the examiners believed that the banks were not only solvent but had sizable net worth (i.e., that their capital was not significantly impaired). Additionally, in light of the risks to owners implied by double liability, the fact that the owners decided to reopen the banks rather than wind them down strongly suggests that the owners also believed that the banks had favorable prospects as going concerns.

## 3. Data and variables

This section reviews our data sources. It also provides a detailed description of the actions that the banks could take to restore confidence and explains how we construct variables that denote these actions.

### 3.1. Data sources

Our sample consists of the 96 national banks (those with charters issued by the national government) that suspended during the Panic of 1893 but that were allowed to re-open at some point during the next year.<sup>7</sup> The cities in which banks suspended, but were allowed to reopen, are shown in Fig. 1. Their locations cover most of the United States, with the exception of the northeast, which was not as affected by this panic as other parts of the country. Colorado was especially hard hit with 14 banks suspending but being allowed to reopen. Altogether, 75 cities had banks that suspended but reopened. Of these, 13 saw multiple banks suspend and reopen. These are indicated by the larger dots in Fig. 1. The remaining 62 cities had only one bank suspend and re-open.

<sup>5</sup> The Comptroller of the Currency had to approve the decision by the bank. Based on discussions in the examination reports, it appears that the Comptroller would only not approve such votes if the Comptroller was concerned about the capital position of the bank and favored a receivership instead.

<sup>6</sup> Consequently, an important part of the examination process was ensuring that the bank kept careful track of the names of the current shareholders.

<sup>7</sup> There were also banks with charters from the state governments that suspended then reopened. Information on these institutions would be from state supervisors. We focus on banks with national charters as the regulations were the same for these institutions and the standards that these institutions had to meet before they could reopen were more uniform.



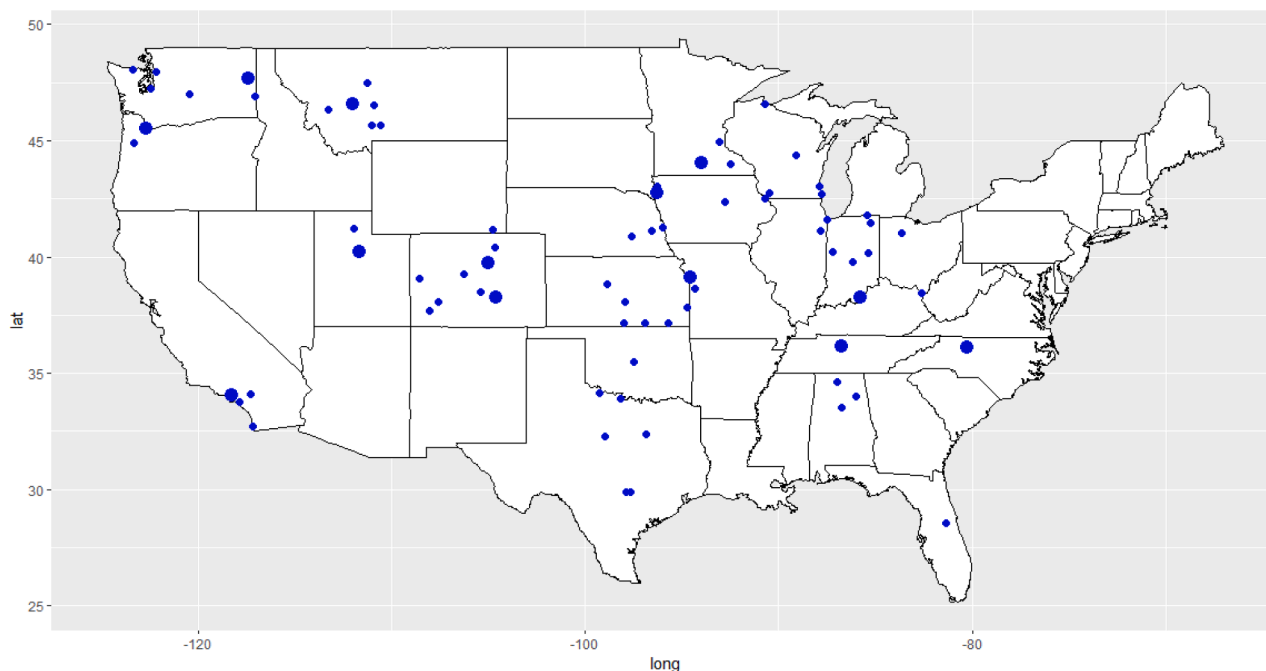


Fig. 1. Location of banks in the sample

Note. Larger dots indicate cities in which multiple banks suspended and reopened. Smaller dots indicate cities in which only one bank suspended and reopened.

The information we use on these banks comes from two primary sources. The first source is the Call Report that was submitted by all nationally chartered banks to the agency that supervised them—the Office of the Comptroller of the Currency. While banks were required to submit these reports on five particular days during the year, only one was published in the Annual Report of the Comptroller. Basic information from each of the five call reports was required to be published in the local newspaper and so would have been apparent to local customers. The Call Report provides a fair bit of detail on the assets and liabilities of the banks. It also lists the current President and Cashier of the banks. We use the data from the 1892 report, the last report submitted before the panic, and the reports from each of the five subsequent years.

The second source of information is the examination reports filed by the bank examiners. These reports were filed one to two times a year, depending on how often the examiners visited the bank. They provide information on the ownership structure, corporate governance, and some additional detail on the balance sheet (see Calomiris and Carlson 2014). The examination reports also contain the examiners' quantitative estimates of losses that the bank was likely to incur on its assets (not only loans, but any losses related to bad checks, securities, depreciation of the bank building, and other items).

As noted above, a special examination was conducted of banks that suspended and, where available, these are filed alongside the other examination reports. The examiners assessed the current condition of the bank, and typically offered some thoughts on the banks' prospects. Banks that were clearly insolvent or that were questionably solvent but faced dim prospects were not allowed to reopen. These special examinations appear to have taken longer than the typical two days for standard examinations. The examiners also described the steps that the banks were taking to prepare to reopen, which suggests that management was aware of the recommendation that the bank be allowed to reopen. Sometimes the examiner would provide his views regarding the reasons that the banks had closed.

We use the examination report closest to, but not after, May 1, 1893 as our initial examination-based assessment of the condition of the bank. We then use the information in other examination reports through June 1894 to provide additional information about the evolution of the condition of the bank. That includes the examination conducted when

the bank was suspended. In some cases, our understanding of what was happening to the banks has been informed by reading reports filed after June 1894, but we have not used these reports systematically.

### 3.2. Description of variables used in the analysis

Here, we describe the variables used in the analysis. We start with the outcomes of interest. We then discuss the variables that might have influenced the outcome following reopening, including variables that describe both the actions taken by the managers and owners to maintain the viability of the bank as well as variables that capture the condition of the bank. Finally we note other variables used as additional controls. Summary statistics of the variables discussed in this section are reported in Table 1.

#### 3.2.1. Outcome measures

We focus on two outcomes. The first is whether the bank survived for a significant period after reopening. We measure survival, defined as continued existence, using two terminal dates: until the Call Report for 1895, and alternatively, until the Call Report for 1897. Of the banks that reopened following the Panic, 72 were still open in 1895 and 61 were still open in 1897. Survival indicates confidence in the bank within the local community, both on the part of depositors and for customers willing to borrow from the bank and conduct other aspects of their business through it. Banks that did not exist, because they voluntarily liquidated, had a receiver appointed, or merged with another bank, are not considered survivors.<sup>8</sup>

The second outcome of interest is deposit retention. If a bank was successful in maintaining the confidence of the depositors, then that should be reflected in higher levels of deposit retention. We analyze the effect of deposit retention for various dates by calculating the ratios of the deposits reported on the 1894, 1895, or 1897 Call Reports relative to deposits on the 1892 Call Report. The ratio of deposits in the years

<sup>8</sup> There were not many mergers involving the banks in our sample. Our results are robust to alternative treatments of such institutions, such as dropping them from the sample entirely.

