Financial Fragility and Bank Leverage: Trends and Cycles during the National Banking Era*

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Abstract

Financial crises are a defining feature of the U.S. National Banking Era of the late 19^{th} century. Back then, banks had substantially higher capital ratios than present-day financial intermediaries – although capitalization trended downwards throughout the period. Previously, aggregate and disaggregate investigations on this imporant era of U.S. economic development relied on a measurement of bank capital as a gross concept. Using a novel, recently digitized long-run panel data set of New York state banks spaning the whole National Banking Era, we develop a new adjusted *net* measure of bank capital. To enable meaningful comparisons with modern day concepts of bank leverage, we net out lending of commercial banks to their own directors that are usually the only capital holders during that time period. We find that – depending on the time period – the levels and the dynamics of capitalization vary substantially using our new net measure of leverage. For example, during the crisis 1884 our data reveals novel patterns such as substantial inter-crisis repayments of director loans to bloster the *net* capital while leaving *gross* capital little changed. Furthermore, at the end of the sample our new measure of *net* capitalization is substantially lower on average than even the low levels of capitalization we saw in the U.S. in the 2000s preceding the Global Financial Crisis.

Keywords: Financial Stability, Money and Banking, U.S. Economic History, New York State

JEL Codes: E51, E52, E58, G18, G21

*The views expressed in this paper are those of the author and are not necessarily reflective of views at the Federal Reserve Bank of Dallas or the Federal Reserve System. Any errors or omissions are the sole responsibility of the authors.

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1 Bank Leverage in the National Banking Era

How did cross-sectional patters of financial fragility and leverage in the U.S. banking system evolve during the National Banking Era? And what can we learn from those patterns? The National Banking Era was marked by major financial panics in 1873, 1884, 1890, 1893, and 1907 (Sprague, 1910; Wicker, 2002) that eventually led up to the establishment of the Federal Reserve System in 1914 (Calomiris and Gorton, 1991). As the U.S. financial system became more interconnected (James, 1978), risk from financial contagion from localized shocks rose. Paddrik, Park, and Wang (2016) investigate how the National Banking Act of 1863 (NBA) altered the network structure and interconnectedness of the banking system using a repeated cross-section before and after the passing of the NBA. To answer these questions we digitize a long-term panel of commercial bank data in New York State spanning to whole national banking area. We show that secular trends in interconnectedness, as measured by inter-institutional liabilities, are in place. We also investigate cross-sectional differences in the levels and dynamics around major banking panics in important balance sheet ratios.

Furthermore, our cross-sectional analysis adds to recent research on corporate governance of commercial banks in the 19th century United States (Bodenhorn, 2013; Bodenhorn and White, 2015). Indeed, we use insights from that literature to generate a novel *net* measure of bank capital and illustrate its cross-sectional trends and cycles in the National Banking Era. This measure sheds new light on recent findings. For instance, Jaremski and Rousseau (2015) point to the *rise in deposits*, in particular, they point out that the deposits to capital ratio throughout the national banking era rose from 100 to more than 500 percent. Our measure suggests that the rise was substantially stronger – indeed about double what Jaremski and Rousseau (2015) find, once one nets out dues to the commercial banks' own directors.

Our objective is to document long-term trends and cyclical movements in bank capital during the National Banking Era. In particular, we focus on cross-sectional differences in bank capital trends and cycles, thus shedding new light on important economic mechanisms that, while narratively discussed in, might otherwise be hidden by aggregate figures such as those reported in Friedman and Schwartz (1963). Our focus on bank level data permits meaningful comparisons leverage in banks in different economic regions, bank of different degree of interconnectness or bank size. We find beyond immediate changes following the

NBA a gradual increase in interconnectedness, in particular, on the liability side of the bank's balance sheet. The median exposure to other intermediaries doubles from about 6 percent of total assets to about 12 percent within a 25 year period.

This novel, long-run data set reveals two findings. First, interconnectedness as measured by due to and due from other financial institutions increased substantially over the sample period. Second, a new measure of bank capitalization that nets out bank assets that are due to their own directors using bank–level data on all state–chartered banks in New York State during the National Banking Era. We find marked differences in the level and cyclical behavior between the traditional leverage measure and our new "net" capital measure. For instance, during the crisis of 1884 bank directors tended to repay loans to their own banks, thereby raising their banks' capital ratios during the course of the recession.

We have collected and digitized the *Annual Report of the Superintendent of Banks*, published by the State Superintendent of Banks of New York, for the years 1874 – 1900, with some breaks in the data coverage.[1] State law required the Superintendent of Banks to publish the names, location, and financial information of all state-chartered banks. Figure 1 illustrates our current data coverage and plots the number of banks over our sample period. The solid gray vertical areas denote NBER–designated recessions, the thin vertical black lines designate the unevenly distributed sample quarters. The early part of our sample contains 78 banks and by the end of our sample period this number rises to over 220 banks.

In the 19^{th} century, directors and senior executives typically held the vast majority of shares in their institutions. New York State law required bank directors to own a minimum quantity of stock, and bank stock owners in New York State faced double liability. Table 1 reports the assets and liabilities published in the *Annual Report*. Particular to our study, on the assets side of the balance sheet the reports separately list "Loans and Discounts, less due from directors" from "Due from directors." This distinction allows us to devise a novel notion, the "net" capital ratio; that is, the paid-in capital less due from directors, relative to assets. If a bank failed, regulators assessed stockholders the par value of each share (typically $100), which went into a fund used to repay depositors, reimburse liquidators, and cover losses. Also, bank officers typically owned stock in their institutions, and often faced civil suits and

[1] We currently have the remaining years under contract for data entry, with the completion date of April 1, 2016. At that point, we will have continuous coverage from 1868-1920

criminal prosecutions after their banks suspended operations.

