The (Dis)Advantages of Clearinghouses Before the Fed

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Abstract:

This paper studies the double-sided effect of central bank activities when not uniformly applied. Operating in individual cities, U.S. clearinghouses were the closest thing to a central bank before 1914, yet they only assisted banks that choose to join the association. Using an annual bank-level database for six states between 1880 and 1910, this paper studies how clearinghouses differentially affected the composition and solvency of member and non-member banks within the same cities. Relative to historical closure rates, member banks were less likely and non-member banks were more likely to close after the entry of a clearinghouse.

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1. Introduction

Modern financial systems are governed by a patchwork of laws and supervisors. In addition to increasing legal costs, the patchwork encourages the pursuit of regulatory arbitrage whereby institutions alter their composition and services to operate under the loosest laws. Therefore, even a central bank could cause negative spillovers when it does not cover the entire system. Leading up to the recent financial crisis, shadow banks in the U.S. used their loose supervision to capture larger market shares and increase their connection to depository institutions through the purchase of mortgage-backed securities and the sale of credit default swaps. The Fed's lack of direct oversight hampered their attempts to curb the risky behavior, and individual depositors trusted in the security of their FDIC covered institutions. This arbitrage obscured the underlying market realities and left the nation vulnerable, but the mechanism is difficult to test using modern data as bank holding companies own a variety of institutions and uncovered institutions are structurally different from covered ones by definition.

The National Banking Era (1863-1914) offers a unique testing ground for examining the spillovers of a central bank as private clearinghouse associations were the only source of emergency funds. Each operating in a single city, clearinghouses acted as quasi-central banks, monitoring bank behavior and providing short-term loan certificates backed by collateral during panics. However, unlike central banks, the private clearinghouses only assisted those banks that chose to join the association. As many banks remained outside of the association, the period allows for the identification of the effect of clearinghouses based on within city variation, explicitly controlling for pre-existing factors that led to clearinghouse entry and local economic factors that influenced bank stability. A comprehensive bank-level database from Indiana, Michigan, Minnesota, Ohio, Pennsylvania, and Wisconsin from 1880 to 1910 allows this analysis for a large number of cities and years while controlling for bank specific characteristics.

Created by groups of commercial banks, clearinghouse associations were established to facilitate the clearing of checks and bank notes, but quickly evolved to monitor banks, publish information, and provide emergency liquidity during financial panics.[1] Gorton (1985, p. 277) states that the "powers and functions that clearinghouses developed most resembled those of a central bank" and Cannon (1910, p. 96) calls them "one of the finest examples the country has ever seen of the ability of the people when left to themselves to devise impromptu measures for their own relief". Clearinghouses were created in many cities, yet membership was costly and exclusionary, preventing many banks from joining. Just like the modern discount window, clearinghouse loan certificates were only available to member banks, and non-members would only have been able to access funds indirectly through members.

The disparity between members and non-members was evident during the Panic of 1907. Banks that were part of the New York City Clearinghouse had few losses, whereas trust companies that were not members suffered widespread deposit losses. Moen and Tallman (2000) argue that the difference between the two types of institutions was due to public perception of emergency liquidity. Depositors were much more likely to run on institutions that were not covered by the clearinghouse, regardless of their solvency.[2] Newspapers ran articles stating that the clearinghouse was providing relief to member banks while the crisis continued at the trust companies (p. 150). Instead, JP Morgan had to coordinate a bailout of the trust companies by the U.S. Treasury and other private individuals in order to provide liquidity to non-member banks.

The narrative evidence suggests that clearinghouses protected member banks and left non-members to fend for themselves. To the extent that non-members believed the presence of a

[1] Loans were issued in 1857, 1860, 1861, 1863, 1873, 1884, 1890, 1893, and 1907 (Sprague 1910, pp. 432-433).
[2] Indeed, several of the trust companies that experienced runs were found to be solvent when examined by JP Morgan and the clearinghouse.

clearinghouse prevented panics through monitoring or by mitigating panics through emergency lending, the entry of a clearinghouse would have pushed them to take more risk and be more susceptible to panics when they did occur. The question of whether the entry of the clearinghouse caused non-member banks to take a more risk has proved difficult to answer.[3] Moen and Tallman (1994, 2000) and Hoag (2011) examine clearinghouse members relative to non-members during specific panics and in specific cities. Moen and Tallman find that member banks in New York City and Chicago fared much better than non-member banks in those cities during the Panic of 1907, whereas Hoag finds that member banks in New York City were not significantly different from non-member banks during the Panic of 1893. In this way, there are conflicting results across panics and no study has tested whether clearinghouses outside of financial centers had a differential effect on banks.

Alternatively, Jaremski (2015) analyzes the effects of clearinghouses on national banks from 1865 through 1914. He finds that national banks were more likely to fail once a clearinghouse entered their city. While the examination of national bank data eliminates the possibility of omitted policy variables, most national banks were members of their local clearinghouse, preventing the test of whether all banks were more likely to fail or whether only non-member banks were negatively affected. Moreover, as state banks and trust companies were less likely to join a clearinghouse and had much higher failure rates, the national bank analysis likely understates the risk increasing effect of clearinghouses.

To fill this gap, I combine national bank data from the Comptroller of the Currency's *Annual Report* with state bank data from the official reports of Indiana, Michigan, Minnesota, Ohio, Pennsylvania, and Wisconsin. In addition to having consistently available annual balance

[3] Seminal studies by Timberlake (1984), Gorton (1985), and Gorton and Mullineaux (1987) discuss the structure and actions of clearinghouses using anecdotal evidence from many cities and panics.

sheet data from 1880-1910, these states contained a wide range of urban, rural, manufacturing, and agricultural areas.[4] For instance, the sample contains two highly developed states in Ohio and Pennsylvania, two agricultural and rural states in Minnesota and Wisconsin, and two states that contained more a mix of industries in Indiana and Michigan. The sample thus provides a microcosm of the various states in the nation and any results should be applicable to any region.[5] I then link the bank data to the dates of clearinghouse membership reported by the *Merchants and Bankers Directory* (1880-1894), *Rand McNally Bankers Directory* (1895-1900), and *Polks Bankers Directory* (1901-1910).

Despite being able to compare banks in the same city, there is still the potential for endogeneity of clearinghouse entry and membership. Any pre-trend or selection into membership would bias the estimated effects. The paper thus starts by examining the determinants of clearinghouse entry and the membership decisions of individual banks. The analysis suggests that clearinghouse entry was based on the population of a city rather than the growth or stability of the banking system. The choice of clearinghouse membership seems to be related to the size of a bank and its local economy rather than the distribution of its portfolio or overall balance sheet risk. As such, the potential sources of endogeneity seem to be unrelated to the relative risk of banks and should not poise a concern to the identification of the effect of clearinghouses.

Even after controlling for the factors that led to clearinghouse entry and membership, the data indicate that banks changed their behavior upon the arrival of a clearinghouse. However, the type of change depended on whether they chose to join the clearinghouse. Banks that became members had small compositional changes, whereas banks that did not become members

[4] The Northeast was the only other region with consistently available data, but the region's large number of mutual savings banks and few state banks makes it not well suited for this study.
[5] The anecdotal evidence also points to the fact that most clearinghouses were structured in similar ways with only a few subtle differences across states.

significantly increased their predicted balance sheet risk. Looking at closure rates after controlling for the balance sheet risk changes, member banks experienced a significant decline in the annual probability of closure, whereas non-member banks were more likely to close after a clearinghouse opened in their city. Even comparing banks in the same city with similar balance sheets, a member bank was a percentage point less likely to close whereas a non-member bank was 1.9 percentage points more likely to close. The exclusivity of clearinghouses seems to have imposed a net negative effect on the financial community. The net results thus match with Jaremski (2015) but the new analysis shows that treating all banks in a city as clearinghouse members causes the negative effect on mislabeled members to obscure the positive effect on actual members.

2. The Development of Clearinghouses in the United States

First started in New York City during 1853, clearinghouses were private organizations created by banks to reduce shoe leather costs by providing a central location and time to clear checks and bank notes every day.[6] Membership in a clearinghouse came with stipulations and requirements. To begin, banks generally had to pay a fee, submit to a balance sheet examination, and certify their capital stock. After becoming a member, banks had to submit financial statements, allow examinations, and were often subject to higher capital and reserve requirements than existing state regulations.[7]

Clearinghouse bylaws often explicitly prevented some institutions from joining. For instance, Chicago's clearinghouse did not allow state banks to become members. The capital and

[6] Clearinghouses also reduced the amount of cash reserves necessary to clear debt, as banks were only required to make up the difference between other banks' debt that they returned and their debt that other banks returned.
[7] These additional requirements may have been an attempt to reduce the regulatory differences between national and state bank members as much as they were to protect against risk-taking.

reserve requirements of clearinghouses also discouraged others from joining. For instance, no trust companies became members of the New York City's clearinghouse due to its high reserve requirements. As a result, only 55.3 percent of the 888 banks that operated in the sample's clearinghouse cities became members. Due to their small size and low regulations, state banks were less likely to adopt membership than national banks, but many still became members.[8]

The ability of clearinghouses to lower costs depended upon establishing intimate relationships with member banks and keeping operations relatively local.[9] Banks in other cities, therefore, formed their own associations rather than clearing debt through New York City. The structure and bylaws of associations were fairly homogenous, often following New York City's example. Deviations from New York City were generally differences in reserve requirements or fee structures.[10]