**Table 1**  
Summary statistics

|   | N  | Mean | Median | Std. Dev | Min  | Max  |
|---|----|------|--------|----------|------|------|
| Survive to 1895   | 96 | 0.74 | 1      | 0.44     | 0    | 1    |
| Survive to 1897   | 96 | 0.63 | 1      | 0.48     | 0    | 1    |
| Deposit ratio 94/92 (%)   | 79 | 61.0 | 59.4   | 22.6     | 10.1 | 131  |
| Deposit ratio 95/92 (%)   | 69 | 67.0 | 66.5   | 25.9     | 21.6 | 146  |
| Deposit ratio 97/92 (%)   | 56 | 75.9 | 75.4   | 33.6     | 27.2 | 192  |
| Depositor agreement   | 96 | 0.58 | 1      | 0.49     | 0    | 1    |
| Capital injection (indicator)   | 96 | 0.12 | 0      | 0.33     | 0    | 1    |
| Capital injection size (ratio to prior net worth)                             | 96 | 0.6  | 0      | 0.20     | 0    | 1.5  |
| Write downs (%)   | 96 | 0.51 | 0.45   | 0.39     | 0    | 1    |
| Change president  | 96 | 0.30 | 0      | 0.46     | 0    | 1    |
| Change cashier  | 96 | 0.48 | 0      | 0.50     | 0    | 1    |
| Suspension length (days)  | 96 | 58.8 | 41     | 52.6     | 6    | 280  |
| Losses estimated by examiner (pre-suspension) (%)                             | 96 | 1.2  | 0.35   | 1.8      | 0    | 9.9  |
| Losses estimated by examiner (post-suspension) (%)                            | 96 | 5.1  | 2.5    | 7.0      | 0    | 35.2 |
| OREO (pre-suspension) (%)   | 96 | 1.3  | 0.34   | 2.7      | 0    | 11.1 |
| OREO (post-suspension) (%)  | 96 | 3.3  | 2.3    | 3.9      | 0    | 20.0 |
| Individual deposits/ liabilities (%)  | 96 | 53.4 | 56.0   | 13.8     | 20.8 | 79.6 |
| Cash and due from banks to liabilities (%)                                    | 96 | 18.3 | 17.0   | 7.8      | 4.5  | 41.6 |
| Log assets  | 96 | 13.2 | 13.0   | 1.01     | 11.4 | 15.7 |
| Ownership by bank officers (%)  | 96 | 31.2 | 25.6   | 23.2     | 1.2  | 96   |
| Banking sector concentration: share of county bank capital at top 3 banks (%) | 96 | 67.4 | 68.3   | 27.0     | 19.7 | 100  |
| Log city population   | 96 | 9.2  | 9.0    | 1.6      | 6.0  | 12.2 |
| Reserve city  | 96 | 0.1  | 0      | 0.30     | 0    | 1    |
| A bank closed permanently in the town   | 96 | 0.36 | 0      | 0.48     | 0    | 1    |

following the panic relative to the deposits prior to the panic are a direct reflection of depositor confidence in the institution. Looking at deposit ratios over several post-panic years allows us to observe whether the remedial actions undertaken by banks mattered for depositor confidence, and whether those actions had lasting effects on depositor confidence. We focus largely on the deposits of individuals, as these comprised the majority of deposits and the confidence of the depositors was essential for the banks' survival. In some of our analysis, however, we consider retention of interbank deposits, and we note that – given the relatively informed position of interbank depositors – these deposits might have been especially sensitive to concerns about bank condition. Understanding their behavior provides a unique window on how sophisticated market observers viewed the remedial actions affected of closed banks, and how successful those actions were in restoring confidence in the reopening bank.

The deposit retention ratio is only available for banks that survived long enough to report deposits on their various Call Reports. We also looked for indications that the banks in the sample had absorbed other banks through mergers or consolidations. Where those have been identified, we adjusted deposit ratios by adding the deposits of the absorbed bank to the deposits of the acquiring bank; doing so avoids creating a false impression of higher deposit retention. In some cases, there are possible merger events (e.g., another bank in the town disappears and deposits of the bank in the sample increase), but we have not yet been able to confirm that a merger occurred.<sup>9</sup> In those cases, we drop those banks for years in which the possible merger is relevant. Including these banks in the analysis below affects the precision of the estimates but not the qualitative impacts estimated. Thus, as noted in Table 1, for 1895, we have the ratio of deposits for 69 banks. Both the mean and

median ratios were about 67%. However, from the minimum and maximum values in all years, it is clear that the experience of banks varied widely.

### 3.2.2. Actions that could have been taken by the bank as part of reopening

There are a variety of actions that the management and owners of a bank could have taken to affect how the bank would be perceived by its depositors and other customers, which would likely have influenced the bank's ability to maintain its viability.

**Depositor agreements.** The examination reports indicate that a number of banks reached agreements with depositors under which demand deposits were converted into time deposits, portions of which would be payable at specified horizons. Here is an example agreement for a bank in Los Angeles:

We the undersigned depositors in the Southern California National Bank do hereby agree with said bank that in consideration of the resumption of business by it, we will accept payment on our several deposits in the following manner: viz: fifteen percent on demand after resumption, ten percent in thirty days thereafter, fifteen percent in sixty days, thirty percent in ninety days, and the balance in four months.

While unavailable for withdrawal by the depositor, those deposits earned interest (unlike demand deposits which typically earned no interest). The interest rates mentioned in the agreements ranged from 4% to 8% per annum, which was slightly above the typical rates paid on time deposits, but in line with the rates paid on the wholesale funding of the day, such as bills payable and rediscounts. The agreements were used by one of the first banks to reopen, the First National Bank of San Diego, and information about their use appears to have spread both in newspapers and through correspondence among examiners. A few examiner reports indicated that there was a secondary market for these deposit agreement contracts.

Commentary in the examination reports indicates that the bank owners and examiners involved in the reopening of the banks were concerned about the possibility of a surge in withdrawals upon reopening, especially if depositors were concerned that banks were competing for a limited supply of liquidity. If one depositor thought that other depositors would withdraw and that this could create a liquidity risk for the bank, then that depositor had an incentive to withdraw, even if he had no fundamental concern about the bank's long-run viability. That resulting run could cause the bank to close again. One purpose of the depositor agreements was to serve as a device for solving this coordination problem. Banks using these agreements reported that a large portion of depositors signed them. In some cases, coverage of agreements reportedly reached as much as 95% of deposits. If each depositor was aware that most other depositors had signed a pledge not to withdraw more than a modest amount, then there would be less need for individual depositors to compete to obtain cash through withdrawals, which presumably would help prevent a run. The depositor agreements could thus have promoted confidence in the bank, at least for an initial period. Such an effect would be consistent with the model outlined by Davis and Reilly (2016). Consequently, the agreements should have reduced the amount of cash the banks would need to have on hand upon reopening and enhanced their ability to keep extending loans and not demand loan repayments solely to accumulate cash.

However, resorting to these agreements might have created some resentment on the part of depositors who had valued and expected a high level of liquidity for their deposits. This might have been the case even if the depositors understood the necessity of the agreements for the reopening of the bank and were compensated for their commitment to leave the deposits at the bank. Resentful depositors may have withdrawn their funds over time and moved them to another bank that had

<sup>9</sup> Typically these involve the disappearance of state banks for which less information is available.

remained open throughout the panic.<sup>10</sup>

About 60% of the banks in our sample used such a deposit agreement. In some cases, we only know whether such an agreement exists. In other cases we also know the maturity buckets. Where we know the length of the maturity of the agreements, we observe that they had largely expired by the 1894 Call Report and certainly expired by 1895, so the deposit ratios of particular interest are measured after the expiration of the contractual restrictions.

A small number of banks announced shortly after reopening that they were waiving the restrictions on withdrawals imposed by their agreements. That suggests that, at least for those banks, the main value in the depositor agreements was in coordinating to limit initial withdrawals upon reopening. By comparing outcomes for banks that waived the restrictions to those for banks that did not, we are able to gain some further insight into the extent to which the agreements were important for coordinating withdrawals upon reopening, providing more stable long-term funding, or creating resentment among depositors.

*Replacing bank management.* Another action that the owners could take was to replace the president of the bank, the cashier, or both. We check for turnover by looking at whether the officers of each type differed between the 1892 Call Report and the 1894 Call Report. Replacing each of these types of officers may have had different effects.

The president was often the public face of the bank, a large shareholder, and the person responsible for overseeing the overall operations (effectively, in today's parlance, the chief executive officer of the bank). Replacing the president could promote public confidence if he was seen as incompetent or otherwise responsible for the problems at the bank. On the other hand, the president typically had strong connections in the community and to the business customers of the bank; in that case replacing him might have reduced confidence. About one-third of the reopening banks replaced the president.

The cashier was typically the bank officer who oversaw the day-to-day operations of the bank (effectively, the chief operating officer of the bank). Cashiers were often responsible for making sure that loans were adequately secured and for attempting to collect on loans that went bad. Cashiers typically had the authority to make small loans. If the cashier was a poor manager and responsible for the troubles at the bank, then replacing the cashier might have improved the bank. On the other hand, replacing the day-to-day manager of the bank during a stressful time and amid deteriorating economic conditions might be disruptive in itself. There was a change in the cashier in just under half the banks in the sample.

It is important to note that there were a variety of reasons that management could be replaced other than poor performance. Calomiris and Carlson (2016A) find that death was the most common reason for a change in the president. At least one examiner report indicates that death caused turnover in the president in this sample as well. In the case of the cashier, at least one examiner report indicated that the cashier left to become the president of a bank in another city; such a transition hardly suggests that the cashier was doing a poor job. In extensions to the baseline analysis below, to avoid simply relying on turnover as a measure of change resulting from poor performance, we measure the quality of the management that was in place at the time the bank suspended. Here, the examiners' reports are particularly useful because they provide the examiners' judgments about management quality.