Our analysis based on observable subcategories of the balance sheets in the *Annual Reports* reveals that during the National Banking Era New York state banks, indeed, lent a lot to their own directors — giving credence to the relevance of our contribution in this paper, the *net capital ratio*. Figure 2 plots the percent of assets due from directors (or loans to directors) against asset size for banks operating in New York City versus banks outside New York City. Banks in New York City typically lent more to their directors than banks of their same size in other areas of the state. For banks in both regions, the ratio declnies as bank size increases. For most country banks, loans to directors to assets was at least four percent, and for New York City banks it was at least five percent.

These loans to directors matter for bank capital and more broadly bank liquidity. Haubrich (1994) provides a modern application of principal–agent theory to incentives, executive compensation, equity stakes, and the firm's debt-equity mix. For 19^{th} century commercial banks Bodenhorn (2003) and Bodenhorn and White (2015) produce evidence that bank capital and loans to bank directors had effects on liquidity and bank survival.

The observation that loans to directors constituted a noticeable percent of banks' balance sheets in New York brings up an interesting issue — What was the relevant, actual *de facto* rather than *de jure* amount of equity tied up in paid-in capital for banks during the National Banking Era? While the issue of lending to directors has been discussed in previous research (Lamoreaux, 1997), to date few researchers have pointed to the different corss-sectional trends and cycles these types of loans from the perspective of the *de facto* risk-exposure of bank directors. Bank directors were required to pay in a certain amount of capital and had double liability on that exposure, yet at the same time our data shows bank directors were borrowing heavily, indeed with cyclical patterns, from their own banks. In other words, double leverage meets double liability.

For example, assume a bank has \$100 in assets and has paid-in capital of the amount \$10 from its directors. If a director takes a loan from the bank for \$9, then the actual *de facto* amount of equity in the bank comes down to \$1. Neglecting the implications of this peculiar liability structure may overstate the true capital ratios of banks in an era where the practice of lending noticeable amounts to bank directors was common.

In order to demonstrate why this distinction is important, we first discuss the gross

capital ratios for banks in New York State, and then contrast that with our "net" capital ratio that nets out bank assets due to their own directors. Figure 3 presents the mean, median, and interquartile range of the commonly used gross capital ratio for all state–chartered banks in New York State. As previous research has shown, capitalization trended down throughout the period beginning with a massive fall in 1878. Furthermore, the cross-sectional capital ratio is top skewed since, throughout our sample, the median is consistently below the cross-sectional mean. This secular trend holds across the distribution: the mean, median, and quartiles as Figure 3 shows.

Bank capital requirements for state banks in New York varied by the population of the town in which the bank operated. Banks residing in smaller towns were required to hold lower levels of capital than banks in larger towns. Additionally, country banks serve different functions and clientels than city banks. This leads to a common distinction in the historical literature between country and city banks. Figure 4 illustrates that both country and city state banks have declining capital ratios. City banks are generally more highly leveraged than country state banks. Country banks were better capitalized than banks in New York City throughout the sample period. This might be due to the fact that country banks were smaller than New York City banks and, due to the absolute capital requirements set by the state, were more likely to have higher capital ratios. We also see the same movements in gross capital ratios that Jaremski and Rousseau (2015) find in the aggregate capital–deposits ratio, notably the drops in 1879 and 1896.

Country banks tend to be better capitalized and smaller than city banks. Given capital requirements in New York were absolute and based on population of the bank's city, the size consideration is important and an aspect we can explore given our microdata. Figure 5 contains the gross capital ratio ratios for the largest and smallest decile sizes of banks. The general patterns remain the same as those in Figure 4: capital ratios at small banks resemble those of country banks and are higher than those at large banks, whose capital ratios are similar to those in New York City. Figure 5 highlights differences in the dynamics of the capital ratios between large and small banks.

Gross capital ratios for small banks appear to behave cyclically. Capital ratios for the smallest banks tend to rise in recessions (the shaded areas of the figure) and fall during the economic expansions. Gross capital ratios for the smallest banks also fall in the early part

of the sample period, but after 1890 they tend to remain in the mid to low thirty percent range. In contrast, gross capital ratios for the largest size decile of banks appear to behave acyclically, and generally move in a downward trend as the sample period progresses. This is a finding consistent with other research. During the 19^{th} century, capital ratios in U.S. banks were declining from levels as high as 40 percent in 1865 to 10 percent in 1920 (Haubrich, 2015). The period of 1879–1881 saw a sharp drop in capitalization, coinciding with the federally–mandated conversion of greenbacks to specie in the Specie Act of 1874. However, while gross capital ratios at the smallest banks in New York fell, the ratios at the largest banks remained quite stable in the 1890s, if slightly trending downward. This finding somewhat contrasts with capital-deposits trend found in Jaremski and Rousseau (2015).

We now return to our *net* measure of capital, which is the ratio of paid-in capital net loans to directors, relative to assets. As Figure 2 previously demonstrated, banks in all areas of the state had issued loans to their directors. Our net measure of capital is a more accurate way to capture the *de facto* stake of bank directors in thee bank since it better reflects their true potential liability.

We now consider the net capital to assets, again focusing on the largest and smallest groups of banks in New York State. Figure 6 presents the *net* capitalization ratios for the largest and smallest bank size deciles. Here, we see starker contrasts in the trends and evolution of capital ratios beween small and large banks. The same downward trend preveails for both groups. The *net* capital ratio for large banks still appears to be acyclical over the sample period, but the pattern for small banks is markedly different. The patterns for small banks show that bank directors borrow from the bank in recessions and then repay the loans during the following economic expansion. This is most evident prior to the Panic of 1884 but the pattern is similar in almost all of the sample. Interestingly, another important pattern of using our new *net* measure of capital is that for the largest banks, capital levels seem to approach the *gross* levels of modern banks held in the 2000s just prior to the recent Global Financial Crisis.

