Liquidity Requirements, Free-Riding, and the Implications for Financial Stability Evidence from the early 1900s

Mark Carlson and Matthew Jaremski

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Maintaining sufficient liquidity in the financial system is vital for financial stability. However, since returns on liquid assets are typically low, individual financial institutions may seek to hold fewer such assets, especially if they believe they can rely on other institutions for liquidity support. We examine whether state banks in the early 1900s took advantage of relatively high cash balances maintained by national banks, due to reserve requirements, to hold less cash themselves. We find that state banks did hold less cash in places where both state legal requirements were lower and national banks were more prevalent.

February 6, 2018

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1. Introduction

The interdependence of financial institutions makes financial stability a common resource and creates considerable potential for spillovers (Hanson, Kashyap, and Stein 2011, Cecchetti and Tucker 2015). All institutions benefit when all other institutions are healthy and, conversely, troubles at some institutions could spread to create troubles at other institutions (Allen and Gale 2007). Financial stability is also potentially subject to free-rider problems (Kahn and Wagner 2017). Institutions may not internalize the impacts they have on each other and so may maintain smaller solvency or liquidity buffers to protect themselves against stresses than is optimal from a systemic perspective. This concern has long been recognized and efforts to address it have underpinned requirements ranging from the minimum reserve requirements set by the New York Clearinghouse for member banks in the 1850s (Coe 1873) to the minimum capital requirements for global banks agreed to as part of the Basel capital standards (Basel Committee on Banking Supervision 2011).

Concerns about free-riding were particularly prominent in the United States' National Banking Era (1863-1913) in which there was a dual banking system where some banks were chartered by the national government through the Office of the Comptroller of the Currency (called national banks) and some banks were chartered by state authorities (called state banks). White (1983) documents how state and national banking authorities lowered capital requirements to entice banks to adopt a state versus national charter. As equity capital is important in promoting bank health and providing a buffer such that loan losses do not cause losses to bank liability holders—including other banks—allowing entry by banks with less capital might have reduced the stability of the banking system (Wheelock and Wilson 1995).

In this paper, we examine another possible instance in which regulatory differences might have led to free riding, again with potential implications for financial stability. Reserve requirements were a prominent regulatory tool in the National Banking Era. These requirements mandated that banks hold a certain amount of cash and other liquid assets against certain liabilities in order to ensure that they had sufficient resources to meet deposit withdrawals under most circumstances (Comptroller 1863). National banks faced a relatively strict set of requirements regarding the cash that they had to hold in proportion to their deposit base.[1] State

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[1] At the start of the National Banking Era, national banks also had to hold a reserve against their note circulation. By the time period analyzed in this paper, that part of the requirement had been dropped.

banks also frequently faced cash reserve requirements (at least by 1900), though the severity of these rules varied. In some places, they were at least as tight as those for national banks while in other places they were notably easier. The question we address in this paper is whether state banks took advantage of lower cash requirements relative to those imposed on national banks to hold less cash.

Banks need a sufficient supply of liquid assets to operate smoothly and meet withdrawals; therefore, banks would hold some cash even where cash reserve requirements were minimal or non-existent. However, state banks subject to lower requirements might have held less cash if they were confident that other nearby banks (i.e. national banks) held a fair amount of cash due to higher cash requirements which the state banks might be able to access if their own supply ran low. To examine whether state banks were free riding in this way, we test whether cash holdings were lower for state banks in cities located in states where the cash reserve requirements were lower *and* in which national banks held substantial cash reserves.

We conduct our tests regarding cash holdings using individual bank-level data from 1905 through 1909 for 25 states. The time period is chosen for several reasons. First, detailed information on reserve requirements for all states was included in the report of the National Monetary Commission in 1910. Second, many states had begun reporting balance sheet information by this time allowing us to control for other bank-level factors that might impact cash holdings. Third, the period includes the Panic of 1907, one of the most severe panics of the National Banking Era, which allows us to examine free-riding behavior around the time of a financial shock. We stop the analysis in 1909, as there was a change in the monetary regime at this time (caused first by the passage of the Aldrich-Vreeland Act in 1908 and then the passage of the Federal Reserve Act in 1913).

Consistent with contemporary complaints by national banks, we find evidence of free riding by state banks. State banks facing lower cash reserve requirements and in close proximity to more national banks tended to hold less cash. Our estimation results indicate that a state bank in a state with easier requirements that was located in a city with an average number of national banks held almost one percentage point less cash than a state bank in a similar city in a state with reserve requirements as tight as or tighter than those imposed on national banks. The result is consistent for a pooled regression of all years as well as for individual year cross-sections.