We use both the examination reports prior to the panic and at the

time of suspension to inform our assessment of the management. We divide managers (both presidents and cashiers) into two groups – criticized and not criticized. In most cases, not criticized managers are straightforward to classify based on the examination report text. The examination report asked the examiner whether managers were “capable and prudent.” Cases where the examiner repeats those words back are labeled as not criticized. Sometimes management can easily be labeled as criticized, such as when management is characterized as “reckless” or “doesn't seem to possess a single attribute of a good, prudent banker.” Management that is reported to be mostly absent or spending most of their time on other activities we also label as criticized. There are some descriptions where making this distinction requires some judgement; however, these tend to be few in number and the results reported below are not sensitive to how they are treated.

*Injecting new paid-in capital.* Owners could also support bank health and boost confidence in the bank by increasing the amount of capital through issuing additional shares. More capital would provide additional protection for depositors against loan losses and could also signal the confidence of informed parties (stockholders) demonstrating their willingness to place additional capital at risk. Local newspapers reported on capital raising efforts by the banks, so depositors would likely have known that such an action was being taken.

The most direct means of observing changes in paid-in capital is a comparison of the amount of capital reported in the 1892 Call Report to the amount of capital reported in 1894. Instances where paid-in capital increased are clearly cases where additional capital has been raised. There are also a few banks where the examiner indicates that the bank added to its capital stock, but then immediately wrote-down bad assets by the same amount. In such cases, there was no net change in reported capital even though a capital increase had occurred. It is important to include these cases where shareholders injected capital into their bank, and therefore, we employ both kinds of data to identify injections of paid-in capital. Altogether, we find that 12 banks injected capital around the time of reopening.

*Writing off bad assets.* Writing off bad assets might provide a signal that the bank was serious about addressing its problems. Resources to write-off bad assets could come from deductions from earnings, reducing surplus or undivided profits, or reducing the paid-in capital (including capital that had just been raised). Writing off bad assets by reducing existing paid-in capital or surplus would have been apparent to the local community from the call report filings reported in the local press. Other adjustments, such as using earnings to write off assets, would not have been as easily apparent to the community, although other shareholders in the bank would have known, and it is plausible that the local community might have become aware that the bank was cleaning its books if this was done on a large scale.

Reducing bad assets on the balance sheet may have had managerial implications. It is sometimes seen as an indication that the management of the bank will focus more of their human resources on making new loans rather than trying to collect on bad assets; Landier and Ueda (2009) and Fioretti et al. (2019) note that, in modern times, high levels of non-performing assets can divert management attention away from new opportunities and reduce operational efficiency. In addition, reporting fewer bad assets on the balance sheet—in this period the item “other real estate owned” (OREO) tended to consist of collateral seized when loans went bad—might boost confidence in the bank. At the same time, reducing bad assets by writing down existing capital or surplus would have increased the leverage of the bank which might have made depositors more concerned about their potential exposure to any future losses at the bank.

Our measure of the extent to which the bank wrote down bad assets has two components. The first is the value of the write-down itself: we measure this amount as the maximum of (1) the sum of all the reported

<sup>10</sup> One bank appears to have imposed the conversion of demand deposits to time deposits. We do not consider that to have been an “agreement” because we think that the action taken by depositors to consent to such arrangements is potentially quite important to their success. This bank failed fairly quickly and so its inclusion does not affect the deposit retention analysis. Moreover, we doubt whether the bank's unilateral decision to convert demand deposits into time deposits was legal, but its speedy failure quickly made this question moot.

writedowns on examination reports conducted at the time of suspensions plus those on examinations conducted before June 30, 1894; or (2) the amount by which capital (including capital raised around the time of reopening), surplus, and undivided profits was reduced between 1892 and 1894; and (3) zero.<sup>11</sup> We then take the ratio of this number to the amount of bad assets on the bank's balance sheet prior to the crisis. The amount of bad assets in turn is taken to be the maximum of (1) OREO in 1892; or (2) the losses on bank assets estimated by the examiner on the report preceding the panic; or (3) the value of loans classified by the examiner as legally delinquent or otherwise doubtful; or (4) the value of write-downs reported in the numerator. In the event that both the numerator and denominator are zero, we set the ratio equal to the median ratio (the bank wrote off assets at a typical pace).

*Summary information about bank actions.* Banks, on average, took two actions, although three banks took all four actions and three banks took none of the possible actions. The most common action taken was to enter into a depositor agreement.

As shown in Table 2, taking any particular action is not highly correlated with taking any other action. The only correlation coefficients rising above 0.25 are the ones indicating that banks that replaced the president of the bank also tended to have injected more capital. Even the correlation between changing the president and changing the cashier is not very high.

### 3.2.3. Variables indicating the condition of the bank

The condition of the bank clearly should matter for bank survival and deposit retention. We have two indicators of the condition of the bank's assets. The first is the amount of OREO on the bank's books, which, as noted above, reflects collateral seized when loans went bad. The second measure is the examiner's estimates of likely losses—those on loans, as well as securities, payments due the bank, depreciation of the banking house, and other items. This measure was constructed by the examiner and was, in normal times, compared to the bank's net worth to determine whether the bank was solvent, whether capital was impaired and the bank should suspend dividend payments. (See Calomiris and Carlson 2016B for further information.) Similar to other indicators used in the analysis, we scale both OREO and loss estimates by the banks' assets.

These two measures are complementary. The ratio of OREO to assets is a backward-looking measure that provides an indication of how the loans that had been extended by the bank actually fared. Estimated losses cover all the bank's assets and is a forward-looking measure that

**Table 2**  
Correlation of the actions taken (and with suspension length)

|                   | Deposit agreement | Change president | Change cashier | Inject capital | Write down ratio |
|-------------------|-------------------|------------------|----------------|----------------|------------------|
| Change president  | -0.04             |                  |                |                |                  |
| Change cashier    | 0.01              | 0.23             |                |                |                  |
| Inject capital    | 0.06              | 0.30             | 0.02           |                |                  |
| Write down ratio  | 0.12              | 0.23             | 0.09           | 0.11           |                  |
| Suspension length | 0.02              | 0.33             | 0.33           | 0.02           | 0.12             |

<sup>11</sup> Mathematically, the value of write-downs observed from changes in capital is  $\min(\text{capital}_{1892} + \text{surplus}_{1892} + \text{undivided profits}_{1892} + \text{additions to capital upon reopening} - \text{capital}_{1894} - \text{surplus}_{1894} + \text{undivided profits}_{1894}, 0)$ . If the bank had more capital in 1892 than in 1894, that indicates that the bank was using some of those resources to write-off bad assets.

provides an indication of how the bank's condition is expected by the examiner to evolve. OREO was disclosed as part of the published Call Report and so would have been known by the public. The examiner's loss estimate was not disclosed publicly. The local population likely had some sense of how healthy the bank was, but were unlikely to be able to form as comprehensive an assessment of likely losses.

We also need to determine when the condition of the bank should be measured for our purposes. We could measure condition (i) prior to the Panic, (ii) at the point when the examiner is assessing the condition of the bank, or (iii) as soon after the bank reopens as the data allows. Measures of condition at points in time (ii) and (iii) tend to be much worse than in period (i). That may reflect a deterioration in the economy, but also may be due to a more careful scrutiny of the bank. Ideally, we would include multiple measures. However, the limited number of observations coupled with some data availability issues forces us to make choices. The condition of the bank following the panic seems most relevant for the decisions that the bank's depositors and other customers would need to make. For OREO, we measure condition using the ratio to assets from the 1894 Call Report but use the ratio for 1893 when the 1894 data is missing. (Banks that had closed permanently by the 1894 Call Report did not file a report while those that were suspended at the time of the 1893 Call Report did not file that one.) For estimated losses, where available we use the examiners' estimates of losses relative to assets from the first exam report after the bank was reopened. If that is not available, we use the assessment at the time the bank was closed.

In addition to these direct measures of the condition of the bank's assets, the length of time that the bank was suspended might be related to the condition of the bank. On average, banks were suspended for 60 days. However the range is considerable; some banks were suspended as few as 6 days while others were suspended for as long as 280 days. It seems likely that management and owners would have been able to provide a credible plan to the bank examiners and depositors fairly quickly if the bank was in better shape. It also seems plausible that a shorter suspension period should be associated with more confidence in the bank and likely more retention and an increased likelihood of survival. However, there may well have been other reasons for the length of suspension to have varied. Because length of suspension might reflect otherwise unobservable influences on a bank's condition, we routinely include it as a control variable.

### 3.4. Other variables used in the analysis

We include a variety of other control variables in our regressions. Some of these reflect the bank's balance sheet prior to the Panic. On the asset side of the balance sheet, we include the ratio of cash and "due from banks (including reserve agent)" relative to liabilities. These two asset categories were more liquid and tended to be safer, especially if the bank's correspondents remained open. This ratio also indicates the propensity of the bank to have invested in safe and liquid assets prior to the panic. Because we are interested in deposit retention, we include the pre-panic share of bank liabilities that were individual deposits to indicate whether individual deposits were an important funding source for the bank prior to the panic. We also include the size of the bank as measured by (log) assets.