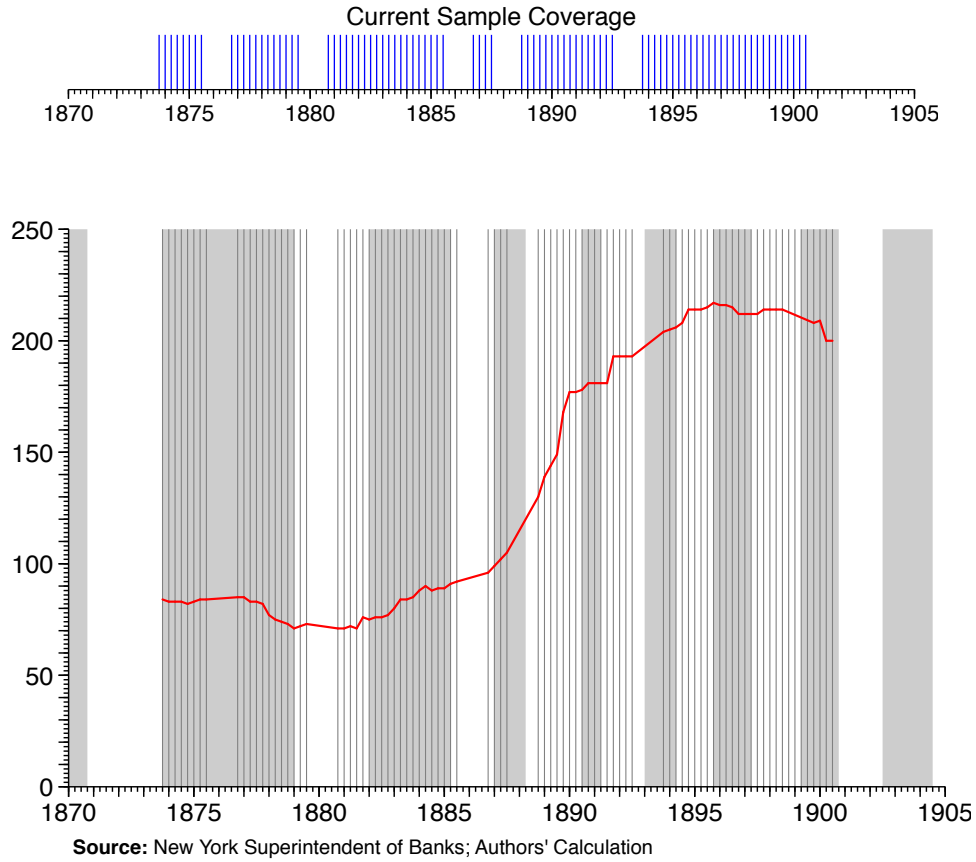
The *gross* and *net* capital ratios for large banks, which were operating at the center of the money market, fell during the era bottoming out substantially below contemporary modern banks low capital levels. On top of that measures of vulnerablity show marked upwards trends – by some measures the banking system became substantially more interconnected and fragile. Figure 7 and Figure 8 plot the percentage of assets due from financial institutions

and the percent of liablilites due to financial institutions, respectively. Both figures show skewedness, but more so on the asset side ("due from").

Interconnectedness rose markedly in Figure 8 on the liability side of New York banks. This was likely due to the increasing amount on deposit by banks in the interior portion of the nation with banks in New York. Scholars have long noted that the National Banking Acts of 1863 and 1864 pooled reserves in the banks in New York City, adding to the fragility of the banking system. For this reason, we again separate banks in New York City and banks outside the city in Figure 9 and Figure 10. These figures show that the net interconnectedness of both country and New York City banks rose during the era.

Figures

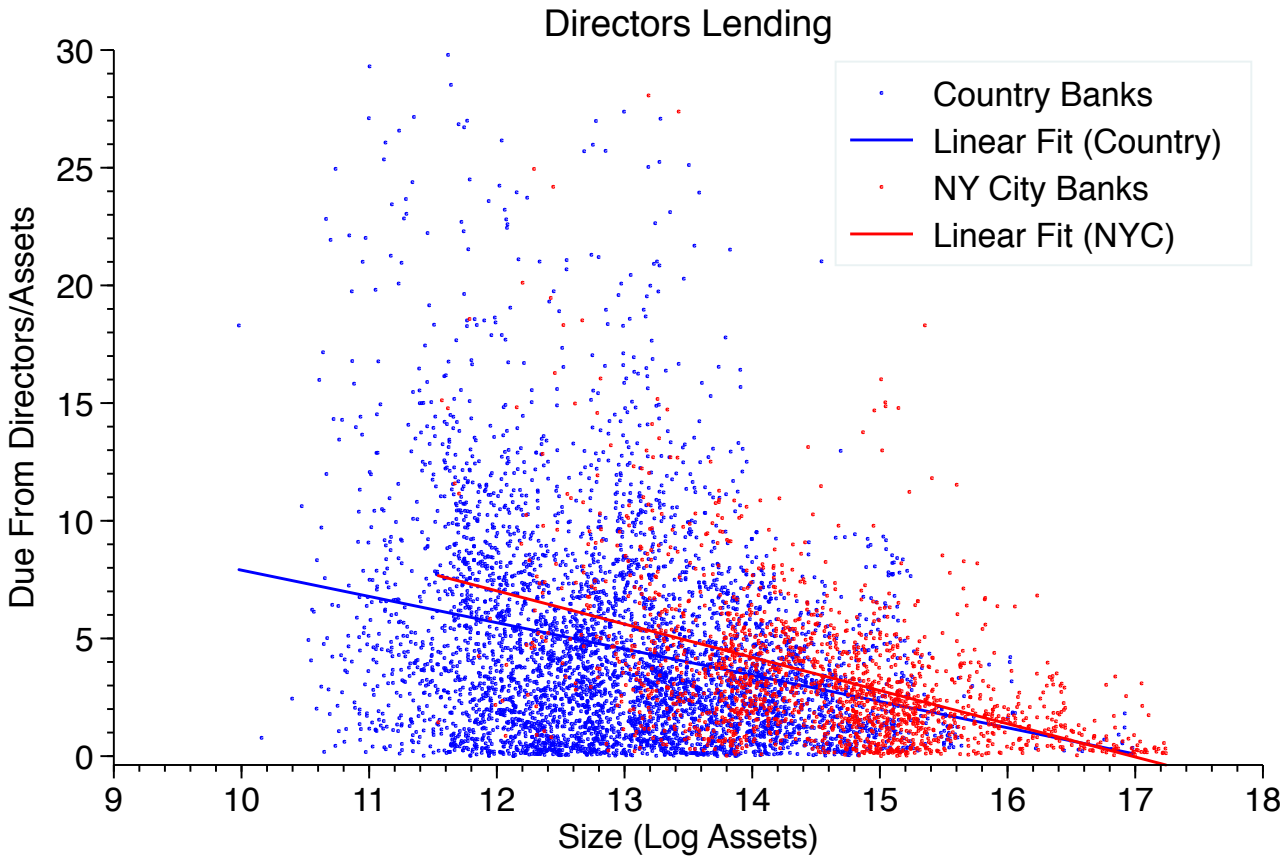
Figure 1: Number of New York State Banks in the Sample