Figure 1 provides a geographic view of the 54 clearinghouses created in the sample states before 1910. The choice of clearinghouse creation seems driven by two factors. First, the locations of clearinghouses were primarily determined by the urban population. 41 of the 53 cities with more than 30,000 people established a clearinghouse by 1910, and all 22 cities that had more than 60,000 people created a clearinghouse.[11] Indeed, early expansion was limited to the largest urban centers: Cincinnati, Cleveland, Columbus, Detroit, Indianapolis, Milwaukee, Minneapolis, Philadelphia, Pittsburgh, and St. Paul. Because the number of people in a location was directly related to the number of checks that would need to be cleared in a given period, and

[8] About half of the clearinghouses had perfect national bank membership, but only 10 clearinghouses had perfect state bank membership.
[9] In the rare instance when members were not in the city, they were in a nearby suburb. For example, a bank in Allegheny (a city just across the river from downtown Pittsburgh) was a member of Pittsburgh's clearinghouse.
[10] Indeed, members from the New York City clearinghouse even helped some other cities start their clearinghouse. Few clearinghouse charters have survived, but those that have survived support the similarity across cities.
[11] It is important to note that many of the larger cities that did not create a clearinghouse were already nearby one and thus could call upon their correspondents to clear checks. For instance, East St Louis had around 48,000 people but was just across the river from the St Louis clearinghouse.

even a city with only three banks would still have benefited from a centralized clearing system.[12] Large cities thus seem to have inevitably chosen to establish a clearinghouse.

Second, the timing of later clearinghouse entry seems tied to the Panics of 1893 and 1907. Nine cities established clearinghouses within three years of 1893, and seven cities established them within three years of 1907. Particularly, the creation of clearinghouses after panics was by less populated cities. Early clearinghouses thus were established to lower clearing costs whereas later clearinghouses were established to provide protection from financial panics.

2.1 Clearinghouses as Lenders of Last Resort

The clearinghouse system quickly evolved to do much more than clear bank debt. As the Panic of 1857 approached, the policy committee of the New York City Clearinghouse authorized the issue of clearinghouse loan certificates to qualified member banks.[13] The certificates were backed by collateral (typically commercial paper or government bonds) from the receiving bank, but they were drawn on the clearinghouse, making them a joint-liability of the members. When a member defaulted, the remaining members bore the loss in proportion to their capital stock. Members thus could conserve their limited currency reserves by settling clearinghouse obligations with certificates rather than currency, and banks with excess reserves gained interest on the certificates.[14]

[12] Indeed, several clearinghouses were formed with less than 5 banks in the city. The number of banks thus was not the biggest driver of entry, a hypothesis that is supported by the later empirical work.
[13] Given that interest rates were fixed for all borrowers and everyone was responsible for losses, the loan committee likely took great care in choosing borrowers and assessing the collateral.
[14] Clearinghouse members were required to accept loan certificates.

The subsequent panics pushed clearinghouses to innovate. During the Panic of 1860, the New York City Clearinghouse pooled their members' reserves to create a fund for mutual aid.[15] The Panic of 1873 ushered in the use of certified checks which did not require collateral. The Panic of 1893 brought the use of lower denomination clearinghouse notes which could be given to non-members. Clearinghouses also protected their members from negative information releases during panics. This included replacing the weekly publication of individual bank statements with the publication of a single aggregate clearinghouse statement and guarding the names of banks that received loan certificates. (Gibbons 1859, Calomiris and Schweikart 1991)

The record shows that clearinghouses primarily protected their members from financial panics, and non-member banks could not rely on them for protection. First, it was not until the issue of clearinghouse notes in the 1890s that emergency liquidity could directly flow outside of the association, and even then, many clearinghouses chose not to issue notes at all. Second, clearinghouses had a vested interested in providing good loans. They thoroughly checked the borrowing bank's collateral assets and often examined the bank itself. Because non-member banks were not subject to previous observation and examination, the approval process largely excluded them from even indirectly receiving loans through clearinghouse members. Third, clearinghouses did not authorize any emergency liquidity until a shock began to harm their members. For instance, the New York City Clearinghouse waited several months before authorizing loan certificates during the Panic of 1893 because its members were not directly affected by the agricultural shocks that started the panic.[16]

[15] Due to the difficulty of forcing banks to give up reserves, this practice was discontinued after the Panic of 1873.
[16] This is potentially why Hoag (2011) finds that NYC clearinghouse members did not perform better than non-members during 1893.

While the clearinghouse undoubtedly brought some positive benefits during the panics, the public actions of the clearinghouse might also have caused some negative spillovers. Moen and Tallman (2000) provide many accounts from the *New York Times* and *Chicago Daily Tribune* on the actions of the clearinghouses. These articles often highlighted the protective actions of the clearinghouse and discuss the potential concern amongst other banks. For example, the *Times* reported in October of 1907 that the Knickerbocker Trust Company "had not been aided by the clearinghouse or JP Morgan and his associates because the company's capital and surplus was impaired" yet then noted that "clearinghouse committee met Tuesday morning to deal with the question of aiding the New Amsterdam National Bank to cover a clearing deficit" (p. 150). The article even went on to report that Morgan "did not care to assume the responsibilities of previous poor management" (p. 150). The reports likely decreased public distress over member banks, but at the same time, they shifted distress to "unprotected" banks. To put it another way, the clearinghouse could have concentrated runs on non-member banks, regardless of their asset portfolio.[17]

Table 1 illustrates the effect of clearinghouses by calculating the fraction of bank closures in the sample states from 1880 through 1910. The top panel suggests simple comparisons of banks can be misleading when they do not take account of geographic and economic characteristics. According to the panel, 34 percent of all member banks closed, yet only 25 percent of all non-member banks closed. However, clearinghouses (and thus members) were in financial centers where bank competition and contagion led to greater instability, whereas most non-members were in small towns that had few banks and no clearinghouse. Indeed, the bottom

[17] While many articles describe clearinghouse lending to member banks but not non-members, the newspapers do not report on the effect of previous articles themselves. Therefore there is no way to know with certainty that this was the mechanism for the higher closures rates of non-members.

panel of Table 1 shows that clearinghouse members were much less likely to close than non-members when restricting the sample to banks in cities with a clearinghouse before 1910. About 34 percent of member banks closed over the thirty year period, whereas almost 56 percent of non-members closed. These values amount to annual probabilities of closure of about 1.2 percent and 1.9 percent respectively. The stabilizing effect of clearinghouses was greatest on national banks (from 74 to 31 percent), yet state banks also see a considerable reduction in the rate of closure (from 52 to 40 percent).

These differences across similar locations are dramatic, but could be caused by endogenous selection into membership based on characteristics such as bank size, composition, or age. The rest of the paper, therefore, accounts for other factors in order to provide a more convincing test of whether clearinghouses had a differential effect on the closure rates of member and non-member banks.

3. Data

I combine annual national and state bank data to examine the effect of clearinghouses on members and non-members. The national bank data come from Jaremski (2013). Culled from the Comptroller of the Currency's *Annual Report,* the data contain the annual balance sheet of every national bank in operation each year.[18] Data are missing for 1885 when balance sheets were not reported and for 1905 when certain balance sheet items were combined. The state bank balance sheet data come from the state reports of Indiana, Michigan, Minnesota, Ohio, Pennsylvania, and Wisconsin.[19] Due mostly to states initially reporting information biannually, state bank balance

[18] Using the tables provided by the Comptroller, I drop the few balance sheets published during the year of a bank's closure in order to avoid changes made in anticipation of closure.

[19] Data for Indiana are from the *Annual Report of the Auditor of State of the State of Indiana*. Data for Michigan are from the *Annual Report of the State Treasurer of the State of Michigan* before 1889 and the *Annual Report of the*

sheets are missing for Indiana in 1880, 1882, and 1884, Minnesota in 1883, Ohio in 1883 and 1893, and Wisconsin in 1883, 1885, and 1887.

To create consistent balance sheet measures, I must make some adjustments when combining the various reports. First, I aggregate unique balance sheet items into more common items. For instance, time deposits, checking deposits, demand deposits, savings deposits, and certificates of deposits are merged into a single individual deposits measure.[20] Second, I fill missing balance sheet observations using a linear trend to avoid years when only one type of bank was observed in a state.[21] Lastly, I define the year of bank closure as the year after the last balance sheet was published. While I account for reported or slight name changes, it is possible that a few of these "closures" might be substantial name changes or mergers. However, as these changes could also have been driven by distress and insolvency, the results should not be greatly biased. The final database contains 62,714 observations for 2,491 national banks and 3,465 state banks from 1880 through 1910.

Clearinghouse information comes from the *Merchants and Bankers Directory* (1880-1889), *Rand McNally Bankers Directory* (1890-1900), and the *Polks Bankers Directory* (1901-1910). The directories provide a list of banks in each year denoting which cities had a clearinghouse and which banks were members. Because the directories were generally published

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Commissioner of the Banking Department of the State of Michigan thereafter. Data for Minnesota are from the *Report of the Public Examiner of the State of Minnesota to the Governor* before 1910 and *the Annual Report of the Banking Department of the State of Minnesota* thereafter. Data for Ohio are from *Annual Report of the Auditor of State to the Governor of Ohio*. Data for Pennsylvania are from the *Reports of the Several Banks and Savings Institutions and Banks Organized under the Free Banking Law of Pennsylvania* before 1895 and the *Annual Report of the Commissioner of Banking* thereafter. Data for Wisconsin are from the *Semi-Annual Statement on the Condition of State and Private Banks of Wisconsin* before 1895, the *Annual Report of the Bank Examiner* from 1896 to 1902, and the *Annual Report of the Commissioner of Banking* thereafter.