To account for corporate governance, we include the share of ownership by the officers of the bank – the president, vice president, and cashier. If the officers had a higher ownership stake in the bank, they may have operated it more conservatively (as Calomiris and Carlson 2016A found for national banks on average), and this may have affected depositors' and other customers' confidence in the institution.

We also include control variables that reflect the environment in which the bank was located. All banks are "unit" banks, located in only one town or city. One simple measure is the size of the community in which the bank was located as indicated by the log of the population of the town or city. Another is an indicator for whether the bank's location was a reserve city; banks in reserve cities were subject to higher reserve



requirements but also benefitted from regulations that provided incentives for banks to keep deposits at the banks in those cities. A third location control that we include is a measure of banking sector concentration as indicated by the share of total bank capital in the county that was at the three largest banks. (Paid in capital is one of the few balance sheet measures that is widely available for private banks and state-chartered banks.) The larger this share, the less competitive the banking environment. Banks with more monopoly power may have been more successful in retaining customers, as those customers would have had fewer alternatives, and this should have improved their ability to survive.

Finally, we include an indicator for whether another bank in the town closed permanently during the panic. On the one hand, such a failure could indicate otherwise unobserved severity of the economic challenges faced by any bank in the community (including the failed subject bank). On the other hand, depositors in the other failed bank presumably would be looking for another local bank in which to deposit their funds, and that might have provided a source of deposit inflows for reopening banks.<sup>12</sup>

### 3.5. Comparison of banks that suspended to banks that never closed or that closed permanently

We first provide a comparison of the condition of the banks that suspended and reopened with the other two other groups of banks: other failed banks – that is, those that closed and were turned over to a receiver or decided to voluntarily liquidate – and banks that never closed during the panic in Table 3. The latter groups of banks are from

**Table 3**  
Comparison of banks with different outcomes in 1893.

| Means [medians]                               | Suspensions | Failing & liquidating | Surviving   |
|---|-------------|-----------------------|-------------|
| Oreo to assets 1892 (percent)                 | 1.3 [0.3]   | 2.1 [1.1]             | 0.5 [0.0]   |
| Use bills & rediscounts                       | 22%         | 48.0%                 | 12.3%       |
| Examiner estimated losses to assets (percent) | 1.1 [0.3]   | 5.7 [1.3]             | 0.6 [0.1]   |
| Cash to assets (percent)                      | 18.3 [17.0] | 27.0 [23.1]           | 31.7 [30.0] |
| Due to banks to liabilities                   | 6.5 [1.8]   | 8.5 [5.9]             | 13.7 [8.2]  |
| Due to individuals to liabilities             | 53.4 [56.0] | 39.5 [41.2]           | 47.7 [47.2] |
| Share of stock owned by top 3 managers        | 31.2 [25.6] | 27.6 [25.5]           | 24.9 [16.9] |
| Log assets                                    | 13.2 [13.0] | 13.5 [13.4]           | 14.1 [14.2] |
| Log city population                           | 9.2 [9.0]   | 10.4 [10.5]           | 10.9 [10.8] |
| Share in reserve cities                       | 9.4%        | 12.5%                 | 40%         |
| <i>Memo: banks</i>                            | 96          | 24                    | 163         |

Note. Failing and liquidating banks and surviving banks are from Calomiris and Carlson (2014).

<sup>12</sup> Given the modest sample size, we are only able to include a limited number of controls. There are a variety of other measures that we tried including, but ultimately dropped because they did not have any statistical relationship to any of the outcome measures. Surprisingly one variable that did not matter was the pre-panic capitalization of the bank as measured by the ratio of net worth to assets; in addition, this variable was not related to length of suspension, use of any of the actions discussed, survival, or deposit retention. In the deposit regressions, we also tried controlling for developments with respect to the deposits at other banks in the same city. However, this variable was not strongly related to developments in deposits at the banks in our sample. Other variables that we tested but that did not matter included whether the city had a clearinghouse and the share of county income from agriculture.

Calomiris and Carlson (2014). Their sample includes a higher concentration of banks in larger towns, especially reserve cities. That difference needs to be kept in mind, but the comparison is nevertheless informative.

As a group, banks that suspended and reopened appear to have been in somewhat worse shape prior to the panic than banks that never closed, but in better shape than banks that closed permanently.<sup>13</sup> For example, both the mean and median ratios of OREO to assets and of the ratio of examiner estimates of losses to total assets for banks that suspended were between the averages of the other two groups. Similarly, the frequency of use of bills and rediscounts (a measure of vulnerability highlighted by examiners, and found to be relevant in many other empirical studies) was less for reopening banks than for failed banks that closed permanently but more than for banks that never closed.

The liquidity metrics also differ across banks in the three groups. Banks that never closed, on average, held more cash than those in the other groups. Banks that suspended but reopened were the most dependent on deposits of individuals and least dependent on the deposits of other banks. Those differences are likely accentuated by the fact that banks in the other groups, especially those that never closed, were more likely to be located in reserve cities, but that does not seem likely to explain the entire difference.

Banks that never closed had a smaller concentration of ownership by bank managers; there is not much difference in ownership concentration between the other two groups. Banks that never closed were also somewhat larger as measured by total assets. That is a relevant difference from the perspective of governance because (as Calomiris and Carlson 2016A show) banks that were larger tended to adopt different governance practices that were less dependent on concentrated shareholding to inspire depositor confidence.

## 4. Factors that affected which actions were taken

Before looking at the relationships between remedial actions taken by reopening banks and the outcomes following the panic, we first look at whether those actions were related to the initial condition of the banks. Such analysis is interesting in itself as it provides insights into why certain choices may have been made. In addition, understanding linkages between initial conditions and the choice of actions provides a sense about how challenging it might be to separate the effects on deposit retention and bank survival from initial conditions versus the actions taken; the more strongly linked the actions are to initial conditions, the greater the challenge separating the effects.

We conduct this analysis by regressing each of the actions on the balance sheet and location control variables described earlier. These results are reported in Table 4. In general, we find only modest associations between the initial condition of the bank and the actions that were taken. When controlling for condition, we use measures based on variables observed prior to the panic—including measures of condition such as OREO to assets and examiner estimates of losses. Robustness checks using post-panic measures of condition produce similar results. Finding that actions are not correlated with observable differences in condition is reassuring for our analysis of the effects of remedial actions because it suggests that those actions are also less likely to be correlated with unobservable differences in pre-panic condition. This in turn may reduce the concerns about the endogeneity of actions. We formalize that thinking in further analysis reported below.

With respect to the use of depositor agreements (column 1), we find that it was mostly location variables that mattered. Banks in areas with more concentrated banking systems were less likely to use depositor agreements, which possibly reflects depositors having fewer places to

<sup>13</sup> Further separating banks that closed permanently into those that were placed with receiver and those that voluntarily liquidated reveals that banks that were placed with reserves were decidedly in the worst shape.

**Table 4**

Factors associated with use of banker actions

|  | Depositor agreements | Change president | Change cashier    | Capital injection | Write downs       |
|--|----------------------|------------------|-------------------|-------------------|-------------------|
| Estimated examiner losses (pre-panic)      | 0.92<br>(2.8)        | -1.87<br>(2.94)  | 7.44***<br>(3.37) | -0.91<br>(2.21)   | -2.56<br>(2.58)   |
| OREO (pre-suspension)                      | 2.09<br>(2.22)       | 0.08<br>(2.22)   | -2.70<br>(2.30)   | 1.60<br>(1.32)    | 2.32<br>(1.87)    |
| Individual deposits/ liabilities           | 0.52<br>(0.42)       | 0.33<br>(0.43)   | -0.43<br>(0.44)   | 0.82**<br>(0.33)  | 0.20<br>(0.38)    |
| Cash and due from banks to liabilities     | 0.43<br>(0.64)       | -0.72<br>(0.67)  | -0.39<br>(0.68)   | -0.57<br>(0.49)   | -1.17**<br>(0.58) |
| Log assets                                 | -0.03<br>(0.09)      | -0.03<br>(0.08)  | 0.15<br>(0.09)    | -0.05<br>(0.06)   | 0.03<br>(0.07)    |
| Ownership by bank officers                 | -0.11<br>(0.24)      | -0.34<br>(0.24)  | 0.22<br>(0.25)    | -0.15<br>(0.16)   | -0.18<br>(0.21)   |
| Banking sector concentration               | -0.42**<br>(0.24)    | 0.02<br>(0.22)   | -0.11<br>(0.24)   | -0.05<br>(0.17)   | 0.00<br>(0.20)    |
| Log city population                        | 0.10*<br>(0.06)      | -0.02<br>(0.06)  | -0.05<br>(0.06)   | 0.05<br>(0.05)    | 0.03<br>(0.05)    |
| Reserve city                               | -0.41**<br>(0.19)    | 0.28<br>(0.19)   | 0.08<br>(0.21)    | 0.01<br>(0.14)    | 0.19<br>(0.18)    |
| Observations                               | 96                   | 96               | 96                | 96                | 96                |
| LR Chi <sup>2</sup> /F-stat                | 17.5                 | 5.1              | 11.1              | 9.0               | 12.4              |
| Pseudo-R <sup>2</sup> / adj-R <sup>2</sup> | 0.13                 | 0.04             | 0.08              | 0.12              | 0.11              |