Source: New York Superintendent of Banks; Authors' Calculation

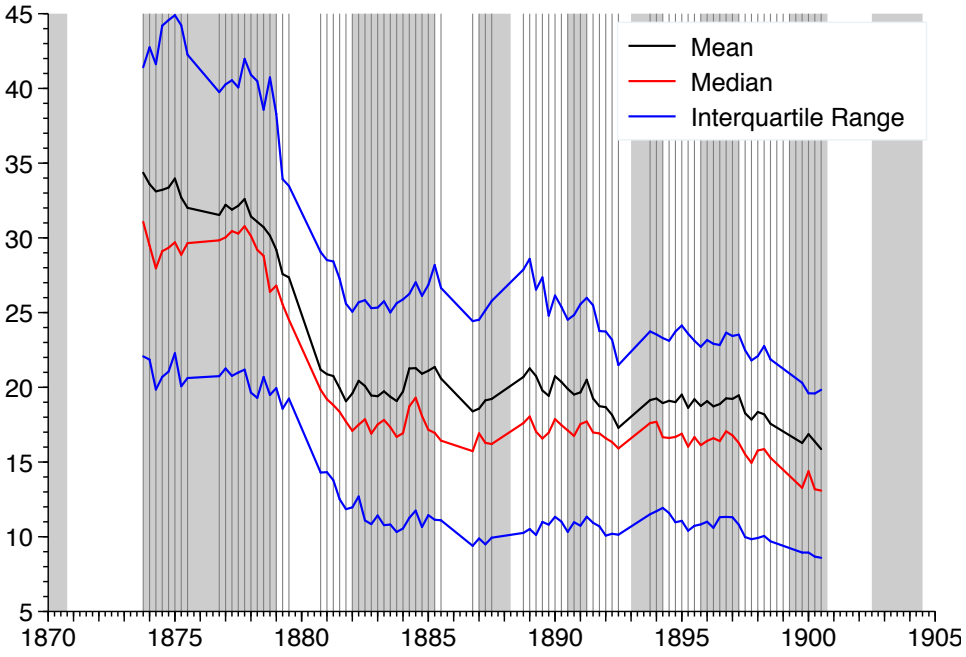
Note: Major ticks on the time-axis denote the Q1 of each year, minor ticks denote Q2, Q3, and Q4.

Figure 2: Scatter Due From Directors Against Size – NYC versus Country



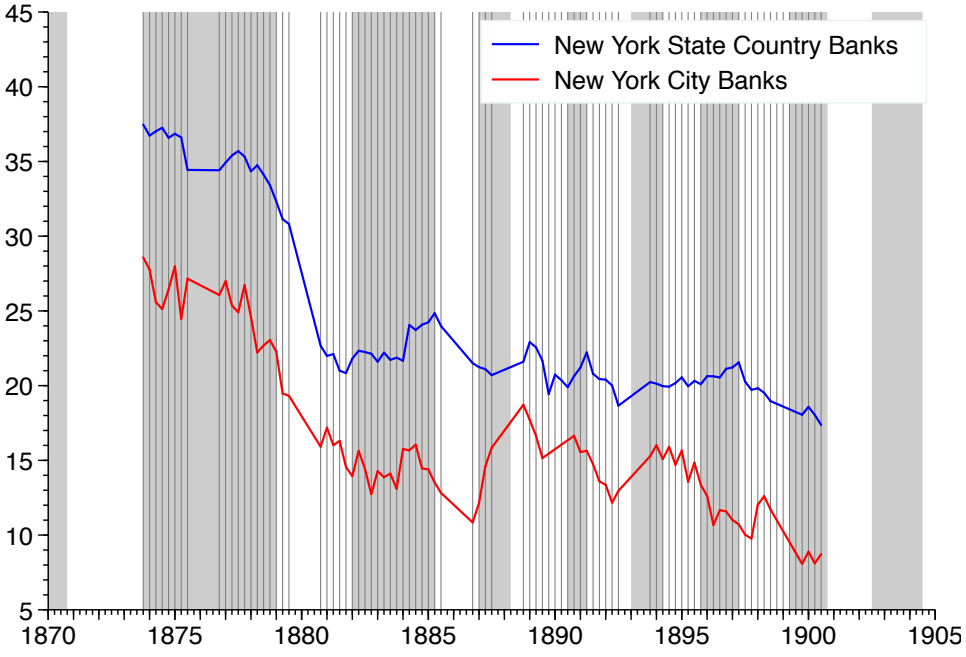
Source: New York State Superintendent of Banks; Authors' Calculation.