The paper proceeds as follows. Section 2 discusses the regulatory environment in the early 1900s, focusing in particular on reserve requirements. Section 3 discusses the data. Section 4 presents our analysis of the cash holdings of state banks and whether their cash holdings were affected by differences in requirements and the presence of national banks. Section 5 concludes.

2. The Regulatory Environment

The banking environment in the National Banking Era can most charitably be described as disjointed. One group of banks were the national banks chartered by federal agency and subject to a uniform set of standards across all states that are described in the Annual Reports of the Comptroller of the Currency. Existing side-by-side with the national banks were state-chartered banks which were regulated by their respective states and subject to rules that varied across the country. Unlike national banks, getting information on the state bank rules is not always straightforward. We use the set of rules compiled by Welldon for the National Monetary Commission (1910).

As noted earlier, some regulations between state and national banks differed notably. One such regulation, which has been discussed relatively extensively in the previous literature, is capital requirements. For instance, as of 1909, the minimum capital requirement for establishing a national bank in towns where the population did not exceed 3,000 was $25,000; while for some states a bank could be started in a similarly sized town with a minimum capital of only $10,000.

While minimum capital requirements also varied across state and national banks, they were quantity requirements rather than ratio requirements and thus served mostly as an entry barrier rather than a barrier to risk-taking. To understand how differences in regulations may have affected risk taking behavior, the regulation that we focus on in this paper is reserve requirements. The National Banking Acts of 1863 and 1864 established reserve requirements for national banks. In the period we look at, national banks in central reserve cities (i.e., New York City, Chicago, and St Louis) were required to hold 25 percent reserve in vault cash. National banks in reserve cities (e.g., large regional centers) had to hold 25 percent reserve but only half that amount needed to be held as vault cash; the rest could be on deposit in a central reserve city national bank. The remaining "country" national banks only had to maintain a 15 percent reserve of which two-fifths needed to be held on site, while the remainder could be held on deposit at a

national bank in a central reserve city or reserve city. In this paper, we focus on the portion of the reserve that needed to consist of cash.

State banks were usually, though not always, subject to a cash reserve requirement. (State banks might also have had total reserve requirements that allowed for some portion to consist of non-cash assets. As with the national banks, we focus on the portion of the requirement that needed to consist of cash.) Given our interest in whether state banks were free-riding on the cash reserves of national banks, it is helpful to classify state requirements relative to the national requirements to determine whether the state banks could have held less cash than national banks if they had desired. The state regulations and whether we classify those rules as easier, tighter, or the same as for national banks appear in Table 1 (states not included in our sample are shown in italics). In most cases—11 of the 24 states in our sample—we find that the reserve requirements imposed on the state banks were unconditionally more lenient than those imposed on national banks. The reserve requirements were the same in many states and were unconditionally tighter in a handful states. In several states, the differences between state laws and national laws depended either on the size of the city in which the bank was located or on the distribution of deposits held by banks. As an example of the former, the reserve requirement in Kansas was 5 percent of deposits held in cash for locations under 5,000 people yet 6.25 percent of deposits held in cash for more populated locations. An example of latter, the reserve requirement in Texas was 25 percent of demand deposits with at least two-fifths held as cash (i.e. 10 percent of demand deposits) yet there was no reserve requirement on time deposits. In the former case, we account for population in the analysis while in the latter case, we treat them as having the same reserve requirements as national banks. (The results are similar if we instead omit these states.)

3. Data

Given that the information on state laws was published in 1910 (but collected in the previous years), we use bank data that come from 1905 to 1909. While the Comptroller of the Currency's *Annual Report* contains the annual balance sheet of every national bank in operation each year, some states did not report balance sheet information on their banks until after 1910, and those that did report data often only did so every other year.[2] It is not until the year 1905 that

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[2] The reporting dates across states are not uniform. We correct for this in the model by controlling for the reporting dates.

enough states with enough different reserve requirements provided data sufficient to conduct our analysis. We digitized the data of the 24 states that published data starting in 1905 or earlier, which are listed in standard text in Table 1.[3]

We stop the analysis in 1909 shortly after the passage of the Aldrich-Vreeland Act in 1908. This Act allowed the formation of local national currency associations that would issue liquidity to member banks during panics and appears to have changed the liquidity dynamics of the financial system. Bernstein, Hughson, and Weidenmier (2010) find that interest rate and equity market volatility declined following this Act; they attribute this decline in volatility to a decline in liquidity risk in conjunction with the new monetary regime. Such a reduction in liquidity risk would likely have changed the behavior of banks and in particular their cash holdings.