[20] Unfortunately, only certain states and certain years separate time from demand deposits and thus all deposits have to be merged into a single variable.

[21] If anything, the linear assumption should bias against finding a significant effect of clearinghouses.

in January, I designate membership as the year before the clearinghouse notation first appeared.[22] I verify or adjust clearinghouse entry dates with Cannon (1900) and the Comptroller's *Annual Report* whenever possible.

While the bank balance sheets exist for every year, the county-level Census database assembled by Haines (2004) only contains information each decade. This limitation is restrictive because many clearinghouses were not created at the end of a decade, and a decennial regression model would pick up changes occurring before a clearinghouse entered. To obtain more precise estimates of the effect of clearinghouses, I assume that the county-level census variables grew linearly over time and create estimates for the years in-between each decennial observation.[23]

4. Empirical Analysis

Before determining whether clearinghouses affected bank behavior, we have to know something about what led to the creation of a clearinghouse and what led individual banks to adopt a membership. If either decision was endogenous to the local economic or financial conditions, then we must control for those conditions before examining the effect of clearinghouses on banks. I thus start in Section 4.1 by examining the decision of a location to create a clearinghouse based not only on the characteristics of the location, but also the characteristics of the banks in that location. In Section 4.2, I then examine the decision of individual banks to become a member based on their location and balance sheet. Because banks could not join a clearinghouse in another city, the sample is restricted to banks in the year prior to the entry of a clearinghouse.

[22] Dating entry one year prior to its appearance also best matches the dates provided by other sources. Two clearinghouses cease operation in the sample. In the empirical analysis, observations after closure from the county are dropped to avoid identifying on the closure. Results are similar when the cities are dropped altogether.
[23] Counties are aggregated to their 1880 county boundaries to provide consistent measures across time.

Because the factors associated with clearinghouse entry and membership are not related to the risk profile of individual banks, the analysis thus proceeds by controlling for environmental factors as separate explanatory variables and testing whether the entry of a clearinghouse altered bank behavior. First, Section 4.3 examines whether banks altered their balance sheet composition after becoming a member of the local clearinghouse. The centralized clearing structure likely reduced the need for excess reserves, but it also could have allowed members to expand their lending or shift into a more illiquid portfolio. At the same time, it is important to separate the effect of clearinghouse entry versus clearinghouse membership. Non-member banks might have had an incentive to take more risk in order to compete with member banks. I thus also examine the behavior of non-member banks after a clearinghouse entered to determine whether banks had differential responses.

Second, Section 4.4 examines whether banks were less likely to close after becoming a member. Membership not only provided banks with the ability to receive emergency liquidity during panics, but it also provided positive media coverage that mitigated public fears of insolvency. As in the balance sheet equations, I separately test the behavior of member and non-member banks upon the entry of a clearinghouse. To provide the closest comparison of banks, the sample is tightened to drop all banks outside clearinghouse locations. The specification thus effectively compares banks in the same cities with the only variation being whether they chose to adopt membership.

Through each step, it is important to use a proper comparison group. Clearinghouses were established in large cities with many banks. Therefore, comparing clearinghouse members in large cities to non-members in rural areas might not provide reliable results. This problem is further exacerbated to the extent that clearinghouse entry and membership was endogenous to

local economic conditions. I thus attempt to create a proper comparison group for the behavior being tested. This is often through narrow geographic controls such as county-fixed effects, but additional sample restrictions are necessary in some cases.

4.1 Determinants of Clearinghouse Entry

Mutually owned by the member banks, clearinghouses were non-profit organizations that only charged enough to pay their administrative bills. The determinants of clearinghouse creation were thus based on the benefits that the clearinghouse offered to members. Clearing services were the primary benefit of establishing a clearinghouse. Banks in locations with large numbers of people (i.e., higher numbers of checks being cleared each day) and other banks (i.e., higher number of locations to visit each day to clear) would likely have been more likely to create a clearinghouse. While the reaction to idiosyncratic closures was likely minimal, banks also might have been more likely to create a clearinghouse after a panic. Panics provided banks with first-hand evidence of how much emergency liquidity was needed. As such, the factors can be separated into those that are not related to risk (number of people, urbanization, agricultural activity of the location) and those that are related to risk (growth and the number of banks). To the extent that the former group of variables is important we can control for them as separate correlates, whereas the extent that the latter group is important we would need to consider additional steps to attain proper identification.

I model entry using a linear probability model where the dependent variable takes the value of "1" if a clearinghouse was created in the county during the following year and “0”

otherwise.[24] As the entry of a clearinghouse was likely to have quickly influenced a county's banking system but not its economic activity, the banking measures are lagged one year but the census variables are not. Moreover, observations after a clearinghouse entered are dropped to avoid any subsequent changes, and counties without banks are dropped to avoid locations that would not need a clearinghouse. The full specification is:

$$Entry_{i,t} = a + \beta_1 NBanks_{i,t-1} + \beta_2 SBanks_{i,t-1} + \beta_3 NAssets_{i,t-1} + \beta_4 SAssets_{i,t-1} + \beta_5 X_{i,t} + t_t + s_s + e_{i,t} \quad (1)$$

$X_{i,t}$ is a vector of county-level variables including the logarithm of population, the logarithm of farm value per person, and the fraction of the population living in an area of 25,000 people or more.[25] $NBanks_{i,t-1}$ and $SBanks_{i,t-1}$ are the logarithms of the number of national and state banks in the county in the previous year. $NAssets_{i,t-1}$ and $SAssets_{i,t-1}$ are the logarithms of national and state bank assets in the previous year and capture whether large banks (and thus the potential need for clearing) rather than many small banks could have attracted clearinghouses.[26] I also include fixed effects for each year (t_t) to control for nation-wide shocks such as financial panics and either state or county-fixed effects (s_s) to control for local economic conditions. $e_{i,t}$ is the error term.

Table 2 shows that clearinghouses were attracted to counties with large urban centers. The coefficients on population and the fraction of the population living in an area of 25,000 or more are always statistically significant and positive. A county with 10 percent more population

[24] While a hazard function yields similar results, I have chosen to use a linear model so the sizes of effects are comparable across all the specifications.
[25] All dollar values are deflated to an 1900 basis using Officer (2008). While the formal measure of urbanization (i.e., a place of more than 2,500) could be used, only a handful of clearinghouses were established in a city with fewer than 25,000 people and thus the included variable better captures the determinants of entry. No manufacturing variable is included in the regressions because none is available for 1910.
[26] To prevent undefined values in the few counties without either a state or a national bank, one is added to all variables before taking the log.

had a 0.04 to 0.4 percentage point higher probability of receiving a clearinghouse, whereas a county with 10 percentage points more people living in a large city had a 0.94 to 1.70 percentage point higher probability. The coefficients of both variables are largest when controlling for county fixed effects suggesting population growth mattered not just the level of population.

The number and assets of banks are not significantly correlated with clearinghouse entry. The coefficients are only significant in the state-fixed effects specifications and even then they are small. Doubling the number of national banks only increases the probability of entry each year by about half a percent. Therefore, after controlling for some level of financial development by dropping counties without a bank, additional bank growth did not seem to attract clearinghouses more quickly. Instead, clearinghouses were likely installed by banks in growing counties in order to reduce clearing costs at existing banks (i.e., the number of individual bank trips an employee would have to make without the clearinghouse) rather than in growing financial centers to reduce bank risk.

4.2. Determinants of Clearinghouse Membership

The next potential source of endogeneity is the individual membership decision by banks. Finding a proper control group for examining the choice of clearinghouse membership is more complicated than controlling for location. Regardless of their composition, banks could not join a clearinghouse if one did not exist in their city. The presence of a clearinghouse also may have altered the decisions of entering banks. To mitigate these issues, I limit the sample to a cross-section of banks in the year before a clearinghouse opened in their city. Each bank's membership decision is then observed just prior to when it was first confronted with a clearinghouse. The

restriction thus drops potentially endogenous new banks and banks that did not have a choice to join a clearinghouse. The model is:

$$Ch_i = a + \beta_1 NBanks_i + \beta_2 SBanks_i + \beta_3 X_i + \beta_4 Age_i + \beta_5 State_i + \beta_6 Z_{i,t} + s_s + e_i \quad (2)$$

where CH_i is a clearinghouse dummy denoting whether the bank became a member of a clearinghouse in the following year, $NBanks_i$ and $SBanks_i$ are now measured at the city-level, $State_i$ is a dummy variable for whether the bank was a state bank[27], and $Z_{i,t}$ is a vector of balance sheet items. I have chosen several balance sheet variables based on historical studies of banking and the CAMELS measures used by modern bank regulators. *Ln(Assets)* measures bank size. The ratio of *Capital to Assets* measures capital adequacy. The ratio of *Cash to Deposits and Due to Banks* is an index of bank liquidity, measuring the bank's capacity to meet bank runs in specie. The ratio of *Individual Deposits to Liabilities* measures liability diversity, whereas the ratio of *Loans to Assets* measures asset diversity. The ratios of *Due From Banks to Assets* and *Due to Banks to Assets* measure the size of interbank relationships and the bank's exposure to the actions and stability of other market participants. Finally, the ratio of *Real Estate Owned to Assets* is included as a proxy for risk.[28] Due to the limited number of observations, year fixed effects cannot be included because of the low number of clearinghouse entries per year.