Figure 3: Capital Ratio in Sample (Mean and Interquartile Range)



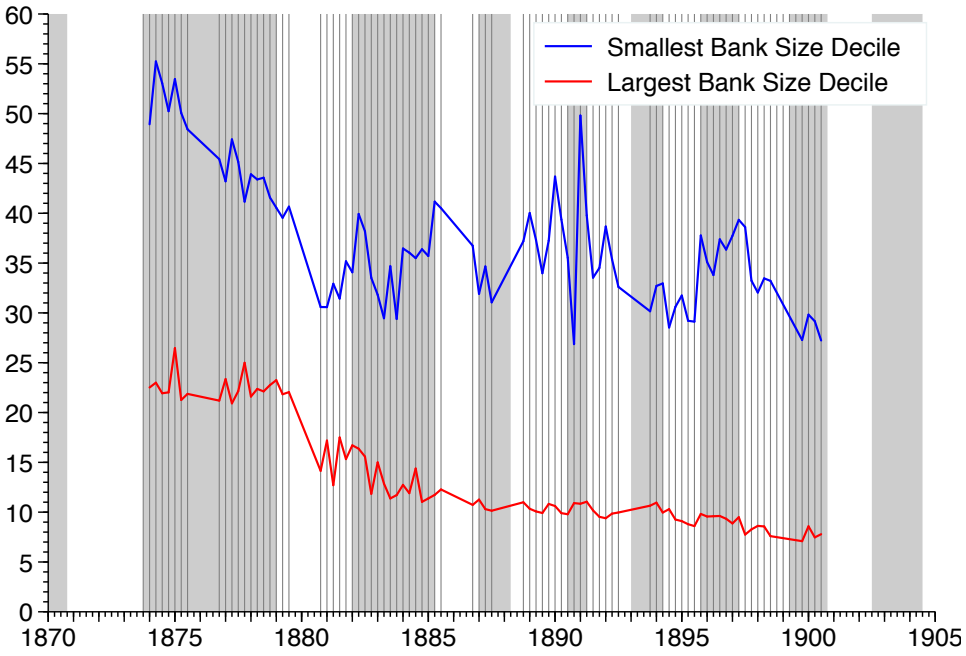
Source: New York State Superintendent of Banks; Authors' Calculation.

Figure 4: Capital Ratio NYC versus Country (Mean)



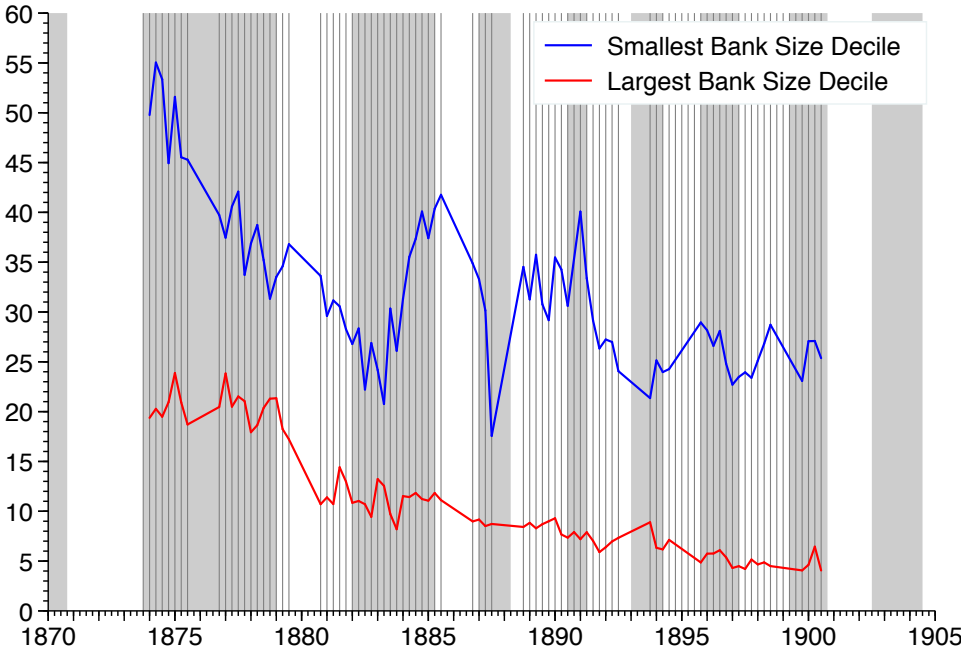
Source: New York State Superintendent of Banks; Authors' Calculation.

Figure 5: **Gross** Capital Ratio Large Versus Small Banks (Mean)