To create a consistent measure of cash holdings across the various states, we aggregate unique balance sheet items listed in a few state reports into more common items. For example, cash in vault, gold coin, silver coin, minor coins, checks, and reserves are merged into a single cash variable measure. We also avoid extreme outliers and potential data errors by dropping banks that had ratios of cash to assets below 2 percent. The results are generally robust to modest adjustments in this cutoff.

4. Analysis of cash holdings at state banks

There was a profitability incentive to minimize cash holdings. The interest rates that banks earned on their loans were reported to have averaged around 6.5 percent in the 1890s (Breckenridge 1898; James 1974). The return on quite safe and liquid assets—balances at correspondent banks in New York City—typically earned rates of around 2 percent. Cash holdings, by contrast, earned no interest. Thus, bank shareholders had a financial incentive to, at the margin, make more loans and economize on cash holdings.

In addition to meeting cash reserve requirements, banks had to maintain sufficient cash to meet deposit withdrawals when they occurred. However, state banks may have believed that they could have obtained cash when needed from nearby banks. James, Weiman, and McAndrews (2013) note that large cities had interbank markets for cash and it is quite possible that

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[3] To include the largest number of locations and banks, we do not restrict ourselves to a balanced panel. Because some states did not report balance sheet information in one of the years, a balanced panel would restrict the sample to only 16 states. The results for the balanced panel display the same pattern but with reduced statistical precision.

arrangements for banks to obtain cash from each other existed in smaller towns as well. As national banks tended to be required to have more cash on hand, we expect that state banks would have been better positioned to take advantage of these markets to reduce cash holdings.

In addition, state banks may have believed that even in a crisis, they would have been able to obtain cash from national banks as the national banks would have felt it was in their own interest to keep the state banks afloat because the closure of a state bank might trigger a more widespread run. The contemporary financial press reported that such a dynamic was in place prior to the Panic of 1893 (*Banker's Magazine*, April 1894, p. 723) stating: "It is believed in times of stringency the National institutions must come to the rescue for the other [state banks] in order to protect themselves. This feeling is shared quite generally by bankers." Reinforcing this idea were statements by the Comptroller of the Currency, the chief regulator of the national banks, that reserve requirements for national banks would be relaxed in times of crisis which would have made the cash holdings of national banks even more accessible to state banks (Carlson 2015).

Based on these incentives, our hypothesis is that state banks will hold lower cash balances where (1) they allowed to by law and (2) where cash balances at nearby national banks were relatively ample. Both conditions matter for this hypothesis. The regulatory requirement is clearly important. In states where the reserve requirements were relatively low, banks may have held less cash, while in states where the reserve requirements were the same as or higher for the national banks, we would not expect much difference. We account for state bank requirements using a dummy variable for whether a state had relatively looser requirements. The second condition concerns the cash holdings of nearby national banks. For the cash balances of the national banks to have been sufficient to affect the behavior of the state banks, there would have to be nearby national banks of meaningful size and they would have to have sizable cash holdings.[4] We measure the importance of the local national banks using the share of total bank assets in the city that consisted of the assets of national banks and our measure of the cash holdings of national banks is the total cash of all national banks in the area divided by the total assets of those national banks (one could interpret this measure as the average cash-to-asset ratio weighted by bank size).

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[4] If the national banks were much smaller than the state banks, then we would not expect that the state banks would hold less cash. (If there were four banks in a town—three large state banks and one small national bank then we would not expect that those state banks would be much affected by the cash holdings of the national bank.)

Various other bank characteristics might influence cash holdings. Larger banks may benefit from having more depositors and, based on the law-of-large-numbers, have smaller net day-to-day changes in deposits as deposit withdrawals would be more likely to be offset by inflows. Consequently, larger banks might need to hold less cash. The capital position of the bank could also be important with better capitalized banks needing to hold less cash (Calomiris and Wilson 2004).[5] Our measures of the capital position of the bank include both the ratio of net worth (capital paid in, surplus, and undivided profits) to assets and the ratio of surplus, and undivided profits to net worth. Surplus and undivided profits tended to reflect retained earnings and thus may reflect the quality of the bank's capital position.