Table 3 shows that state banks were not necessarily more or less likely to become clearinghouse members than national banks after controlling for age, location-specific factors, and composition. Instead, large banks located in towns with few other banks were the most likely

[27] While unreported, separate regressions for state and national banks show that the bank types primarily responded to surrounding banks of their own type. National banks also were more affected by asset size, but the coefficient still becomes statistically insignificant when controlling for location fixed effects.

[28] Used by studies such as Calomiris and Mason (1997, 2003), real estate owned contains foreclosed properties, and thus is a proxy of previous loan failures. The historical reports of the Comptroller and state officials do not include information on income or asset quality, preventing the use of direct measures of risk such as loan losses or non-performing assets.

to adopt a membership. However, after controlling for location fixed effects, the effect of being a large bank becomes statistically insignificant. The results make intuitive sense given the sample captures founding members. Large banks were best able to shoulder the costs of membership and likely had the most to gain from the clearinghouse, whereas banks in a city with only 3 banks would likely have only started a clearinghouse if they all agreed. [29]

The data indicate that the decision to become a clearinghouse member is based on a bank's size and environment rather than the composition of its investment portfolio. However, it is still possible that the piecemeal approach masks the overall risk of banks' portfolios. To examine this potential, I estimate the determinants of bank closures for clearinghouse counties before they gained a clearinghouse. The analysis thus avoids any changes that the entry of a clearinghouse could have had on bank outcomes. [30] The model is:

$$Closure_{i,t} = a + \beta_1 SBanks_{i,t} + \beta_2 NBanks_{i,t} + \beta_3 X_{i,t} + \beta_4 Age_{i,t} + \beta_5 State_i + t_t + s_s + e_{i,t} \quad (3)$$

Applying the coefficients reported in Appendix Table A1 to the data, I calculate each bank's predicted portfolio risk. I then estimate the equation (2) using predicted portfolio risk as the only control variable. Seen in Table 4, the coefficient on predicted risk is negative but not statistically significant. As such, the results suggest that selection into clearinghouse membership was not determined by individual bank risk.

[29] Controlling for the fraction of other banks that joined the clearinghouse does not eliminate the negative effect of the number of banks, suggesting the results are not driven by lower membership costs in small cities.
[30] The regression results of the reduced sample are similar to the results for all years discussed later in the paper.

4.3 Effect of Clearinghouses on Balance Sheets

The previous sections have indicated that clearinghouse entry was based on a location's population and that large banks with few surrounding banks were more likely to join the clearinghouse when it entered. The next step is to examine the behavior of banks after they became members while controlling for the factors that led to clearinghouse entry and membership. I start by examining whether banks changed their composition.

To isolate the effect of clearinghouses on bank balance sheets, I make several additions to the model. First, I control for the endogeneity of clearinghouse entry by including each county's population, urbanization, and farm value as well as each city's number of state and national banks. Second, I control for bank size by dividing most dependent variable by assets and by controlling for bank fixed effects. Third, I drop banks that entered a county after a clearinghouse was established because their composition might have been endogeneous to the existing clearinghouse. Finally, I include the logarithm of the bank's age to capture growth trends that existed over the lifetime of the bank, year fixed effects to capture effects that existed across the financial system in a given year, and bank fixed effects to capture time invariant bank characteristics.

The model takes the form of:

$$Z_{i,t} = a + \beta_1 NBanks_{i,t} + \beta_2 SBanks_{i,t} + \beta_3 X_{i,t} + \beta_4 Age_{i,t} + \beta_5 CH_{i,t} + \beta_6 CH_{i,t} * State_i + t_t + u_i + e_{i,t} \quad (4)$$

where $CH_{i,t}$ is a dummy denoting whether the bank was a member of a clearinghouse in the current year, and the other variables retain their definitions.[31] The interaction between the clearinghouse dummy and the state bank dummy provides the additional effect of clearinghouses

[31] $Z_{i,t}$ now contains the ratio of bonds and stocks to assets which was previously excluded to avoid multicollinearity.

on state banks.[32] Note that the inclusion of bank-fixed effects prevents the clearinghouse dummy from being identified off cities that had a clearinghouse in 1880.

Table 5 shows that banks changed their balance sheet composition after joining a clearinghouse. In addition to an overall increase in asset size, becoming a member is correlated with decreases in the proportions of individual deposits, and increases in the proportions of capital and interbank deposits. At the same time, state banks responded differently than national banks. National banks increased their loans and interbank liabilities, and decreased their individual deposits and real estate owned. State banks increased their assets and interbank assets, and decreased their loans and individual deposits.[33] The differences between state and national banks correspond to the starting position of each bank type. State banks had low assets, reserve requirements, and minimum capital requirements compared to national banks. Therefore, they expanded to meet the clearinghouse's requirements. National banks, on the other hand, took advantage of the lowered cost of clearing and invested more of their excess reserves. The growth in state bank assets is large, but the coefficients on the balance sheet ratios are moderate in size for both bank types, ranging between 1 and 5 percentage points.

Member banks adjusted their balance sheets to take advantages of the clearinghouses, but did clearinghouses also affect the behavior of non-member banks. Clearinghouses had no effect on state regulations and thus non-member banks could have continued to operate in the same way. However, non-member banks might have changed their composition to compete with member banks or protect themselves from panics. To estimate the spillover effect on non-

[32] The total effect on national banks therefore would be β_5, while the total effect on state banks would be $\beta_5 + \beta_6$.
[33] Note that the coefficient on the state bank interaction for the ratio of due to banks and real estate is canceled out by the coefficient of the opposite sign on the level.

members, I create a separate indicator variable. $CHCity_{i,t}$ denotes whether the bank was in a city with a clearinghouse *but* was not a member. The balance sheet regression is:

$$Z_{i,t} = a + \beta_1 NBanks_{i,t} + \beta_2 SBanks_{i,t} + \beta_3 X_{i,t} + \beta_4 Age_{i,t} + \beta_5 CH_{i,t} + \beta_6 CHCity_{i,t} + t_t + u_i + e_{i,t} \quad (5)$$

where the variables retain their previous definitions.

In Table 6, even banks that did not choose to become members altered their behavior after the arrival of a clearinghouse. Non-members experienced a decline in individual deposits as well as an increase in interbank assets and capital. Many of these same changes occurred for member banks, but the corresponding changes were larger for non-member banks. The shift towards interbank assets for non-member banks was particularly large compared to member banks. This increase in interbank deposits might have reduced stability during a panic when all banks have trouble meeting withdrawal demands. While member banks could have given out clearinghouse loan certificates to meet redemption demands, non-member banks did not have the same ability.

With some measures increasing and some decreasing, it is helpful to examine the overall effect of clearinghouses on bank balance sheet risk. I therefore test whether portfolio risk changed after the entry of a clearinghouse using the predicted risk measure calculated in the previous section.[34] In Table 7, there was a differential effect of clearinghouses. After the entry of a clearinghouse, non-member banks increased their overall portfolio risk while member banks had no significant change in risk. As such, the results suggest that clearinghouse entry may have allowed non-member banks more freedom from investor scrutiny.

[34] As in the previous section, the predicted portfolio risk measure is calculated based on equation (3) and all observations when a clearinghouse was present are dropped.

4.4 Effect of Clearinghouses on Bank Closure

Similar to equation (3) except with the addition of clearinghouse dummies, I model the probability of closure over the following year using the following model:

$$Closure_{i,t} = a + \beta_1 SBanks_{i,t} + \beta_2 NBanks_{i,t} + \beta_3 X_{i,t} + \beta_4 Age_{i,t} + \beta_5 State_i + \beta_6 CH_{i,t} + \beta_7 CH_{i,t} * State_i + t_t + s_s + e_{i,t} \quad (6)$$

In this case, I include either state or county-fixed effects because the use of bank-fixed effects would restrict the examination to only banks that closed as the fixed effects would completely determine the outcome of surviving banks.[35]

In Table 8, banks that became members of the local clearinghouse were 0.8 to 1.6 percentage points less likely to close. This annual effect is nearly as large as the average probability of closure in the data, indicating that clearinghouses had an economically large effect on bank stability. While clearinghouse membership had approximately equal effects on state and national banks, the table indicates that banking instability spread from state banks. Not only is the annual probability of closure about 3 percentage points higher for state banks, but the number of state banks in a location is also positively correlated with bank closure. A bank in a location with only one state bank would be between 0.8 and 1.5 percentage points more likely to close than a bank in a location with no state banks.

Bank closures were also more prevalent in high population counties. A 10 percent increase in population increased the probability of closure by 0.08 to 0.3 percentage points. As bank runs were often the cause of panics, a county with a high population might a proxy for the number of watchful depositors and size of potential bank runs.

[35] The results are similar but with larger standard errors on the clearinghouse variables if bank fixed effects are added to the models.