Note. Marginal effects reported in columns 1, 2, 3, and 4. Standard errors in parentheses. The symbols \*\*\*, \*\*, and \* indicate significance at the 1, 5, and 10 percent levels respectively. All variables measured pre-panic. Columns 1-4 are estimated using probit regressions. Column 5 is estimated using a tobit regression with 5 observations censored at zero.

move their funds. Banks in reserve cities also were more likely to use these agreements. Surprisingly, there is no relationship between the use of agreements and the importance of individual depositors as a source of funding; one might have expected that retaining these depositors would be more important when the bank was more dependent on them. The sign of the association is positive—relatively more depositors makes the use of an agreement relatively more likely—but the standard error is very large. In additional analysis not shown here, we looked to see whether the importance of interbank deposits mattered for the use of deposit agreements but did not find any evidence that they did.

Changes in the president of the bank (column 2) were also not strongly related to the condition of the bank measured either using indicators of condition prior to the panic or measures of condition following the panic. While the coefficient on the portion of equity owned by bank managers was negative, consistent with the idea that if the president was a major shareholder he was loath to replace himself, this effect is not statistically significant.<sup>14</sup>

Changes in the cashier (column 3) were strongly related to the condition of the bank as measured prior to the panic (and as measured after the panic). This finding suggests that the cashiers were held responsible for managing the quality and security of existing loans. Moreover, cashiers typically had only a small ownership stake in the bank, if any, so replacing them may have been easier than replacing the president, who was often a major stockholder.

One of the stronger associations that we find is between the importance of individual deposits as part of the liability base and increases in capital (column 4). An increase in the ratio of individual deposits to total liabilities of 10 percentage points, which is less than one standard deviation, is associated with a 7 percentage point increase in the likelihood that the bank increased its paid in capital. Perhaps surprisingly, concentration of ownership by the management was not strongly related to the decision about whether to raise additional capital. On the other hand, this may not be surprising given that Calomiris and Carlson (2016A) find that banks with lower ownership concentration were more likely to undertake formal corporate governance practices that would

<sup>14</sup> Other measures of corporate governance, such as having an independent loan and discount committee, did not have a statistically significant association with the turnover of the president, but these coefficients were consistently negative.

have facilitated their ability to raise new capital.

With respect to write-downs of expected losses and bad assets (column 5), the only strong association we find is a negative one with respect to higher levels of cash and due from banks. The reason for such a relationship is unclear, but could reflect the desire by management to present a strong balance sheet (more safe/liquid assets and fewer problems assets). There is a positive, but statistically insignificant, association with write downs and the existing bad assets on banks' books (as measured by OREO).

We also examine how suspension length was related to the initial condition of the bank, given that condition is a potentially important control variable. As shown in Table 5, banks for which the examiner estimated higher losses pre-panic tended to be suspended for longer; although, more bad assets on the books tended to go the other way.

**Table 5**

Factors related to length of suspension

|  | Suspension length (days) |
|--|--------------------------|
| Estimated examiner losses (pre-suspension) | 550*<br>(313)            |
| OREO (pre-suspension)                      | -441*<br>(236)           |
| Individual deposits/ liabilities           | 35.4<br>(47.9)           |
| Cash and due from banks to liabilities     | -35.2<br>(72.4)          |
| Log assets                                 | 29.5***<br>(9.4)         |
| Ownership by bank officers                 | 56.0**<br>(26.7)         |
| Banking sector concentration               | -1.75<br>(25.6)          |
| Log city population                        | -16.9**<br>(6.6)         |
| Reserve city                               | 20.3<br>(22.4)           |
| Constant                                   | -207*                    |
| Observations                               | 96                       |
| F-statistic                                | 2.2                      |
| Adj-R <sup>2</sup>                         | 0.10                     |

Note. Standard errors in parentheses. The symbols \*\*\*, \*\*, and \* indicate significance at the 1, 5, and 10 percent levels respectively. All variables measured pre-panic.

Larger banks tended to have longer suspension periods; this result is similar to the discussion in White and Yorulmazer (2014), who argue that complexity can increase the time it takes to resolve a bank. We also find that suspension times tended to be longer for banks located in smaller cities

## 5. Bank survival

In this section, we examine whether the actions taken by the bank, as well as other factors, are associated with an increased likelihood that the bank survived. A sizable fraction of the banks that suspended and reopened did not survive very long after the panic (although, of course, some survived for decades). The results of our analysis of whether the actions taken following suspension are associated with whether the bank survived until 1895 and until 1897 are reported in Table 6.

We find that writing off more bad assets is correlated with an increased likelihood of survival, which suggests that there were benefits to addressing balance sheet issues. A one standard deviation increase in this measure would have increased the likelihood of survival by around 6 percentage points in 1897. The impact has the same sign in 1895, though the size of the estimated effect is a little smaller and not statistically significant.

Also suggesting that there were benefits of strengthening the balance sheet, we find banks that injected additional capital were also more likely to survive. Doing so increased the likelihood of survival by 29 percentage points relative to a bank that did not inject additional capital. However, the direction of causality is not certain here. Bank owners may have only been willing to risk injecting additional equity in banks

**Table 6**  
Factors affecting survival (marginal effects)

| Dependent variable: Bank still exists       | 1895               | 1897               |
|---|--------------------|--------------------|
| Depositor agreement                         | -0.07<br>(0.07)    | -0.07<br>(0.08)    |
| Capital injection                           | 0.18<br>(0.12)     | 0.29*<br>(0.16)    |
| Write downs                                 | 0.08<br>(0.09)     | 0.16*<br>(0.09)    |
| Change president                            | -0.14<br>(0.09)    | -0.01<br>(0.08)    |
| Change cashier                              | -0.21***<br>(0.07) | -0.12*<br>(0.08)   |
| Suspension length (days)                    | -0.01<br>(0.01)    | -0.002*<br>(0.001) |
| Estimated examiner losses (post-suspension) | -1.12***<br>(0.42) | -1.35***<br>(0.53) |
| OREO (post-suspension)                      | -1.22*<br>(0.76)   | -1.40<br>(0.91)    |
| Individual deposits/ liabilities            | 0.60***<br>(0.35)  | 0.43<br>(0.33)     |
| Cash and due from banks to liabilities      | -0.23<br>(0.44)    | -0.37<br>(0.53)    |
| Log assets                                  | 0.03<br>(0.06)     | 0.09<br>(0.06)     |
| Ownership by bank officers                  | -0.40**<br>(0.17)  | -0.27<br>(0.17)    |
| Banking sector concentration                | 0.50***<br>(0.20)  | 0.27<br>(0.17)     |
| Log city population                         | 0.04<br>(0.05)     | -0.02<br>(0.05)    |
| Reserve city                                | 0.06<br>(0.13)     | -0.16<br>(0.14)    |
| A bank closed permanently in the town       | -0.20**<br>(0.10)  | -0.09<br>(0.11)    |
| Observations                                | 96                 | 96                 |
| LR Chi <sup>2</sup>                         | 57.9               | 58.1               |
| Pseudo-R <sup>2</sup>                       | 0.54               | 0.46               |

Note. Standard errors in parentheses. The symbols \*\*\*, \*\*, and \* indicate significance at the 1, 5, and 10 percent levels respectively. Balance sheet variables are measured pre-suspension unless noted.

that they were confident would succeed. We explore this issue more in Section 7.

Changing the cashier is strongly negatively associated with survival until 1895, and moderately so in 1897. This finding suggests that there are challenges associated with replacing the person in charge of the banks' operations in the challenging environment in which the banks were resuming business. As noted above, however, the condition of the bank was strongly related to whether or not there was turnover in the cashier. While we include asset quality measures in the regression as controls, it is possible that there are non-linear effects not fully captured by the controls.

Given this potential endogeneity problem, to further analyze the relationship between turnover of the cashier and bank survival, we compare matched pairs of banks that were quite similar in credit quality but where one bank had a change in cashier and the other did not. When constructing the pairs, we match each bank that had a change in cashier to the bank where the cashier did not change that had the closest match in terms of the ratio of estimated losses to assets following the panic subject to the constraint that the cashiers of the banks must either be both criticized by the examiners or both free of criticism. Other than two pairs at the upper tail of the distribution, the loss-to-assets ratios differed by less than 0.3 percentage points. We arrive at 23 pairs of banks. For these pairs, we find that 21 banks (88%) that retained their cashier survived to 1895 while only 16 banks (66%) that did not retain their cashier survived that long. This finding reinforces the strong association between turnover in the cashier and closure and discounts the importance of the concern that the observed effect of termination simply reflected greater unobserved loss severity. Terminating a cashier apparently produced disruption that harmed the prospects of a bank.