Other location factors, besides the cash position of nearby banks, might also influence the cash holdings of the bank. For instance, areas with larger or more urban populations might have more transactions and thus higher liquidity needs. Areas with more manufacturing firms may have greater need for long-distance transactions so banks might hold a larger portion of their liquid assets as balances at other banks, as was found by Calomiris and Carlson (2017), rather than as cash. We also control for whether the city is a reserve city, whether the city had an active clearinghouse, and the log of the number of banks nearby. As the balance sheet reports come from different times of the year, we control for whether the report was filed in the summer months (June to August) rather than toward the end of the year.

Putting these parts together, the specification we use in our regressions is:

$$Reserves_{i,t} = a + \beta_1 NBShare_{i,t} + \beta_2 NBReserve_{i,t} + \beta_3 RRLoose_i + \beta_4 NBShare_{i,t} * NBReserve_{i,t} * RRLoose_i + \beta_5 BS_{i,t} + \beta_6 X_i + t_t + e_{i,t}, \qquad (1)$$

where $Reserves_i$ is the ratio of cash to assets of state bank i, $NBShare_{i,t}$ is the ratio of national bank assets to total assets in a location, $NBReserve_{i,t}$ is the ratio of total national bank cash to assets in a location, $RRLoose_i$ is a dummy variable that takes a value of "1" if the state bank reserve requirement was relatively looser than the national bank requirement. $BS_{i,t}$ is a vector of bank balance sheet controls including the logarithm of assets, the ratio of capital to assets, the ratio of surplus to capital, and the ratio of due to banks to deposits. X_i is a vector of city-level controls, including whether the city is a reserve city and the logarithm of the number of banks in

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[5] Similarly, Calomiris, Heider, and Horova (2012) argue that higher holding of cash may have been a way that banks demonstrated their safety. If the nearby national banks were demonstrating their safety by holding more cash, then that would likely increase the pressure on the state banks to hold more cash to demonstrate their own safety. Thus, the effect should be in the opposite direction of what we predict.

the city, and county-level Census controls from Haines (2004) including the logarithm of population, the share of the population defined living in a location of more than 2,500 people (i.e., an urban location), the logarithm of manufacturing firms. t_t is a vector of time fixed effects. $e_{i,t}$ is the robust error term. Summary statistics for the variables in the year 1906 are in Table 2. Those for other years are similar.

As an alternative, we also estimate equation (1) using as our dependent variable the ratio of cash in excess of the minimum amount the bank would need to satisfy its reserve requirement relative to assets. Not all states published detailed enough deposit data to calculate this ratio correctly, especially if the reserve requirement differed between demand and time deposits, so we are limited to a slightly smaller sample of states.

When conducting our analysis, we limit the sample to towns with neither too many nor too few banks. It is not clear that a state bank in a town in which the only other bank is a national bank would have the same opportunity to free ride as three state banks in a town with three national banks, even if the state banks accounted for the same share of assets in both cases. For instance, the interbank market for cash balances noted above would clearly be more limited in the town with only two banks. To implement our test, we posit that there must be at least four banks in the town for the free-riding effect to be observable and limit our analysis to cities with at least four banks. It is also possible that very heavily banked cities were different and required different cash balances of banks operating in them. Thus we exclude cities with 20 more banks.[6] We discuss sensitivity of our results to these cutoffs below.

We start by pooling all the years between 1905 and 1909 to test whether state banks displayed behavior consistent with free riding. Specifically, we are interested in testing whether β_4 in equation (1) is negative, which would signal that state banks in states with looser reserve requirements and in locations with sufficient national bank cash reserves chose to hold significant less cash than state banks that did not meet those conditions. As shown in Table 3, we do indeed find a strong negative coefficient on the interaction term which is consistent with our hypothesis. This finding holds regardless of whether we look at the total cash holdings or the cash holdings in excess of the required reserve. We also find that state banks tended to hold more cash in places where national banks were a larger share of the local bank population and where

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[6] By cutting off locations with 20 or more banks, we exclude 13 cities in 1906: Brooklyn, Chicago, Cincinnati, Cleveland, Columbus, Kansas City (MO), Los Angeles, New Orleans, New York City, Philadelphia, Pittsburgh, San Francisco, and St Louis. The list of cities in other years is very similar.