The coefficients on the balance sheet ratios show that small banks with low proportions of reserves and individual deposits or high proportions of capital and real estate owned were more likely to close. Despite their statistical significance, the coefficients are small. When county fixed effects are included in the model, the probability of closure decreases by 0.18 percentage points for every 10 percent increase in assets, 0.5 percentage points for every 10 percentage point increase in deposits, and 0.001 percentage points for every 10 percentage point increase in cash. On the other hand, the probability of closure increases by 0.46 percentage points for every 10 percentage point increase in capital and 0.1 percentage points for every 10 percentage point increase in real estate. As suggested by Table 7, the total effect of clearinghouse entry on closure through balance sheet of the average member bank is nearly zero (i.e., 0.027 percentage points) when using the coefficients for specification (8).

The evidence suggests that clearinghouses made member banks less likely to close, but did they also affect surrounding non-members? Unlike the balance sheet regressions that examine only the time series variation of bank membership, the bank closure regressions also examine cross-sectional variation. This creates a problem when including both clearinghouse dummies because banks in counties with a clearinghouse were generally concentrated in the clearinghouse city. Therefore, the model would compare a large number of banks in a large city with a couple banks in the surrounding small towns. To avoid this problem, I drop cities that never received a clearinghouse, leaving the model to compare banks in very similar locations before and after a clearinghouse entered. Focusing on the time series variation in membership, the model is now:

$$Closure_{i,t} = a + \beta_1 NBanks_{i,t} + \beta_2 SBanks_{i,t} + \beta_3 X_{i,t} + \beta_4 Age_{i,t} + \beta_5 State_i + \beta_6 CH_{i,t} + \beta_7 CHCity_{i,t} + t_t + s_s + e_{i,t} \quad (7)$$

In this case, I estimate the specifications separately with state and city fixed effects. Similar to the bank-fixed effects, the inclusion of city-fixed effects prevents the clearinghouse dummies from being identified off cities that already had a clearinghouse in 1880 and any bank that entered after a clearinghouse was established.

The regressions results in Table 9 indicate that members were less likely and non-members were more likely to close after the entry of a clearinghouse. The effect on members is between 0.9 and 1.7 percentage points, while the effect on non-members is much larger, ranging from 1.9 to 2.9 percentage points. The coefficient for clearinghouse members falls just above the 10 percent cutoff when county-fixed effects are included, while the coefficient on non-members grows. The loss of significance suggests that member and non-member banks in large cities that established clearinghouse before 1880 might have been better protected from failure.[36]

Again it is useful to calculate the size of a clearinghouse's effect on closure through balance sheet changes. The effect on members is approximately 0.027 percentage points, but the effect on non-member banks was 0.267 percentage points. The effect through the balance sheet is thus ten times larger for non-member banks than for member banks.

The empirical evidence is clear: the entry of a clearinghouse helped banks that chose to join and hurt others. Even after comparing banks in the same city and controlling for balance sheet composition, a member bank was less likely to close and a non-member bank was more likely. The equations suggest two effects on the probability of closure. First, the smaller effect is coming from non-member banks taking slightly more portfolio risk after the entry of a clearinghouse. The entry of a clearinghouse would have pushed non-member banks to compete and might even have given them greater latitude to take risk. Second, the larger effect is likely

[36] While unreported, the coefficients are similar to those in the location fixed effects models if cities with a clearinghouse before 1880 are dropped and state-fixed effects are used.

coming from emergency liquidity and public perception. Depositors would have been more likely to run on a bank that was not covered by a clearinghouse than one that was regardless of their composition. Indeed, clearinghouse banks often published weekly balance sheet statistics compared to other banks that only provided them at most every quarter. Depositors thus would have had much less uncertainty about member banks than others during the panics. The clearinghouse could also effectively prop up insolvent banks through the panic to avoid public fear, whereas non-clearinghouse members were more likely to have been lumped together with banks that had already closed.

5. Conclusion

Kroszner (2000 p.158) writes "the 'lesson' learned from [the Panic of 1907] was that the clearinghouse mechanism appeared to be inadequate to serve the financial system of the U.S. and was used as a motivation for the creation of the Federal Reserve System." This paper highlights the positive and negative impacts of clearinghouses and why a more inclusive institution was needed. For starters, the clearinghouse system audited its members' balance sheets, reduced their need for excess reserves, and provided emergency liquidity during panics. As a result, member banks were less likely to close over the highly cyclical period. However at the same time, the entry of a clearinghouse negatively influenced surrounding banks that did not become members. Non-member banks increased their predicted balance sheet risk and became much more likely to close after a clearinghouse entered their city. Because less than 60% of banks in clearinghouse cities became members, the introduction of clearinghouses might have endangered the financial system as much as they stabilized it.

The negative effect on non-member banks is likely tied to public perception as much as emergency liquidity. Clearinghouses effectively mitigated fears by issuing public statements of

security and actions. The newspapers of the time ran articles highlighting the collective action of clearinghouse members and the lack of protection for non-members. Clearinghouse members also published balance sheet information much more frequently than non-member banks. Depositors thus would have been much more likely to have run on non-member banks regardless of their solvency.

The exclusivity of the clearinghouses was a reason why the nation passed the Federal Reserve Act (1913) rather than encouraging the expansion of the clearinghouse system. As described by Wicker (2005), the establishment of a central bank was not just about emergency relief to illiquid banks during panics. If it was the goal, then the combined funds issued under the Aldrich-Vreeland Act (1908) and the clearinghouse system were likely sufficient.[37] Instead the adoption of a central bank was an attempt to provide stability to the entire banking system over time—something the exclusionary approaches of clearinghouses could not achieve. First, the Federal Reserve forced every national bank to become a member and strongly encouraged state banks and trust companies to join. This reduced the number of non-protected banks and made sure that a lender of last resort was present in all cities. Second, it installed an active lender of last resort that was available to provide emergency and seasonal liquidity during all periods rather than just during financial panics. This protected banks from all economic fluctuations and not just wide-scale problems (Miron 1986).

While the Federal Reserve was intended to unify the banking system, it never stretched over the entire system, and inevitably, the connection between institutions inside and outside the system led to the depth of both the Great Depression and Great Recession. In 1929, only about 35 percent of state and national banks were members of the Fed. These non-member banks relied

[37] Jacobson and Tallman (2013) show that the two factors prevented a panic from spreading in 1914.

heavily on their interbank networks for liquidity, just as they had during the National Banking Period. However when the panic started, country banks withdrew their deposits from money center banks specifically when they were needed the most (Mitchener and Richardson 2015). Leading up to the Great Recession, institutions moved outside the purview of the Fed in order to avoid regulations and oversight. Again these institutions created tight connections to the formal banking sector. Therefore, as their securitized assets took losses from the collapse of the housing sector, they pulled the rest of the system down with them. This study along with the historical narrative emphasizes policies that unify financial regulation and decrease the number of institutions outside the formal system. By making sure that most if not all financial institutions are under the same regulator, aggregate risks will be able to be properly measured and actions taken by the regulator during panics would be more effective.

Works Cited

Calomiris, Charles and Joseph Mason. 1997. “Contagion and Bank Failures During the Great Depression.” *American Economic Review* 87, 863-883

Calomiris, Charles and Joseph Mason. 2003. “Fundamentals, Panics, and Bank Distress During the Great Depression.” *American Economic Review* 93, 1615-1647.

Calomiris, Charles and Larry Schweikart. 1991. “The Panic of 1857: Origins, Transmission, and Containment.” *Journal of Economic History* 51, 807-834.

Cannon, James. 1900. *Clearing Houses–Their History, Methods, and Administration*. New York: D. Appleton and Company.

Cannon, James. 1910. *Clearinghouses*. National Monetary Commission. Washington, DC: Government Printing Office

Gibbons, James S. 1859. *The Banks of New York, Their Dealers, the Clearinghouses, and the Panic of 1857*. New York: D. Appleton and Co.

Gorton, Gary. 1985. "Clearinghouses and the Origin of Central Banking in the United States." *Journal of Economic History* 45, 277-283.

Gorton, Gary and Donald Mullineaux. 1987. "The Joint Production of Confidence: Endogeneous Regulation and Nineteenth Century Commercial-Bank Clearinghouses." *Journal of Money, Credit, and Banking* 19, 457-468.

Haines, Michael R. 2004. Historical, Demographic, Economic, and Social Data: The United States, 1790-2000. *ICPSR Study 2896*. Ann Arbor, MI: Inter-university Consortium for Political and Social Research.

Hoag, Chris. 2011. “Clearinghouse Membership and Deposit Contraction during the Panic of 1893.” *Cliometrica* 5, 187-203

Jaremski, Matthew. 2015. “Clearinghouses as Credit Regulators Before the Fed?” *Journal of Financial Stability* 17, 10–21.

Jacobson, Margaret and Ellis Tallman. 2013. "Liquidity provision during the crisis of 1914: private and public sources." Federal Reserve Bank of Cleveland Working Paper 1304.

Kroszner, Randall. 2000. "Lessons from Financial Crises: The Role of Clearinghouses." *Journal of Financial Services Research* 18, 157-171.

Merchants and Bankers’ Directory (also called *Merchants and Bankers’ Almanac*). 1861-1890. New York: Bankers’ Magazine Office.

Minnesota Population Center. 2004. *National Historical Geographic Information System: Pre-release Version 0.1*. Minneapolis, MN: University of Minnesota. http://www.nhgis.org.