We do not find strong evidence that either depositor agreements or changing the president was associated with differential rates of survival.

Control variables associated with the condition of the bank clearly mattered for survival and were of strong economic importance. Our measures of the bank's balance sheet condition—the post-panic ratio of OREO to assets and post-panic ratio of examiner estimated losses to assets—have the expected signs and one or both are statistically significant. A one standard deviation increase in the estimated losses would have decreased the likelihood that the bank survived till 1895 by 8 percentage points. Similarly, a one-standard deviation increase in the ratio of OREO to assets would have decreased that likelihood of survival by 5 percentage points. Banks that suspended for longer periods of time were less likely to survive after reopening, although this effect is only statistically significant for survival through 1897.

Banks funded to a greater extent with individual deposits were more likely to survive. The effect is economically large for survival to both 1895 and 1897, but only statistically significant in the first case. We find that banks in counties with more concentrated banking sectors were more likely to survive. Monopoly power may have enabled the banks to obtain profits sufficient to recover. Alternatively, it may simply have been the case the residents had less choice regarding banks and so were unable to move to a different one.

## 6. Deposit retention (conditional on survival)

Here we consider whether the actions available to bank owners are associated with greater deposit retention, conditional on the bank

surviving to a particular year.<sup>15</sup> We look at deposit retention in 1894, 1895, and 1897. In general, there is strong consistency between items that supported survival (analyzed in Section 5) and that promoted deposit retention (analyzed here).

### 6.1. Baseline results

Our baseline results are in Table 7. We find that use of deposit agreements is associated with having a higher level of deposits in 1894

**Table 7**

Deposit retention conditional on survival Dependent variable: Ratio of deposits of individuals in subsequent years to the deposits of individuals from the 1892 call report (in percentage points)

|   | 1894/<br>1892     | 1895/<br>1892     | 1897/<br>1892    |
|---|-------------------|-------------------|------------------|
| Depositor agreement                         | 9.1**<br>(4.1)    | 11.3**<br>(5.8)   | 12.2<br>(9.4)    |
| Capital injection                           | -10.6*<br>(5.9)   | -7.5<br>(8.5)     | -10.7<br>(14.2)  |
| Write downs                                 | -4.5<br>(5.5)     | -11.7<br>(7.7)    | -8.2<br>(12.3)   |
| Change president                            | -2.3<br>(4.8)     | -2.6<br>(7.4)     | 12.8<br>(12.0)   |
| Change cashier                              | 0.9<br>(4.5)      | 4.2<br>(6.5)      | 18.0*<br>(10.2)  |
| Suspension length (days)                    | -0.09**<br>(0.05) | -0.13*<br>(0.07)  | -0.41*<br>(0.22) |
| Estimated examiner losses (post-suspension) | -144***<br>(36)   | -91.5**<br>(76.5) | 9.3<br>(99.9)    |
| OREO (post-suspension)                      | -88.2<br>(54.6)   | -221**<br>(84)    | -335**<br>(148)  |
| Individual deposits/ liabilities            | 35.6<br>(20.5)    | 16.7<br>(27.4)    | -4.5<br>(46.9)   |
| Cash and due from banks to liabilities      | -35.4<br>(27.7)   | -33.7<br>(46.4)   | -38.1<br>(71.0)  |
| Log assets                                  | 4.6<br>(3.8)      | 0.5<br>(5.7)      | -8.0<br>(9.7)    |
| Ownership by bank officers                  | -7.6<br>(10.7)    | 2.6<br>(14.7)     | 30.6<br>(29.2)   |
| Banking sector concentration                | 20.1**<br>(9.5)   | 34.5<br>(15.1)    | 18.4<br>(24.7)   |
| Log city population                         | -0.5<br>(2.6)     | 1.1<br>(3.7)      | 1.2<br>(6.0)     |
| Reserve city                                | 5.3<br>(9.8)      | 6.3<br>(13.3)     | -16.1<br>(24.6)  |
| A bank closed permanently in the town       | 14.2**<br>(5.7)   | 27.2***<br>(7.9)  | 35.2**<br>(14.5) |
| Constant                                    | -13.0             | 31.2              | 166              |
| Observations                                | 79                | 69                | 56               |
| F-statistic                                 | 4.0               | 2.5               | 1.4              |
| Adjusted R <sup>2</sup>                     | 0.38              | 0.26              | 0.11             |

Note. Standard errors in parentheses. The symbols \*\*\*, \*\*, and \* indicate significance at the 1, 5, and 10 percent levels respectively. Balance sheet variables are measured pre-suspension unless noted.

<sup>15</sup> Suspending was clearly detrimental to local confidence in the institution. Comparing deposits in 1892 to deposits in 1895 for banks that suspended to banks in the same town that remained open throughout the panic, we find that this ratio was, on average, 40 percentage points lower for banks that suspended. It is likely that there was some shift in deposits from banks that suspended to banks that remained open, which would accentuate this difference. We tried including the ratio of deposits in the relevant year relative to deposits in 1892 at banks that remained open in the same town as banks that suspended as a control in the regressions. The coefficient on this ratio is positive, but the estimate is not very precise and is not statistically significant. This variable is also not available in many towns, as the suspended bank was the only national bank in the town, which diminishes the sample size. Hence, we do not include it in the results reported here.

and 1895 relative to the level in 1892; in particular, this ratio was about 10 percentage points higher for banks in which an agreement was in place than for banks where an agreement was not in place.<sup>16</sup> As the typical deposit retention ratio in 1895 was 68%, a 10 percentage-point lift was quite meaningful. The positive association appears to have dissipated somewhat by 1897; however, the coefficient remains positive, which indicates that the collective conversion of demand deposits into time deposits did not result in significant long-term damage to confidence in the bank, at least over and above any loss in confidence associated with suspension.

Surprisingly we find that banks that increased their capital had somewhat lower deposit retention than other banks. This association appears to be driven in part by the use of the additional capital by some banks to write-off bad loans rather than to provide a permanent boost to equity. If we look at the size of the capital injection that stayed on the books relative to net worth (after subtracting any write downs), we find a positive association between that measure and deposit retention. These results together suggest that, all else equal, only fairly large increases in capital – above and beyond what was needed to support write downs – were associated with meaningfully larger deposit retention.

We do not find any direct association between deposit retention and the write downs of losses; however, as noted above, such write downs may not have been observed by depositors. In addition, the results in Table 7 do not indicate any impact on deposit retention from changing the president while turnover in the cashier mattered only for the specification involving 1897 deposits. However, in the extensions reported below, we do find that a change in the President mattered, but that effect depended on the quality of the preexisting management.

The control variables generally have the expected relationships to deposit retention. Banks that were suspended for longer tended to have lower levels of deposits relative to deposit balances in 1892. Such a result is consistent with the idea that quicker action promotes greater confidence, as noted by White and Yorulmazer (2014), but in our case, it is not clear whether it was the faster reopening itself that promoted confidence or the challenges retaining depositors is what delayed the reopening of the bank.

Our two primary measures of asset quality are strongly linked with retention of individual deposits. Banks for which the examiner estimated higher prospective losses tended to retain fewer deposits. Banks that reported higher levels of OREO following the crisis also tended to retain fewer individual deposits relative to deposits in 1892 during the years following the panic; a one standard deviation increase in the ratio of OREO to assets following the crisis is associated with a roughly 10 percentage points lower level of deposits in 1895 relative to deposits in 1892. These results point to the importance of the fundamental condition of the bank in determining depositor behavior.

Locational factors also mattered. Banks in counties with more concentrated banking sectors tended to retain more deposits; this again suggests that monopoly power may have benefitted some institutions in the aftermath of the panic. We further find that banks located in towns in which other banks failed tended to have more deposits relative to deposit levels in 1892; that result may indicate that surviving banks were recipients of the deposits that formerly had been in the now closed institutions.

### 6.2. Extensions

This section reports results of extending our baseline analysis in three ways: looking at how waivers of deposit agreements affected deposit retention; how interbank deposits were affected by bank responses; and how quality of management affected the response to manager turnover.

<sup>16</sup> We do not believe that the coefficient for 1894 is affected by the agreements themselves as the vast majority of deposits would no longer have been covered. All deposit agreements would have expired by 1895.



### 6.2.1. Waivers of deposit agreements

We first look at whether, among banks that survived to 1895, deposit retention differed between the 8 banks that waived the deposit agreements after imposing them initially and the 31 banks that maintained them. Limiting the sample to these 39 banks, we regress the ratio of deposits in 1895 relative to 1892 on whether the deposit agreement was waived. Given the smaller number of observations, we limit explanatory variables to the policy actions, measures of asset quality, and the two other control variables that a forward selection model indicates have the most explanatory power. The results are reported in Table 8.