national banks tended to hold more cash. To illustrate the economic effects of the laws versus the cash holdings of nearby banks, we compare banks using the effects based on the coefficients and data means from the pooled sample. The coefficients from the specification using the total cash holdings indicate that a bank in a state with reserve requirements as tight as those of the national banks and with all other covariates set at the mean would be predicted to have had a cash-to - asset ratio of 5.8 percent. For comparison, a bank in a town located in a state that allowed lower reserve requirements but was the same in all other ways, would be predicted to have had a cash ratio of 5.2 percent, a noticeably lower ratio.[7]

While we find evidence of free riding for some banks, there were locations where this behavior does not seem to have occurred. In unreported results, we do not find evidence of free riding among state banks in towns of two or three banks—consistent with our expectation that a critical mass of banks needed before the free riding effect occurs or is observable. Additionally, we find no evidence of free riding in the largest cities (those with 20 or more banks).

Next we examine if there is any differential behavior over time. The Panic of 1907 was a severe financial crisis that resulted in a widespread and scramble for liquidity and the suspension of convertibility of deposits to cash by clearinghouse associations across the country and a collapse of the payment system (Sprague 1910). If state banks were free-riding before the Panic, they might have been in even more trouble during 1907. It is even possible that they changed their ways after the Panic. We, therefore, drop the year fixed effects and re-estimate equation (1) for each individual year. We conduct the analysis using total cash holdings, as that ratio is available for a larger number of states.

These results are reported in Table 4. The coefficients on the interaction term of interest (the fraction of city assets at national banks * cash holdings of national banks * easier state reserve requirement) are consistently negative and statistically significant. There is not too much variation over time. We observe perhaps slightly less free-riding immediately after the Panic of 1907, with the estimated effect of being near national banks with more cash the smallest in 1908. But any change in behavior appears to have been temporary as the estimated effect in 1909 is in

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[7] Across all state banks in the pooled sample, the average cash ratio was 5.7 percent with a standard deviation of 3.8 percentage points.

line with the estimated effect in 1905 and 1906. The incentive to free-ride seems to have been quite strong.[8]

5. Conclusion

Our paper examines the potential for some financial institutions to free-ride on the liquidity of the financial institutions. Holding cash can be costly in terms of opportunities foregone so banks may have preferred to minimize cash on their balance sheet. We find that state banks that were subject to lower cash reserve requirements and that were located near national banks where cash requirements were higher, tended to hold less cash. It is possible that that this reliance by state banks on cash holdings of national banks increased the severity of liquidity pressure during the panic of 1907. Such a dynamic was described in New York City where dependence by trust companies on the liquidity of New York Clearinghouse members increased the stresses on the clearinghouse member banks (Sprague 1908).

The findings in this paper offer some lessons for financial stability today. In the wake of the recent financial crisis, there has been renewed interest and emphasis on liquidity requirements. For instance, large and internationally active commercial banks are now subject to a liquidity coverage ratio (LCR) that stipulates that these banks must hold particular quantities of high-quality liquid assets in proportion to particular liabilities (See Board of Governors of the Federal Reserve, 2014). Prime money market funds are also subject to new liquidity rules (Securities and Exchange Commission 2016). However our findings highlight a concern about having some parts of the financial system covered by liquidity requirements while other parts of the system are not covered. As shown in Section 4, institutions not covered by rules may believe that increased holdings of liquidity on the part of covered institutions may allow them to operate with lower liquidity holdings because they can depend on the covered institutions to supply liquidity when needed. This dynamic could increase the pressure on the covered institutions during a stress event and points to the importance of understanding the liquidity position of the financial system as a whole.

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[8] This finding is also consistent with the observation that the panic, while triggering widespread temporary suspensions of convertibility of convertibility at banks, did not appear to result in a very large number of bank failures or permanent closures. The low closure rate suggests that, in this episode, the costs to the banks of being illiquid was not very large.