Miron, Jeffrey A. 1986. "Financial Panics, the Seasonality of the Nominal Interest Rate, and the Founding of the Fed". *The American Economic Review* 76, 125-140.

Mitchener, Kris and Gary Richardson. 2015. "Shadowy Banks and the Interbank Amplifier During the Great Depression". Unpublished working paper.

Moen, Jon and Ellis Tallman. 1992. "The Bank Panic of 1907: The Role of the Trust Companies." *Journal of Economic History* 52, 611-630.

Moen, Jon and Ellis Tallman. 2000. "Clearinghouse Membership and Deposit Contraction During the Panic of 1907." *Journal of Economic History* 60, 145-163.

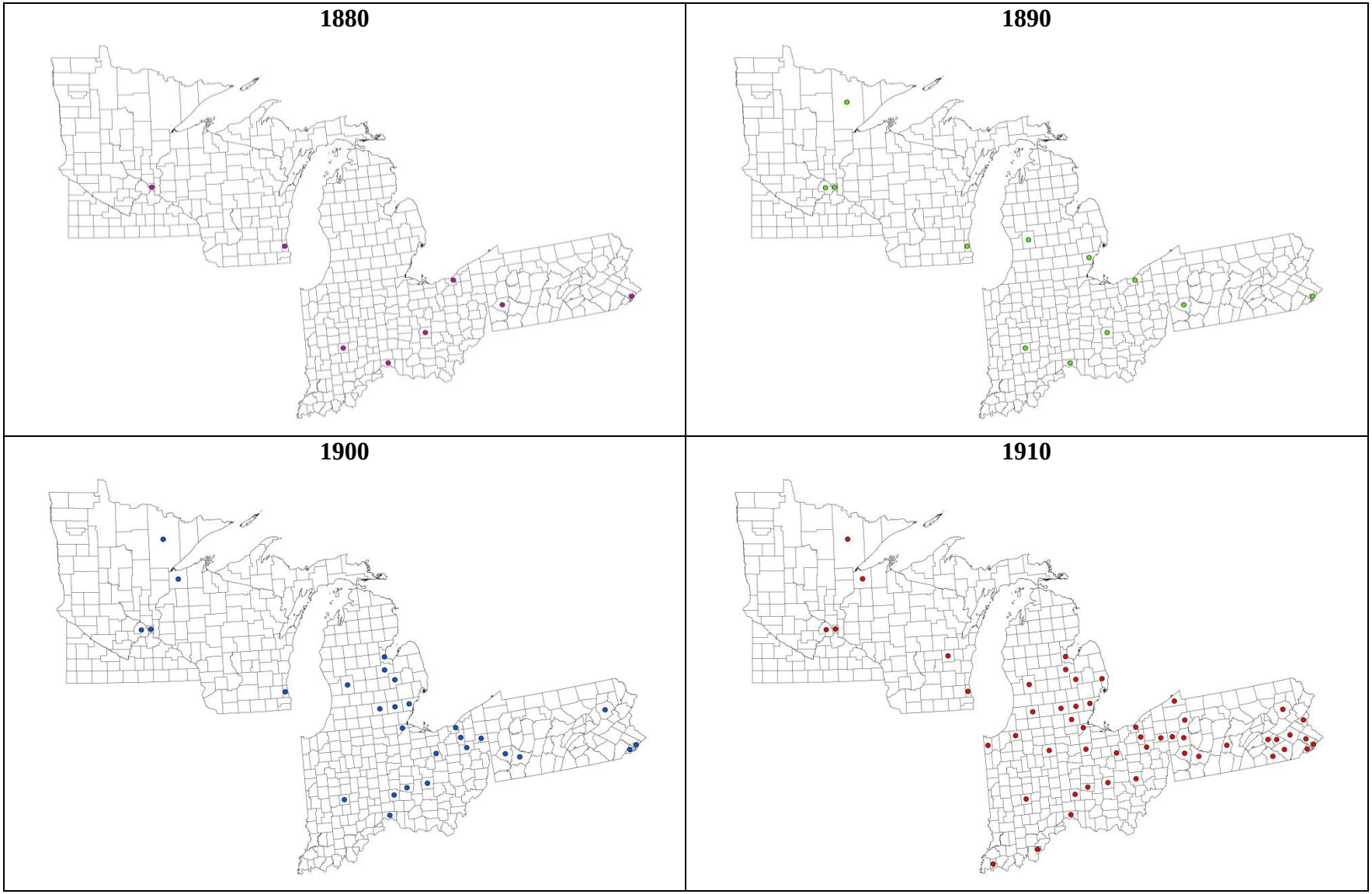
Officer, Lawrence. 2008. "What Was the Value of the US Consumer Bundle Then?" MeasuringWorth. http://www.measuringworth.org/consumer/

Rand McNally Bankers' Directory. 1890-1914. Chicago: Rand McNally.

Sprague, Oliver. 1910. *History of Crises Under the National Banking System*. National Monetary Commission.

Timberlake, Richard. 1984. "The Central Banking Role of Clearinghouse Associations." *Journal of Money, Credit, and Banking* 16, 1-15.

Figure 1: Clearinghouses By County (1880-1910)



Notes: Figures display the clearinghouses in each year. County boundaries obtained from Minnesota Population Center (2004).

Table 1: Descriptive Statistics of Banks (1880-1910)

	All Banks	National Banks	State Banks
All Banks			
Number of Banks	5,979	2,511	3,468
% Members	8.2%	12.5%	5.1%
% Closed			
Clearinghouse Members	34.2%	30.8%	40.3%
Non-Clearinghouse Members	25.2%	21.4%	27.8%
All Banks	26%	23%	28%
Banks in Clearinghouse Cities			
Number of Banks	888	385	503
% Members	55.3%	81.8%	35.0%
% Closed			
Clearinghouse Members	34.2%	30.8%	40.3%
Non-Clearinghouse Members	56.2%	74.3%	52.3%
All Banks in Clearinghouse Cities	44.0%	38.7%	48.1%

Notes: Table presents the fraction of banks that became a member of their local clearinghouse and their closure rate. Locations that never gained a clearinghouse are dropped.

Table 2: County-Level Determinants of Clearinghouse Entry (1880-1910)

	Counties With At Least One Bank			
	(1)	(2)	(3)	(4)
Ln(Population)	0.004**	0.040***	0.004*	0.040***
	[0.002]	[0.012]	[0.002]	[0.012]
Fraction Living in Place	0.094***	0.170***	0.095***	0.169***
With More than 25,001	[0.020]	[0.048]	[0.020]	[0.047]
Ln(Farm Value P.C.)	-0.002*	-0.021***	-0.002*	-0.021***
	[0.001]	[0.005]	[0.001]	[0.005]
L.Ln(Number of National	0.003***	0.003	0.006***	0.003
Banks)	[0.001]	[0.003]	[0.002]	[0.005]
L.Ln(Number of State	0.003*	0.001	0.004*	0.003
Banks)	[0.002]	[0.002]	[0.002]	[0.003]
L.Ln(National Bank			-0.001***	-0.001
Assets)			[0.001]	[0.001]
L.Ln(State Bank			-0.001	-0.001
Assets)			[0.001]	[0.001]
Location Fixed Effects	State	County	State	County
Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	10,558	10,558	10,558	10,558
R-squared	0.0418	0.1149	0.0425	0.1152

Notes: Table presents the results of an OLS regression. The dependent variable is whether or not a county gained a clearinghouse in that particular year. Each observation is a county-year. Counties that had a clearinghouse before 1880, or did not have a bank are dropped. Counties are also dropped from the sample after a clearinghouse was established. Dollar values are deflated to 1900 using Officer (2008). Robust standard errors are provided in brackets. * denotes significance at 10%; ** at 5% level and *** at 1% level.

Table 3: Bank-Level Determinants of Clearinghouse Membership

	Probability of Becoming A Member of Local Clearinghouse In Year It Started			
	(1)	(2)	(3)	(4)
State Bank Dummy	-0.046	-0.062	-0.016	-0.109
	[0.059]	[0.060]	[0.072]	[0.083]
Ln(Bank Age)	0.029	0.018	0.011	-0.005
	[0.023]	[0.034]	[0.028]	[0.034]
Number of National Banks	-0.167**		-0.158**	
	[0.066]		[0.073]	
Number of State Banks	-0.098***		-0.122***	
	[0.036]		[0.039]	
Ln(Population)	0.047		0.050	
	[0.060]		[0.064]	
Fraction Living in Place	0.127		0.041	
With More than 25,000	[0.123]		[0.126]	
Ln(Farm Value P.C.)	0.018		0.012	
	[0.039]		[0.042]	
Ln(Assets)			0.071*	0.046
			[0.044]	[0.049]
Capital/Assets			0.224	-0.134
			[0.272]	[0.311]
Indiv. Deposits/Liabilities			0.241	0.295
			[0.252]	[0.267]
Due to Banks/Assets			0.781	0.958
			[0.531]	[0.642]
Loans/Assets			0.072	0.283
			[0.180]	[0.218]
Due from Banks/Assets			-0.013	0.393
			[0.382]	[0.463]
Cash/(Indiv. Deposits+Due			-0.444	-0.788
From Banks)			[0.544]	[0.613]
Real Estate Owned/Assets			-0.041	0.280
			[0.517]	[0.475]
Location Fixed Effects	State	Location	State	Location
Observations	234	234	234	234
R-squared	0.125	0.275	0.162	0.326

Notes: Table presents the results of an OLS regression. The dependent variable whether the bank became a member of the local clearinghouse in the first year it opened. The sample consists of banks in the year prior to when a clearinghouse entered their city. Dollar values are deflated to 1900 using Officer (2008). Robust standard are provided in brackets. * denotes significance at 10%; ** at 5% level and *** at 1% level.