We find that banks that waived the deposit agreement had higher deposit levels in 1895 relative to 1892 than banks that did not waive the deposit agreements. This result helps point to a potential reason why the agreements were beneficial. The fact that banks could waive the agreements and have retention rates at least as high as banks that maintained them implies that the benefit from depositor agreements accrued in the very short run and is consistent with the idea that depositor agreements helped solve the coordination issues related to possible depositor runs in the immediate aftermath of reopening the bank. The net positive impact of waiving the agreements is also consistent with some depositor resentment of the agreements that likely was mitigated by their quick removal.

### 6.2.2. Interbank deposits

The second extension of our baseline analysis is to look at the retention of interbank deposits. Banks maintained deposits at other banks for a variety of reasons, but importantly for payment clearing purposes, especially in cities outside of the major financial centers (see James 1978, Calomiris and Carlson 2017). Such balances were unlikely to be left at banks in which the depositing bank did not have confidence

**Table 8**

Deposit retention conditional on survival and use of deposit agreements  
Dependent variable: Ratio of deposits of individuals in 1895 to the deposits of individuals from the 1892 call report (in percentage points)

|   | 1895/1892         |
|---|-------------------|
| Waived depositor agreement                  | 18.6**<br>(9.0)   |
| Capital injection                           | -5.7<br>(9.8)     |
| Write downs                                 | 1.9<br>(9.8)      |
| Change president                            | -22.4**<br>(8.5)  |
| Change cashier                              | 7.5<br>(7.7)      |
| Estimated examiner losses (post-suspension) | -207**<br>(103)   |
| OREO (post-suspension)                      | -298***<br>(82)   |
| Banking sector concentration                | 44.5***<br>(15.6) |
| A bank closed permanently in the town       | 34.0***<br>(8.7)  |
| Observations                                | 39                |
| F-statistic                                 | 5.4               |
| Adjusted R <sup>2</sup>                     | 0.51              |

Note. Standard errors in parentheses. The symbols \*\*\*, \*\*, and \* indicate significance at the 1, 5, and 10 percent levels respectively. Balance sheet variables are measured pre-suspension unless noted.

in their continued operation. Hence the retention of such deposits provides another indication of whether the actions of the bank owners promoted confidence in their institution.

How depositor agreements are related to the retention of interbank deposits may be of particular interest. Interbank deposits appear to have not been covered by the agreements.<sup>17</sup> In that case, interbank deposits received an improved, superior claim on the liquidity of the reopening bank because there were no limits on when they could be withdrawn.

In this robustness exercise, our outcome variable is the ratio of interbank deposits in future years relative to the level in 1892 (similar to the analysis of individual deposits). We limit the analysis to banks that had a meaningful amount of interbank deposits in 1892. In balancing that limitation against the need to have sufficient observations, we settle on requiring that banks had at least \$1,600 in interbank deposits in 1892. As above, we limit explanatory variables to the policy actions, measures of asset quality, and the two other control variables that a forward selection model indicates have the most explanatory power.<sup>18</sup>

The results are reported in Table 9. Despite the small sample and consequent imprecision of estimation, we find that deposits agreements are associated with greater retention of interbank deposits; use of agreements boosted the retention of such deposits in 1894 relative to 1892 by 35 percentage points, about one-third of a standard deviation. We also find positive effects in 1895 and 1897 but the estimates are quite imprecise as the standard deviation of the bank deposit ratios becomes very high. Nevertheless, these results further suggest that use of the depositor agreements promoted confidence in the institution being

**Table 9**

Interbank deposit retention conditional on survival  
Dependent variable: Ratio of deposits of other banks in subsequent years to the deposits of other banks from the 1892 call report (in percentage points)

|   | 1894/<br>1892    | 1895/<br>1892   | 1897/<br>1892  |
|---|------------------|-----------------|----------------|
| Depositor agreement                         | 35.7**<br>(16.8) | 139<br>(88.0)   | 134*<br>(76.7) |
| Capital injection                           | -7.9<br>(30.0)   | -175<br>(145)   | -182<br>(119)  |
| Write downs                                 | 32.9<br>(21.7)   | -26.4<br>(108)  | -40.5<br>(105) |
| Change president                            | -2.8<br>(19.5)   | 21.8<br>(110)   | 78.3<br>(94.3) |
| Change cashier                              | 23.9<br>(17.4)   | 141<br>(86.9)   | 90.3<br>(75.9) |
| Suspension length (days)                    | -0.27*<br>(0.14) | -1.14<br>(0.79) | -2.6*<br>(1.5) |
| Estimated examiner losses (post-suspension) | -48.0<br>(133)   | 449<br>(934)    | -375<br>(684)  |
| OREO (post-suspension)                      | -260<br>(342)    | -598<br>(995)   | -677<br>(907)  |
| Banking sector concentration                | 50.2<br>(33.7)   | -9.9<br>(85)    | -288<br>(182)  |
| Constant                                    | -8.7             | 96.8            | 329            |
| Observations                                | 49               | 39              | 32             |
| F-statistic                                 | 1.6              | 0.8             | 1.1            |
| Adjusted R <sup>2</sup>                     | 0.10             | 0.01            | 0.03           |

Note. Standard errors in parentheses. The symbols \*\*\*, \*\*, and \* indicate significance at the 1, 5, and 10 percent levels respectively. Balance sheet variables are measured pre-suspension unless noted.

<sup>17</sup> We determine that interbank deposits were not covered in the deposit agreements from comparing several examiner statements about the total amounts and proportions of deposits covered by the agreements to the values reported on the most recent call report or examiner report. However, we have not found a definitive statement that they were excluded.

<sup>18</sup> For consistency, we estimate the forward selection model using the 1894/1892 interbank deposit ratio and keep that specification for other years.

reopened.

For the control variables, we find that banks that were suspended longer retained fewer interbank deposits. Our measures of asset quality are negatively correlated with interbank deposit retention, although neither is statistically significant.

### 6.2.3. Role of manager quality

Finally, we extend our baseline results by examining the interaction between manager quality and manager turnover on deposit retention. Focusing first on the president, in Table 10 (column 1), we repeat the estimation using only banks where the examiners did not report any concerns about the quality of the president of the bank at the time of the bank either ex ante or ex post. (Given the smaller number of observations, we again use a forward selection model to focus on a limited number of control variables.) For these banks, we find that changing the management is associated with lower deposit retention. Analysis of banks where the examiner did have concerns about the president is shown in column 2. For these banks, we find a near-zero association between changing the President and deposit retention. These results provide some nuance to our earlier results: Changing a good president is bad; changing a bad president is not.

A repeat of this analysis focusing on the cashier is shown in Table 11. Here, we find insignificant results regardless of whether the examiner did or did not criticize the examiner.

## 7. Role of unobserved factors

An important concern with the results above is that some underlying and unobserved factor may be driving both the decision to engage in particular actions as well as the outcomes we study. For instance, it may be that the same factors that led the bank managers to decide that raising that capital was an action worth taking may have been responsible for the bank’s survival rather than the actual capital raising itself. We have a set of detailed controls, including assessments of credit quality from

**Table 10**  
Deposit retention conditional on survival Dependent variable: Ratio of deposits of individuals in 1895 to the deposits of individuals from the 1892 call report (in percentage points)

|   | No Examiner concerns about the president | Examiner did have concerns about the president |
|---|--|--|
| Change president                            | -19.8*<br>(10.1)                         | -1.8<br>(7.8)                                  |
| Depositor agreement                         | 17.9**<br>(7.2)                          |  |
| Capital injection                           | -0.20<br>(10.4)                          |  |
| Write downs                                 | -4.6<br>(8.7)                            |  |
| Suspension length (days)                    | -0.18**<br>(0.09)                        |  |
| Estimated examiner losses (post-suspension) | -141<br>(103)                            | -5.8<br>(76.6)                                 |
| OREO (post-suspension)                      | -98.1<br>(106)                           |  |
| Log assets                                  | 7.6*<br>(4.1)                            |  |
| Banking sector concentration                |  | 54.5***<br>(19.9)                              |
| A bank closed permanently in the town       |  | 37.5***<br>(9.5)                               |
| Constant                                    | -20.2                                    | 8.4  |
| Observations                                | 46                                       | 22   |
| F-statistic                                 | 3.2                                      | 5.4  |
| Adjusted R <sup>2</sup>                     | 0.28                                     | 0.45   |

Note. Standard errors in parentheses. The symbols \*\*\*, \*\*, and \* indicate significance at the 1, 5, and 10 percent levels respectively. Balance sheet variables are measured pre-suspension unless noted.