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Table 1
Reserve requirements by State

State	Required reserve that must be in cash	Comparison to national banks	Number cities in 1906 used	Number banks in 1906 used
National Banks	6 percent of deposits (demand, time, and net interbank)			
Alabama	*6 percent of demand deposits*	*Easier*		
Arizona	*6 percent of all deposits*	*Same*		
Arkansas	*Little legislation regulating banks*	*Easier*		
California	6 percent of deposits	Same	24	70
Colorado	*None reported*	*Easier*		
Connecticut	*4 percent of deposits*	*Easier*		
Delaware	*$3^1/_3$ percent of deposits (if pop. < 50,000)* *5 percent of deposits (if pop > 50,000)*	*Easier*		
Florida	8 percent of deposits	Tighter	1	2
Georgia	None (Entire reserve may consist of deposits in other banks)	Easier	10	33
Idaho	7.5 percent of demand deposits	Easier	4	11
Illinois*	6 percent of deposits	Same	15	25
Indiana	No requirement	Easier	5	10
Iowa	2.5 percent of deposits	Easier	24	33
Kansas	5 percent of deposits (if pop. < 5,000) 6.25 percent of deposits (if pop > 5,000)	Easier Same	11	34
Kentucky	*5 percent of deposits (if pop. < 50,000)* *$8^1/_3$ percent of deposits (if pop > 50,000)*	*Easier* *Tighter*		
Louisiana	8 percent of demand deposits (plus additional requirements)	Unclear	2	4
Maine	*5 percent of deposits*	*Easier*		
Maryland	*None reported*	*Easier*		
Massachusetts	*Possible for entire reserve to consist of deposits in other banks*	*Easier*		
Michigan	7.5 percent of deposits	Tighter	8	34
Minnesota	10 percent of demand deposits	Unclear	5	24
Missouri	Reserve requirement, but banks determine the share to be kept as cash	Easier	12	44
Montana	Reserve requirement, but banks determine the share to be kept as cash	Easier	4	6
Nebraska	6 percent of deposits (if pop. < 25,000) 8 percent of deposits (if pop > 25,000)	Same Tighter	8	13
Nevada	*5 percent of deposits*	*Easier*		
New Hampshire	*None reported*	*Easier*		
New Jersey	6 percent of demand deposits	Easier	0	0
New Mexico	*None reported*	*Easier*		
New York	6 percent of deposits	Same	6	23

North Carolina	6 percent of deposits	Same	4	10
North Dakota	8 percent of deposits	Tighter	4	8
Ohio	6 percent of demand and 4 percent of time deposits	Easier	26	61
Oklahoma	*6.7 percent of deposits (if pop. < 2,500)* *8.3 percent of deposits (if pop > 2,500)*	*Tighter* *Tighter*		
Oregon	*5 percent of demand deposits and 3.3 percent of time deposits (if pop. < 50,000)* *8.3 percent of demand deposits and 3.3 percent of time deposits (if pop. < 50,000)*	*Easier* *Unclear*		
Pennsylvania	5 percent of deposits	Easier	11	29
South Carolina	No law	Easier	3	11
South Dakota	None (Entire reserve may consist of deposits in other banks)	Easier	3	8
Tennessee	*None reported*	*Easier*		
Texas	10 percent of demand deposits	Unclear	6	13
Utah	*Reserve requirement, but banks determine the share to be kept as cash*	*Easier*		
Vermont	*None reported*	*Easier*		
Virginia	*None reported*	*Easier*		
Washington	*20 percent of demand deposits*	*Unclear*		
West Virginia	6 percent of demand deposits	Easier	5	8
Wisconsin	*Reserve requirement, but banks determine the share to be kept as cash*	*Easier*		
Wyoming	*None reported*	*Easier*		

*Not listed in the data of the National Monetary Commission. The Report of the Comptroller of the Currency for 1895 indicates that the laws for these states were the same as for the National banks.

Table 2: State bank summary statistics for 1906

	Mean	Std. Dev.	Min.	Max.
Reserves	0.056	0.037	0.010	0.309
Ln(assets)	13.178	1.209	9.281	16.805
Capital/assets	0.232	0.139	0.037	0.964
Profits/capital	0.286	0.212	0.000	0.982
Due to others/(deposits + due to others)	0.048	0.107	0.000	0.716
Fraction of local assets in national banks	0.503	0.239	0.083	0.989
Avg. fraction of cash/assets in national banks	0.060	0.017	0.040	0.122
Easier state bank reserve requirements	0.523	0.500	0.000	1.000
Ln(population)	11.018	0.932	9.207	13.733
Urban	0.529	0.243	0.000	0.959
Reserve city	0.172	0.378	0.000	1.000
Ln(number of manufacturing firms)	5.717	1.091	3.086	8.264
Ln(number of banks)	1.854	0.466	1.386	2.944
Report in Summer	0.348	0.477	0.000	1.000