Table 4: Effect of Predicted Portfolio Risk on Clearinghouse Membership

	Probability of Becoming A Member of Local Clearinghouse In Year It Started
	(1)
Predicted Portfolio Risk Measure Using	-1.646
Only Clearinghouse Counties	[1.080]
Location Fixed Effects	Location
Observations	234
R-squared	0.276

Notes: Table presents the results of an OLS regression. The dependent variable is whether the bank became a member of the local clearinghouse in the first year it opened. The sample consists of banks in the year prior to when a clearinghouse entered their city. The predicted portfolio risk measure is obtained by applying the regression results of Table A1 to the portfolios of each bank. Dollar values are deflated to 1900 using Officer (2008). Robust standard are provided in brackets. * denotes significance at 10%; ** at 5% level and *** at 1% level.

Table 5: Effect of Clearinghouses on Bank Balance Sheets (1880-1910)

	Dropping Banks that Entered After Clearinghouse							
	Ln(Assets)		Loans/ Assets		Real Estate Owned/Assets		Cash/(Indiv. Deposits+Due From Banks)	
Clearinghouse Member	0.046*	-0.032	0.002	0.028***	-0.001	-0.006***	0.146	0.171
	[0.028]	[0.032]	[0.009]	[0.008]	[0.003]	[0.002]	[0.158]	[0.176]
Clearinghouse*State Bank		0.236***		-0.077***		0.015*		-0.074
		[0.060]		[0.020]		[0.008]		[0.069]
Ln(Bank Age)	0.335***	0.333***	0.036***	0.037***	0.000	-0.000	0.026	0.026
	[0.007]	[0.007]	[0.002]	[0.002]	[0.001]	[0.001]	[0.045]	[0.045]
Ln(# of National Banks)	-0.042**	-0.041**	0.044***	0.044***	0.000	0.000	-0.083	-0.083
	[0.016]	[0.016]	[0.005]	[0.005]	[0.001]	[0.001]	[0.086]	[0.086]
Ln(# of State Banks)	0.023**	0.023**	0.009***	0.008***	-0.001	-0.001	0.036	0.036
	[0.010]	[0.010]	[0.003]	[0.003]	[0.001]	[0.001]	[0.036]	[0.036]
Ln(Population)	0.529***	0.533***	-0.047***	-0.048***	-0.007	-0.007	0.139*	0.138*
	[0.054]	[0.054]	[0.015]	[0.015]	[0.005]	[0.005]	[0.073]	[0.072]
Fraction Living in Place With More than 25,000	-0.003	-0.006	0.036***	0.037***	-0.002	-0.002	0.025	0.026
	[0.021]	[0.021]	[0.006]	[0.006]	[0.002]	[0.002]	[0.095]	[0.096]
Ln(Farm Value P.C.)	-0.095	-0.090	-0.024	-0.026	0.016***	0.017***	-1.138	-1.139
	[0.076]	[0.076]	[0.023]	[0.023]	[0.006]	[0.006]	[1.137]	[1.138]
Location Fixed Effects	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	56,689	56,689	56,689	56,689	56,689	56,689	56,689	56,689
R-squared	0.636	0.637	0.118	0.121	0.131	0.132	0.001	0.001
	Due from Banks/ Assets		Capital/ Assets		Indiv. Deposits/ Liabilities		Due to Banks/ Assets	
Clearinghouse Member	0.004	0.000	0.008*	0.004	-0.022***	-0.016**	0.006**	0.009***
	[0.003]	[0.004]	[0.004]	[0.005]	[0.006]	[0.008]	[0.002]	[0.003]
Clearinghouse*State Bank		0.010		0.010		-0.019*		-0.010***
		[0.006]		[0.009]		[0.010]		[0.003]
Ln(Bank Age)	-0.026***	-0.026***	-0.081***	-0.081***	0.009***	0.009***	-0.002***	-0.002**
	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.001]	[0.001]
Ln(# of National Banks)	-0.013***	-0.013***	0.006*	0.006*	0.007**	0.007**	-0.004***	-0.004***
	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]	[0.001]	[0.001]
Ln(# of State Banks)	-0.004**	-0.004**	0.000	0.000	-0.006**	-0.006**	0.004***	0.004***
	[0.002]	[0.002]	[0.002]	[0.002]	[0.003]	[0.003]	[0.001]	[0.001]
Ln(Population)	-0.017**	-0.017**	-0.013	-0.012	-0.020	-0.020	0.008	0.008
	[0.008]	[0.007]	[0.009]	[0.009]	[0.013]	[0.013]	[0.005]	[0.005]
Fraction Living in Place With More than 25,000	0.028***	0.028***	-0.013***	-0.013***	-0.018***	-0.018***	0.011***	0.011***
	[0.004]	[0.004]	[0.004]	[0.004]	[0.005]	[0.005]	[0.002]	[0.002]
Ln(Farm Value P.C.)	0.033***	0.033***	0.016	0.016	-0.011	-0.012	-0.002	-0.002
	[0.011]	[0.011]	[0.014]	[0.014]	[0.018]	[0.018]	[0.007]	[0.007]
Location Fixed Effects	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	56,689	56,689	56,689	56,689	56,689	56,689	56,689	56,689
R-squared	0.124	0.125	0.586	0.586	0.136	0.136	0.033	0.033

Notes: Table presents the results of an OLS regression. The dependent variable is described in the column heading. Each observation is a bank-year. Banks that entered after a clearinghouse was established are dropped. Dollar values are deflated to 1900 using Officer (2008). Robust standard are provided in brackets. * denotes significance at 10%; ** at 5% level and *** at 1% level.

Table 6: Effect of Clearinghouses on Bank Balance Sheets (1880-1910)

	Dropping Banks that Entered After Clearinghouse			
	Ln(Assets)	**Loans/ Assets**	**Real Estate Owned/Assets**	**Cash/(Indiv. Deposits+Due From Banks)**
Clearinghouse Member	0.048*	-0.001	-0.001	0.153
	[0.029]	[0.008]	[0.003]	[0.167]
Clearinghouse in City But Not Member	0.021	-0.047	0.009	0.118
	[0.069]	[0.033]	[0.008]	[0.143]
Ln(Bank Age)	0.335***	0.036***	0.000	0.026
	[0.007]	[0.002]	[0.001]	[0.045]
Ln(# of National Banks)	-0.042**	0.043***	0.000	-0.082
	[0.016]	[0.005]	[0.001]	[0.085]
Ln(# of State Banks)	0.023**	0.009***	-0.001	0.036
	[0.010]	[0.003]	[0.001]	[0.036]
Ln(Population)	0.528***	-0.045***	-0.007	0.134**
	[0.055]	[0.015]	[0.005]	[0.068]
Fraction Living in Place With More than 25,000	-0.003	0.036***	-0.002	0.025
	[0.021]	[0.006]	[0.002]	[0.096]
Ln(Farm Value P.C.)	-0.096	-0.021	0.016***	-1.146
	[0.075]	[0.023]	[0.006]	[1.147]
Local Fixed Effect	Bank	Bank	Bank	Bank
Year Fixed Effect	Yes	Yes	Yes	Yes
Observations	56,689	56,689	56,689	56,689
R-squared	0.636	0.119	0.131	0.001
	Due from Banks/ Assets	**Capital/ Assets**	**Indiv. Deposits/ Liabilities**	**Due to Banks/ Assets**
Clearinghouse Member	0.005	0.009**	-0.024***	0.006***
	[0.003]	[0.004]	[0.006]	[0.002]
Clearinghouse in City But Not Member	0.025***	0.028***	-0.034*	0.013
	[0.008]	[0.011]	[0.018]	[0.008]
Ln(Bank Age)	-0.026***	-0.081***	0.009***	-0.002***
	[0.002]	[0.002]	[0.002]	[0.001]
Ln(# of National Banks)	-0.013***	0.006*	0.007**	-0.004***
	[0.003]	[0.003]	[0.003]	[0.001]
Ln(# of State Banks)	-0.004**	0.000	-0.006**	0.004***
	[0.002]	[0.002]	[0.003]	[0.001]
Ln(Population)	-0.018**	-0.014	-0.018	0.008
	[0.008]	[0.009]	[0.012]	[0.005]
Fraction Living in Place With More than 25,000	0.028***	-0.012***	-0.018***	0.011***
	[0.004]	[0.004]	[0.005]	[0.002]
Ln(Farm Value P.C.)	0.032***	0.014	-0.009	-0.002
	[0.011]	[0.014]	[0.018]	[0.007]
Location Fixed Effects	Bank	Bank	Bank	Bank
Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	56,689	56,689	56,689	56,689
R-squared	0.125	0.586	0.136	0.033

Notes: Table presents the results of an OLS regression. The dependent variable is described in the column heading. Each observation is a bank-year. Banks that entered after a clearinghouse was established are dropped. Dollar values are deflated to 1900 using Officer (2008). Robust standard are provided in brackets. * denotes significance at 10%; ** at 5% level and *** at 1% level.