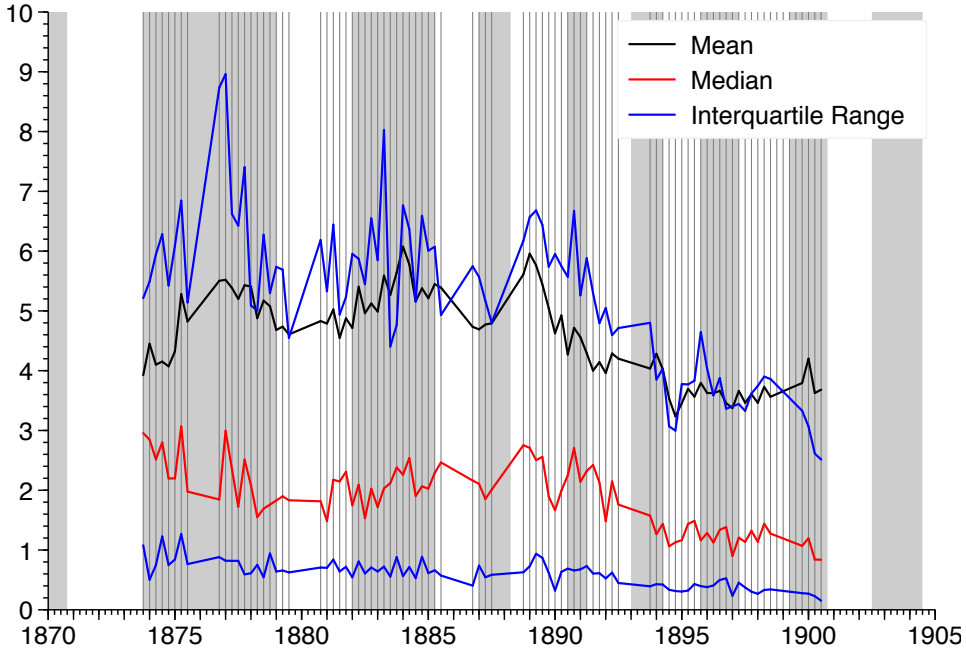
Source: New York State Superintendent of Banks; Authors' Calculation.

Figure 6: **Net** Capital Ratio – Large Versus Small Banks (Mean)



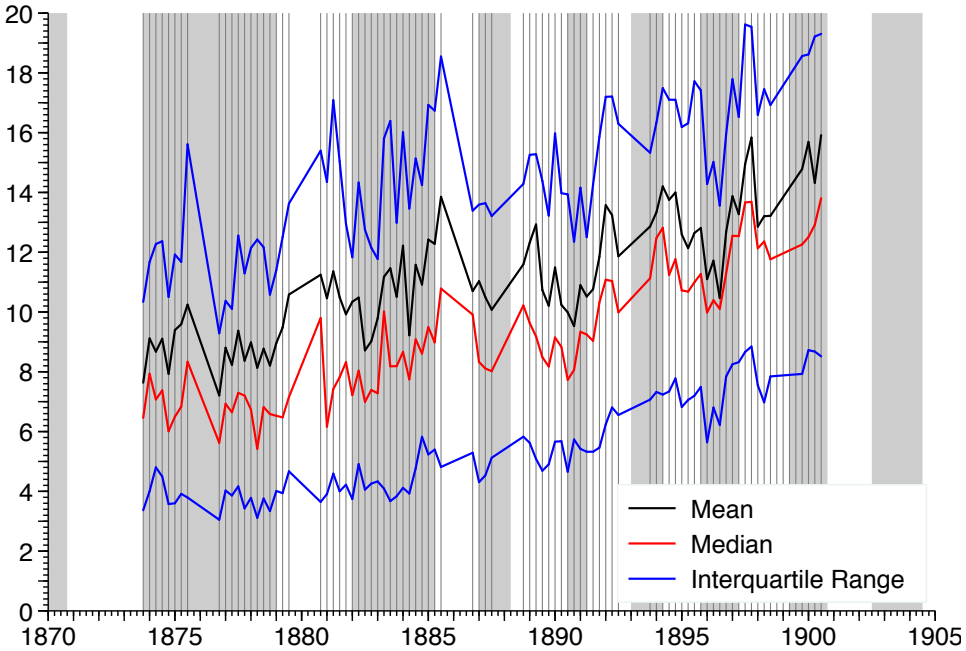
Source: New York State Superintendent of Banks; Authors' Calculation.

Figure 7: Interconnectedness – Due From FIs (Mean and Interquartile Range)



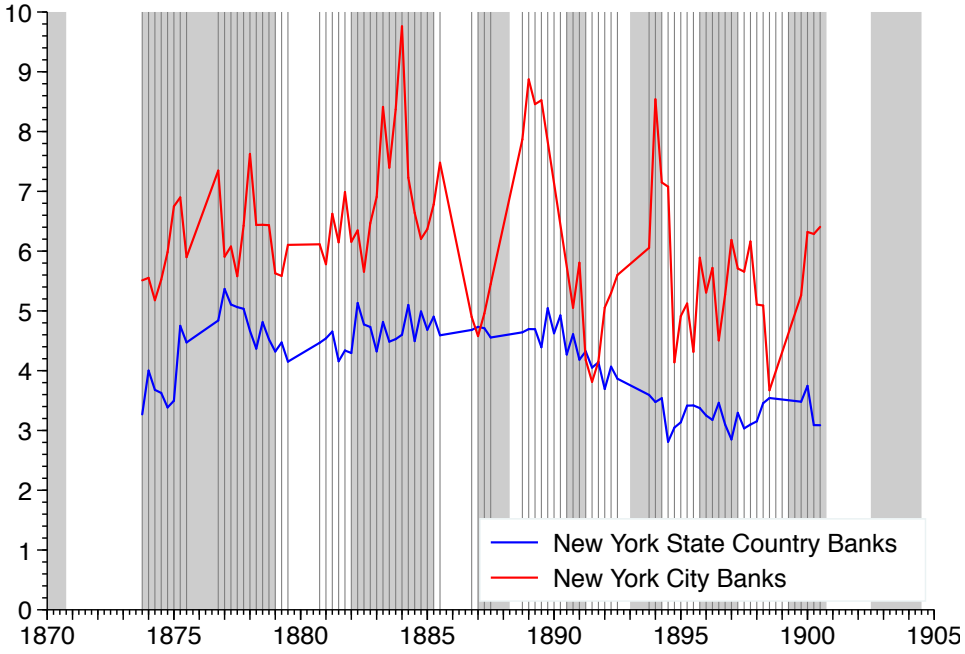
Source: New York State Superintendent of Banks; Authors' Calculation.