Table 3: Determinants of state bank cash reserves (1905-1909) — panel approach

	Total cash reserves	Excess cash reserves
	(1)	(2)
Ln(assets)	-0.006***	-0.005***
	[0.001]	[0.001]
Capital/assets	0.002	0.020***
	[0.006]	[0.006]
Profits/capital	0.001	-0.003
	[0.004]	[0.005]
Due to others/(deposits + due to others)	0.053***	0.067***
	[0.009]	[0.010]
Fraction of local assets in national banks	0.031***	0.031***
	[0.004]	[0.005]
Avg. fraction of cash/assets in national banks	0.351***	0.380***
	[0.059]	[0.079]
Easier state bank reserve requirements	0.006**	0.006**
	[0.003]	[0.003]
Fraction of assets in NB * avg. cash/assets in NB * easier state reserve requirements	-0.380***	-0.414***
	[0.085]	[0.110]
Ln(population)	0.003	0.007***
	[0.002]	[0.003]
Ln(number of manufacturing firms)	0.007	-0.009***
	[0.005]	[0.003]
Ln(number of banks)	-0.003	-0.002
	[0.003]	[0.003]
Reserve city	-0.004**	-0.007*
	[0.002]	[0.005]
Urban	-0.003	0.007
	[0.002]	[0.006]
Reporting in Summer	-0.001	-0.001
	[0.002]	[0.002]
Clearinghouse in city	0.001	0.001
	[0.002]	[0.002]
Year fixed effects	Yes	Yes
Observations	2689	2015
R-squared	0.147	.176

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

Table 4: Determinants of state bank total cash reserves (1905-1909) — cross-sections

	1905	1906	1907	1908	1909
	(1)	(2)	(3)	(4)	(5)
Ln(assets)	-0.006**	-0.005**	-0.008***	-0.006***	-0.005***
	[0.003]	[0.002]	[0.003]	[0.002]	[0.002]
Capital/assets	0.017	0.016	-0.033**	0.001	-0.002
	[0.018]	[0.013]	[0.015]	[0.011]	[0.012]
Profits/capital	-0.009	-0.009	0.003	0.002	0.007
	[0.010]	[0.009]	[0.013]	[0.006]	[0.008]
Due to others/(deposits + due to others)	0.041*	0.034**	0.113***	0.048***	0.049***
	[0.022]	[0.016]	[0.037]	[0.013]	[0.013]
Fraction of local assets in national banks	0.035***	0.018**	0.058***	0.019***	0.032***
	[0.010]	[0.009]	[0.015]	[0.007]	[0.006]
Avg. fraction of cash/assets in national banks	0.393***	0.274*	0.309*	0.476***	0.220**
	[0.134]	[0.141]	[0.178]	[0.096]	[0.089]
Easier state bank reserve requirements	0.002	0.002	0.015	0.002	0.012*
	[0.006]	[0.006]	[0.011]	[0.005]	[0.007]
Fraction of assets in NB * avg. cash/assets in NB * easier state reserve requirements	-0.433*	-0.363*	-0.698*	-0.252*	-0.380**
	[0.222]	[0.195]	[0.383]	[0.133]	[0.156]
Ln(population)	0.003	0.008*	-0.002	0.007	-0.007
	[0.006]	[0.005]	[0.007]	[0.004]	[0.004]
Ln(number of manufacturing firms)	-0.005	0.016	0.003	0.001	0.023***
	[0.018]	[0.012]	[0.016]	[0.009]	[0.009]
Ln(number of banks)	-0.007	-0.010	0.002	0.004	-0.009*
	[0.007]	[0.007]	[0.013]	[0.005]	[0.005]
Reserve city	-0.003	-0.013***	-0.003	-0.004	0.002
	[0.005]	[0.004]	[0.006]	[0.004]	[0.004]
Urban	-0.008	0.002	-0.001	-0.006*	0.003
	[0.006]	[0.006]	[0.007]	[0.004]	[0.004]
Reporting in Summer	0.005	0.003	-0.010	-0.004	0.000
	[0.003]	[0.003]	[0.006]	[0.003]	[0.003]
Clearinghouse in city	0.015**	0.006	-0.000	-0.003	-0.004
	[0.006]	[0.005]	[0.006]	[0.004]	[0.004]
Year fixed effects	No	No	No	No	No
Observations	406	559	468	734	522
R-squared	0.192	0.110	0.198	0.174	0.161

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