**Table 11**

Deposit retention conditional on survival Dependent variable: Ratio of deposits of individuals in 1895 to the deposits of individuals from the 1892 call report (in percentage points)

|   | No Examiner concerns about the cashier | Examiner did have concerns about the cashier |
|---|--|--|
| Change cashier                              | 4.8<br>(8.3)                           | -14.1<br>(10.0)                              |
| Depositor agreement                         | 12.4*<br>(7.2)                         |  |
| Capital injection                           | -2.4<br>(11.0)                         |  |
| Write downs                                 | -4.2<br>(8.9)                          |  |
| Suspension length (days)                    | -0.32**<br>(0.12)                      |  |
| Estimated examiner losses (post-suspension) | -41.3<br>(79.0)                        | 15.8<br>(142)                                |
| OREO (post-suspension)                      | -110.7<br>(94.5)                       |  |
| Log assets                                  | 5.2<br>(4.3)                           |  |
| Banking sector concentration                |  | 9.3<br>(27.2)                                |
| A bank closed permanently in the town       |  | 46.0***<br>(14.6)                            |
| Constant                                    | -6.4                                   | 48.7   |
| Observations                                | 49                                     | 19   |
| F-statistic                                 | 1.8                                    | 3.7  |
| Adjusted R <sup>2</sup>                     | 0.12                                   | 0.38   |

Note. Standard errors in parentheses. The symbols \*\*\*, \*\*, and \* indicate significance at the 1, 5, and 10 percent levels respectively. Balance sheet variables are measured pre-suspension unless noted.

bank examiners with access to private information as well as information about the governance of the bank which give some comfort that we are able to account for many confounding factors. And in the case of cashier termination, we used a matched sample to further investigate selection bias, and found that our regression results about cashier termination were robust. However, this section provides a further and more formal investigation of the role that unobserved factors might be playing in our results.

The method we employ to examine whether unobserved differences are likely to be a serious concern was developed by [Altonji, Elder, and Taber \(2005\)](#) and enhanced by [Oster \(2019\)](#). These authors argue that, if the unobservable factors are positively correlated with the observed factors, then looking at how the coefficient of interest changes as the observable controls are added provides insight into how the coefficients would likely change if the unobserved factors were able to be included. In our case, that means that if the coefficients on the actions taken to promote confidence tend to increase in magnitude and become more significant when controls for condition and the local environment are added, then they are likely to become stronger if the unobserved factors were able to be included. And conversely, there would be more concern about unobserved factors if the coefficients tend to diminish in size as more observables are added.

Our implementation of this analysis is shown in Table 12. We consider the effects of the actions taken on survival until 1897 in the top panel of the table and on deposit retention in 1895 in the bottom panel of the table. The implementation of the analysis approach in [Oster \(2019\)](#) considers only one variable that might be affected by unobservables at a time. We follow that approach and consider each action taken by the owners individually. The implementation approach also requires the regressions to be estimated using ordinary least squares rather than a probit regression.

Each panel of the table has three lines. The first line shows coefficients resulting from regressing outcome variables on the actions taken when no controls are included. The second line shows the

**Table 12**

Indicators of the importance of unobserved factors Dependent variable: Survival to 1897 (estimated using OLS)

| Intervention   | Depositor agreements | Change president | Change cashier     | Capital injection | Write downs      |
|--|----------------------|------------------|--------------------|-------------------|------------------|
| Coefficient without observable controls  | -0.11<br>(0.10)      | -0.07<br>(0.11)  | -0.30***<br>(0.10) | 0.32**<br>(0.15)  | 0.17<br>(0.13)   |
| Coefficient with observable controls   | -0.07<br>(0.09)      | 0.08<br>(0.10)   | -0.14<br>(0.09)    | 0.24*<br>(0.13)   | 0.21**<br>(0.11) |
| Relative importance of unobservables to observables needed to explain away result ( $\delta$ ) | 0.8                  | 0.3              | 0.4                | 1.4               | 12.5             |
| Observations   | 96                   | 96               | 96                 | 96                | 96               |
| Dependent variable: Ratio of deposits 1895 to 1892 (estimated using OLS)                       |                      |                  |                    |                   |                  |
| Intervention   | Depositor agreements | Change president | Change cashier     | Capital injection | Write downs      |
| Coefficient without observable controls  | 8.0<br>(6.3)         | -13.2*<br>(6.6)  | -8.4<br>(6.4)      | -8.0<br>(8.5)     | -10.8<br>(8.0)   |
| Coefficient with observable controls   | 9.9*<br>(5.8)        | -7.0<br>(6.8)    | 0.6<br>(6.5)       | -8.6<br>(8.1)     | -10.9<br>(7.6)   |
| Relative importance of unobservables to observables needed to explain away result ( $\delta$ ) | 6.8                  | 0.4              | 0.1                | 5.0               | 3.2              |
| Observations   | 69                   | 69               | 69                 | 69                | 69               |

Note. Standard errors in parentheses. The symbols \*\*\*, \*\*, and \* indicate significance at the 1, 5, and 10 percent levels respectively.

coefficients when a full suite of observable control variables is included. The third line shows the relative importance that unobservables would need to have relative to observables in order for those unobservable factors to explain away the results. [Altonji et al. \(2005\)](#) and [Oster \(2019\)](#) both argue that it is unlikely that the role unobservables exceeds that of observables; thus a relative importance of more than one strongly suggests that the variable would not be explained away if we were able to observe everything.

We see that some of our strongest results are robust when using this methodology. In particular the benefit of write-downs in promoting survival and the role of depositor agreements in supporting deposit retention are both quite unlikely to be explained away by unobservables. In contrast, the role of changing the president on deposits is significant by itself in 1895, but the effect diminishes notably in magnitude when controls are added; unobservable factors do not appear to need to be very large for the relative importance of this factor to be completely explained away. The role of capital injections on survival is a middle case where the coefficient diminishes when observables are included, but unobservables would still need to be quite important for the effect to be fully explained away. We also see that, were we able to observe some item that are currently unobservable, those items are unlikely to explain away the effect of capital injections on deposit retention.

This methodological approach for assessing the possible importance of unobservables and their role in shaping actions taken by bank owners does require assuming that those unobservables be correlated with observable controls. It is inherently impossible to verify that assumption and that caveat should be kept in mind when considering these results. Nonetheless, it is not an implausible assumption, and the strength of these results provides reassurance about the robustness of our findings.

## 8. Conclusion

Enhancing the ability of bank regulators to restructure a bank during a resolution was a key regulatory reform following the financial crisis of 2007-2009 that was intended to reduce “too-big-to-fail” concerns, minimize the need to public sector bail-outs, and promote financial stability. However, there has been very little research into the elements that make such restructurings successful in part because of a dearth of episodes to study. This paper offers new insights into this question based on the results of private responses to bank suspensions during the Panic of 1893. While this historical episode involves a sample of only about 100 banks, the setting is ideal in that there was no expectation of government support or bailouts. Hence the results provide clearer evidence about which actions mattered because they must have influenced the views of the customers of the bank about the prospects of the bank rather than because they signaled that the government stood behind the bank.

Most of the actions available to, and used by, the bank owners are associated with how the bank fared over the next few years. For instance, banks that added capital and/or wrote down more bad assets as part of the process of reopening, which would have supported the health of the bank, had higher survival rates than other banks. Banks that reported larger amounts of bad assets still on their books following the panic tended to have lower deposit retention than other banks.

We also find that banks that reached agreements with depositors to convert demand deposit into time deposits tended to have higher deposit retention rates over time. This association holds even if those agreements were waived by the bank not too long after the reopening occurred. The comments from the examiners as they were preparing for the reopening of the banks express concerns about coordination issues upon reopening with depositors testing the institution. Our analytical results and the contemporary commentary are supportive of the idea that the depositor agreements were important in solving those coordination issues.

Management changes are also associated with outcomes with some of these correlations suggesting that turnover may have been harmful to the bank’s future success. Holding the officials responsible for a banks’ poor condition arguably is a necessary part of any resolution strategy. However, our results suggest that one should be cautious about removing officials that have key knowledge of the workings of the bank or that are important for the bank’s relationships. Removing these individuals in the midst of a stress event may also create significant challenges.

The initial condition of the banks mattered as well. Banks that were healthier on the eve of the panic tended to do better. Banks that used more “core” deposits—those of individuals—rather than wholesale funds also did better. Stronger corporate governance was also associated with better outcomes.

There are clearly considerable differences between the banking system of 1893 and the banking system of today. Nevertheless the quantitative evidence we provide and the narratives that accompany these results suggest straightforward and intuitive reasons why various actions might, or might not, support confidence in banks as they reopen. Hence the results provide insights into what might be valuable for modern resolution plans to incorporate, and also provide support for many aspects of the plans that have already been developed, so that the needs for official sector backstops can be reduced.

### Credit author statement Calomiris Carlson

Nothing has changed with respect to our credit author statement.  
Charles Calomiris  
Mark Carlson

### Declaration of Competing Interest

None.

**Data availability**

Data will be made available on request.

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