Figure 8: Interconnectedness – Due To FIs (Mean and Interquartile Range)



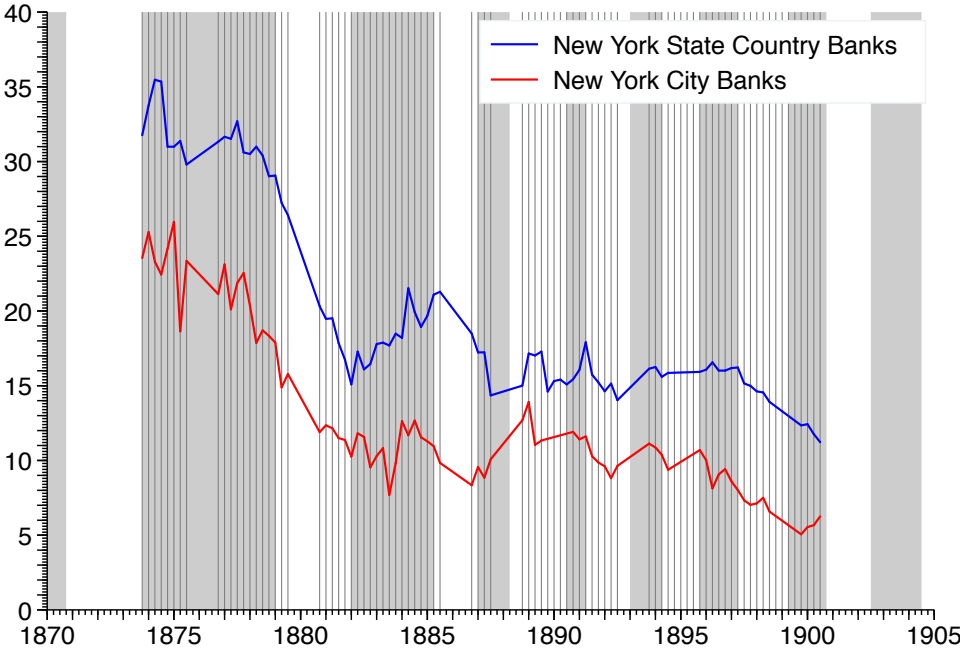
Source: New York State Superintendent of Banks; Authors' Calculation.

Figure 9: Due From FIs Ratio NYC versus Country (Mean)



Source: New York State Superintendent of Banks; Authors' Calculation.

Figure 10: Due To FIs Ratio NYC versus Country (Mean)



Source: New York State Superintendent of Banks; Authors' Calculation.

Table 1: Balance Sheet Variables and Categories

Item	Category	Description
1	Misc.	Bank Name
2	Misc.	City
3	Misc.	Date Organized
4	Misc.	President
5	Misc.	Cashier
6	Misc.	Date of Figures
7	Assets	Loans and Discounts, less due from directors
8	Assets	Due from directors
9	Assets	Overdrafts
10	Assets	Due from trust companies, etc
11	Assets	Real estate
12	Assets	Bonds and mortgages
13	Assets	Stocks and bonds
14	Assets	Specie
15	Assets	United States legal tender notes and circulating notes of national banks
16	Assets	Cash items
17	Assets	Loss and expense account
18	Assets	Assets not included in either of the above heads
19	Assets	Add for cents
20	Assets	Total Resources
21	Liabilities	Capital
22	Liabilities	Surplus fund
23	Liabilities	Undivided profits
24	Liabilities	Circulation
25	Liabilities	Due depositors on demand
26	Liabilities	Due to trust companies, etc
27	Liabilities	Due individuals and corporations
28	Liabilities	Due treasurer of the State of New York
29	Liabilities	Amount due not included in either of the above heads
30	Liabilities	Add for cents
31	Liabilities	Total Liabilities

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Principles of Microeconomics: 2007, 2009, 2010
Intermediate Macroeconomics: 2009, 2011, 2012, 2013, 2014, 2015, 2016
Macroeconomic Theory with Calculus (using David Romer's *Advanced Macroeconomics*): 2013
Money and Banking: 2007, 2008, 2009, 2010, 2011, 2012, 2014
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European Economic History: 2008, 2011
History of Financial Crises: 2010, 2013
Corporate Finance: 2012, 2013, 2014, 2015, 2016

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"Leverage, Liability, and Commercial Banks: Evidence from the Booms Before the Great Depression and Great Recession" with Christoffer Koch and Gary Richardson. Manuscript requested for special issue of *Journal of Economic Dynamics and Control*.

"When the Music Stopped: Transatlantic Contagion During the Financial Crisis of 1931" with Gary Richardson. NBER Working Paper #w17437. Manuscript requested by the editor of *Explorations in Economic History*. Revision requested and submitted.

"Excess Reserves during the Great Contraction: Evidence from the Central Money Market of New York City, 1929 to 1932."

Research Ideas in Progress:
"Did Reserve Requirements Discourage State Banks from Joining the Fed?" with Marco Cornia and Haelim Park.

"Time to Panic! Risk Management and Lending Behavior in the Panic of 1857." with Nick Sivon (undergraduate student at Southwestern University).

"The Metropolitan National Bank and the Panic of 1884: The First Example of Too-Big-To-Fail" with Ellis Tallman.

"Benford's Law in Historical Perspective: Evidence from New York State banks in the 19th Century" with Christoffer Koch.

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Archival consultant for the Federal Reserve Bank of Dallas. Duties include archiving and assessing the importance of historical documents recently recovered.

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Expert witness, IMS Recruiting Services. Serving as an expert witness in a securities fraud case involving mortgage backed securities and loan applicant quality.

Accuracy Checker, Numerical and Analytical Questions, Lawrence Ball, *Money, Banking, and Financial Institutions*, 2nd Edition.

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- *The American Economic Association Annual Meetings.* "Commercial Bank Leverage and Regulatory Regimes: Comparative Evidence from the Great Depression and Great Recession." Session was one of those chosen for national webcasting. San Francisco, CA. January 6.