Table 7: Effect of Clearinghouses on Predicted Portfolio Risk (1880-1910)

	Dropping Banks that Entered After Clearinghouse	
	Predicted Portfolio Risk Measure	
	(1)	(2)
Clearinghouse Member	0.001	0.001
	[0.001]	[0.001]
Clearinghouse in City		0.004**
But Not Member		[0.002]
Ln(Bank Age)	0.016***	0.016***
	[0.001]	[0.001]
Ln(# of National	-0.001	-0.001
Banks)	[0.001]	[0.001]
Ln(# of State	-0.001***	-0.001***
Banks)	[0.001]	[0.001]
Ln(Population)	-0.012***	-0.012***
	[0.002]	[0.002]
Fraction Living in Place	0.001**	0.001**
With More than 25,001	[0.001]	[0.001]
Ln(Farm Value P.C.)	0.009***	0.009***
	[0.003]	[0.003]
Local Fixed Effect	Bank	Bank
Year Fixed Effect	Yes	Yes
Observations	56,689	56,689
R-squared	0.400	0.401

Notes: Table presents the results of an OLS regression. The dependent variable is described in the column heading. Each observation is a bank-year. Banks that entered after a clearinghouse was established are dropped. The predicted portfolio risk measure is obtained by applying the regression results of Table A1 to the portfolios of each bank. Dollar values are deflated to 1900 using Officer (2008). Robust standard are provided in brackets. * denotes significance at 10%; ** at 5% level and *** at 1% level.

Table 8: Determinants of Bank Closure (1880-1910)

	Probability of Closing							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Clearinghouse Member	-0.015***	-0.015***	-0.014***	-0.012***	-0.011***	-0.010**	-0.011**	-0.008*
	[0.004]	[0.004]	[0.005]	[0.005]	[0.004]	[0.004]	[0.005]	[0.005]
Clearinghouse*State Bank			-0.004	-0.007			-0.001	-0.005
			[0.007]	[0.008]			[0.007]	[0.008]
State Bank Dummy	0.029***	0.035***	0.030***	0.035***	0.025***	0.028***	0.025***	0.029***
	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]	[0.005]	[0.004]	[0.005]
Ln(Bank Age)	0.012***	0.013***	0.012***	0.013***	0.021***	0.024***	0.021***	0.024***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.002]	[0.002]	[0.002]	[0.002]
Ln(# of National Banks)	-0.003	-0.004	-0.003	-0.004	0.001	0.002	0.001	0.002
	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]	[0.004]	[0.003]	[0.004]
Ln(# of State Banks)	0.014***	0.014***	0.014***	0.014***	0.016***	0.017***	0.016***	0.017***
	[0.002]	[0.003]	[0.002]	[0.003]	[0.002]	[0.003]	[0.002]	[0.003]
Ln(Population)	0.008***	0.034***	0.008***	0.034***	0.011***	0.038***	0.011***	0.038***
	[0.003]	[0.006]	[0.003]	[0.006]	[0.003]	[0.007]	[0.003]	[0.007]
Fraction Living in Place	0.005	0.005	0.005	0.005	0.006	-0.001	0.006	-0.001
With More than 25,001	[0.009]	[0.013]	[0.009]	[0.013]	[0.008]	[0.013]	[0.008]	[0.013]
Ln(Farm Value P.C.)	-0.006***	-0.001	-0.006***	-0.001	-0.007***	-0.001	-0.007***	-0.001
	[0.002]	[0.003]	[0.002]	[0.003]	[0.002]	[0.003]	[0.002]	[0.003]
Ln(Assets)					-0.014***	-0.018***	-0.014***	-0.018***
					[0.002]	[0.002]	[0.002]	[0.002]
Capital/Assets					0.046***	0.048***	0.046***	0.047***
					[0.014]	[0.014]	[0.014]	[0.014]
Indiv. Deposits/Liabilities					-0.051***	-0.049***	-0.051***	-0.049***
					[0.010]	[0.010]	[0.010]	[0.010]
Due to Banks/Assets					-0.028	-0.028	-0.028	-0.028
					[0.020]	[0.020]	[0.020]	[0.021]
Loans/Assets					0.005	0.001	0.005	0.001
					[0.008]	[0.008]	[0.008]	[0.008]
Due from Banks/Assets					-0.002	-0.009	-0.002	-0.009
					[0.011]	[0.011]	[0.011]	[0.012]
Cash/(Indiv. Deposits+Due From Banks)					-0.001***	-0.001**	-0.001***	-0.001**
					[0.001]	[0.001]	[0.001]	[0.001]
Real Estate Owned/Assets					0.099***	0.092***	0.099***	0.092***
					[0.032]	[0.031]	[0.032]	[0.031]
Location Fixed Effects	State	County	State	County	State	County	State	County
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	63,777	63,777	63,777	63,777	63,777	63,777	63,777	63,777
R-squared	0.0207	0.0222	0.0207	0.0222	0.0253	0.0271	0.0253	0.0271

Notes: Table presents the results of an OLS regression. The dependent variable is whether or not the bank closed in the following year. Each observation is a bank-year. Dollar values are deflated to 1900 using Officer (2008). Robust standard errors are provided in brackets. * denotes significance at 10%; ** at 5% level and *** at 1% level.

Table 9: Determinants of Bank Closure (1880-1910)

	Cities That Established a Clearinghouse Before 1910			
	(1)	(2)	(3)	(4)
Clearinghouse Member	-0.017***	-0.011**	-0.014***	-0.009
	[0.005]	[0.005]	[0.005]	[0.005]
Clearinghouse in City	0.027**	0.029**	0.019*	0.019*
But Not Member	[0.011]	[0.011]	[0.011]	[0.012]
State Bank Dummy	0.008	0.009	-0.006	-0.007
	[0.009]	[0.010]	[0.010]	[0.010]
Ln(Bank Age)	0.016***	0.017***	0.029***	0.031***
	[0.003]	[0.004]	[0.004]	[0.005]
Ln(# of National Banks)	-0.004	0.001	-0.011	-0.004
	[0.008]	[0.012]	[0.008]	[0.012]
Ln(# of State Banks)	0.011***	0.007*	0.014***	0.011**
	[0.004]	[0.004]	[0.004]	[0.004]
Ln(Population)	0.011	0.049***	0.027***	0.067***
	[0.009]	[0.018]	[0.009]	[0.019]
Fraction Living in Place	0.021	0.005	0.026*	0.007
With More than 25,001	[0.015]	[0.021]	[0.015]	[0.021]
Ln(Farm Value P.C.)	-0.014**	0.002	-0.016***	-0.004
	[0.006]	[0.010]	[0.006]	[0.010]
Ln(Assets)			-0.021***	-0.024***
			[0.005]	[0.005]
Capital/Assets			0.070**	0.066*
			[0.036]	[0.036]
Indiv. Deposits/Liabilities			-0.069***	-0.062***
			[0.023]	[0.023]
Due to Banks/Assets			-0.048	-0.044
			[0.039]	[0.040]
Loans/Assets			0.002	-0.004
			[0.017]	[0.018]
Due from Banks/Assets			0.041	0.036
			[0.039]	[0.039]
Cash/(Indiv. Deposits+Due			-0.004***	-0.004***
From Banks)			[0.001]	[0.001]
Real Estate Owned/Assets			0.123**	0.127**
			[0.057]	[0.057]
Location Fixed Effects	State	County	State	County
Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	13,045	13,045	13,045	13,045
R-squared	0.0274	0.0304	0.0368	0.0399

Notes: Table presents the results of an OLS regression. The dependent variable is whether or not the bank closed in the following year. Each observation is a bank-year. Dollar values are deflated to 1900 using Officer (2008). Robust standard errors are provided in brackets. * denotes significance at 10%; ** at 5% level and *** at 1% level.

Table A1: Determinants of Bank Closure Before Clearinghouse Entry (1880-1910)

	Probability of Closing In Years Before City Gained a Clearinghouse
	(1)
State Bank Dummy	0.002
	[0.015]
Ln(Bank Age)	0.027***
	[0.006]
Ln(# of National Banks)	-0.017
	[0.026]
Ln(# of State Banks)	0.002
	[0.008]
Ln(Population)	-0.014
	[0.034]
Fraction Living in Place	0.000
With More than 25,001	[0.031]
Ln(Farm Value P.C.)	0.016
	[0.025]
Ln(Assets)	-0.021*
	[0.012]
Capital/Assets	0.018
	[0.056]
Indiv. Deposits/Liabilities	-0.072**
	[0.032]
Due to Banks/Assets	-0.087
	[0.082]
Loans/Assets	-0.015
	[0.025]
Due from Banks/Assets	0.067
	[0.051]
Cash/(Indiv. Deposits+Due	-0.002**
From Banks)	[0.001]
Real Estate Owned/Assets	0.082
	[0.078]
Location Fixed Effects	County
Year Fixed Effects	Yes
Observations	3,483
R-squared	0.030

Notes: Table presents the results of an OLS regression. The dependent variable is whether or not the bank closed in the following year. Each observation is a bank-year. The sample consists of banks in cities that received a clearinghouse before 1910 and drops any observation when a clearinghouse was present. Dollar values are deflated to 1900 using Officer (2008). Robust standard errors are provided in brackets. * denotes significance at 10%; ** at 5% level and *** at 1% level.