2015

- *Large-scale Crises: 1929 vs 2008*, Università Politecnica delle Marche. "Commercial Bank Leverage and Regulatory Regimes: Comparative Evidence from the Great Depression and Great Recession." with Christoffer Koch and Gary Richardson. Ancona, Italy. December 2015.
- *NBER Summer Institute,* Development of the American Economy Workshop Workshop, "Leverage, Liability, and Commercial Banks: Evidence from the Booms Before the Great Depression and Great Recession" with Christoffer Koch and Gary Richardson. Cambridge, MA. July 9.
- *Federal Reserve System Applied Microeconomics Conference*, Federal Reserve System, "Leverage, Liability, and Commercial Banks: Evidence from the Booms Before the Great Depression and Great Recession," with Christoffer Koch and Gary Richardson. Dallas, Texas, May, 2015.

2014

- *Central Banking in Historical Perspective: One Hundred Years of the Federal Reserve*,," Did the Reserve Requirement Increments of 1936-1937 Reduce Bank Lending? Evidence from a Natural Experiment" with Haelim Park. San Francisco, California. March 7.
- *Midwest Economics Association Meetings*, " Did the Reserve Requirement Increments of 1936-1937 Reduce Bank Lending? Evidence from a Natural Experiment" with Haelim Park. Chicago, Illinois. March 22.
- *NBER Summer Institute,* Monetary Economics Workshop, " Did the Reserve Requirement Increments of 1936-1937 Reduce Bank Lending? Evidence from a Natural Experiment" with Haelim Park. Cambridge, MA. July 7.

2013

- *Walk the Talk? Challenges for Monetary Policy Actions and Communications in Uncertain Times,* "Did the Reserve Requirement Increments of 1936-1937 Reduce Bank Lending? Evidence from a Natural Experiment" with Haelim Park. Waterloo, Canada. August 8.
- *Economic History Association Meetings*," Did the Reserve Requirement Increments of 1936-1937 Reduce Bank Lending? Evidence from a Natural Experiment" with Haelim Park. Washington, D.C. September 17.

2012

- *The euro: (Greek) Tragedy or Europe's Destiny?* "When the Music Stopped: Transatlantic Contagion During the Financial Crisis of 1931" with Gary Richardson. Nuremberg, Germany.
- *Workshop on Financial Stability*, When the Music Stopped: Transatlantic Contagion During the Financial Crisis of 1931," with Gary Richardson Munster, Germany, April 12.
- *Macroeconomics Research at Liberal Arts Colleges,* "When the Music Stopped: Transatlantic Contagion During the Financial Crisis of 1931." with Gary Richardson. Lafayette College, Easton, PA. August 2012.

2011

- *Allied Social Science Association (ASSA) Meetings*, Denver, Colorado. "When the Music Stopped: New York Banks During the International Financial Crisis of 1931" (with Gary Richardson, UC Irvine).
- *Economic and Business History Society Conference* (April 2011) Columbus, Ohio. "We've Been Here Before: Leverage, Speculation, and the Ohio Banking Panic of 1854"
- *Economic History Association Meetings* (September 2011). "When the Music Stopped: Transatlantic Contagion During the Financial Crisis of 1931" (with Gary Richardson).

2010

- *Allied Social Science Association (ASSA) Meetings* (Discussant), Atlanta, Georgia.
- *University of California, Irvine* "Credit Expansion and Contraction during the Great Depression: An Empirical Examination of Search Models of Credit Markets" with Haelim Park(March 2010)
- *University of California, Merced*, Credit Expansion and Contraction during the Great Depression: An Empirical Examination of Search Models of Credit Markets" with Haelim Park (March 2010)

2009

- *Midwestern Economic Association Meetings*, Cleveland, Ohio (March 2009), *Economic and Business History Conference*, Grand Rapids, Michigan (April 2009)
- *Causes and Consequences of the German Financial Crisis in National and International Perspective*, Bonn, Germany (September 2009)
- *Social Science History Association Meetings*, Long Beach, California (scheduled, November 2009).

2008

- *Sixth World Congress of Cliometrics*, Edinburgh, Scotland. (July 2008).
- *Economic History Association*, New Haven, Connecticut (September 2008)
- *Social Science History Association Conference*, Miami, Florida. (October 2008)
- *Southern Economic Association*, Washington, D.C. (November 2008).

2007

- *Social Science History Association Conference*, Chicago, Illinois. (November 2007).
- *Economic History Seminar*, University of Michigan at Ann Arbor (October 2007).

2006

- *Southern Economic Association Conference* in Charleston, South Carolina. (November 2006).
- *Social Science History Association Conference* in Minneapolis, Minnesota (November 2006).
- *Economic History Association Conference* in Pittsburgh, Pennsylvania (September 2006).
- *All-UC Group in Economic History Conference* in Riverside, California (May 2006).

Grants, Fellowships, and Awards:
Sam Taylor Fellowship, 2015
Southwestern University, Faculty-Student Research Grant, 2014.
University of Michigan at Dearborn, Small Research Grant, 2009.
Arthur Cole Grant in Aid, Economic History Association, 2008
University of Michigan at Dearborn, Academic Apprentice Grant, 2008
University of Michigan at Dearborn, Faculty Seed Grant, 2007
University of California, Irvine, Regents Dissertation Fellowship, 2006.
University of California, Irvine. Department of Economics Summer Fellowship, 2004, 2005.
University of California, Irvine. Regents Fellowship, 2001.
Stephen F. Austin State University, Economics Student of the Year, 2001.

Referee: *Explorations in Economic History, Eastern Economic Journal, Journal of Economic History, Essays in Economic and Business History, Social Science Quarterly*

Affiliations: American Economic Association, Economic and Business History Society, Economic History Association, Southern Economic Association.