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Stopping contagion with bailouts: Micro-evidence from Pennsylvania bank networks during the panic of 1884☆

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ABSTRACT

Using a newly constructed historical dataset on the Pennsylvania state banking system, detailing the amounts of "due-froms" on a debtor bank-by-debtor bank basis, we investigate the effects of the Panic of 1884 and subsequent private sector-orchestrated bailout of systemically important banks (SIBs) on the broader banking sector. We find evidence that Pennsylvania banks with larger direct interbank exposures to New York City changed the composition of their asset holdings, shifting from loans to more liquid assets and reducing their New York City correspondent deposits in the near-term. Over the long-term though, only the lower correspondent deposits effect persisted. Our findings show that the banking turmoil in New York City impacted more exposed interior banks, but that bailouts of SIBs by the New York Clearing House likely short-circuited a full-scale banking panic.

1. Introduction

The global financial crisis highlighted the issues of regulatory forbearance and the public bailout of systemically important banks (SIBs). Public interventions around the world were based on the notion that the failure of SIBs, like Citigroup in the U.S. and the Royal Bank of Scotland in the U.K., would precipitate runs and failures elsewhere in the financial sector, freeze the flow of credit and payments to the real economy, and lead to a depression (Laeven et al., 2014). In the wake of the crisis, many of these SIBs have actually grown larger, due to consolidation within the industry, potentially increasing the need for collective support for these institutions in times of stress (Lambert et al., 2014).[1] Yet, despite the expectation of interventions in future crises, there has been little empirical study on how the public bailout of SIBs affects the rest of the financial sector.

An empirical study of the effects of bailouts of SIBs on other banks confronts a number of practical difficulties. First, it is often hard to identify *ex ante* which banks are systemically important. For example, the Financial Stability Board, which monitors global financial stability and proposes international standards, only began constructing lists of global systemically important banks (G-SIBs) in 2011 (FSB, 2011 and 2014). When the U.S. government decided to provide asset guarantees and additional capital to Citigroup in November 2008, its decision was based "as much on gut instinct and fear of the unknown as on objective criteria," accord-

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[1] At the same time, there have been a number of legal and regulatory changes passed around the world to limit the contingent taxpayer liability for such bailouts. For example, the European Union now requires "bail-in" of a minimum of 8% of other liabilities (that is, conversion of debt or debt-like instruments to equity) before a public bailout of a bank may be undertaken (see the Bank Recovery and Resolution Directive, adopted April 2014).

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ing to a government investigation (SIGTARP, 2011). While size is the most well-known indicator of systemic importance, other factors, such as interconnectedness, the lack of readily available substitutes or infrastructure for their services, their global activity, and their complexity, may also make institutions systemically important (FSB, 2013).

Second, it is tough to disentangle losses and disruptions due to counterparty exposure from those due to other factors. The highly complex modern financial environment, characterized by myriad instruments held by a number of parties, makes the determination of counterparty exposures across financial institutions difficult and complicates the identification of risk channels. Furthermore, exposures may be direct or indirect, such that a bank may not recognize that they have strong second or third order connections to a particular SIB.

In this paper, we exploit banking disturbances and the subsequent bailouts of key banks by the membership of the New York Clearing House during the Panic of 1884 to assess the effects of the bailout of SIBs on other banks.[2] Using new data on the correspondent network of state-chartered banks in Pennsylvania at the time, we calculate the degree of counterparty exposure of each Pennsylvania bank to New York City banks and see how differential degrees of interbank exposure to New York City affected the dynamics of deposit and lending growth before and after the Panic of 1884. If efforts by the New York Clearing House to rescue troubled banks failed and distress had propagated, cash payments and deposit access would have been interrupted more for banks with higher exposures to New York City, negatively impacting their balance sheets and depressing their ability to engage in lending. Focusing on this differential effect allows us to be more confident that it is the Panic of 1884 underlying any estimated effect rather than some other common macroeconomic driver.

Our analytical results show that more exposed interior banks in Pennsylvania changed their behavior during the panic even though the clearinghouse's bank bailouts appear to have succeeded in preventing a large-scale bank panic outside New York City. After controlling for bank fundamentals, we find that Pennsylvania state banks with higher level of exposures to New York City had statistically significant falls in equity capital growth and rises in nonperforming assets' (captured by a Texas ratio analogue) in the quarters after the panic. There is also some evidence of a shift towards more liquid assets and a greater dependence on deposits as a financing source on impact. Over the longer term though (at the annual frequency), these differences vanish; the only robust differences are declines in the use of correspondent deposits, particularly in New York City, by more highly exposed banks.

While earlier findings of bankers, economists, and policymakers (among others, Sprague, 1910; Wicker, 2006; Gorton, 2012) argue that the Panic of 1884 was an 'incipient' panic that was contained in New York City and did not spill over to other regions, our results indicate that more exposed banks elsewhere did respond to the events in New York. However, these balance sheet responses were largely short-lived. Apart from a decline in correspondent deposits, there is no strong evidence that they lasted beyond a year.

Our paper makes three key contributions. Firstly, to the best of our knowledge, this paper provides the first microeconomic evidence on the effects of the bailouts of New York City banks on interior banks during the Panic of 1884. Existing studies have analyzed the effects of the panic and the subsequent bailouts of New York banks on New York banks rather than interior banks using aggregated measures of bank balance sheets and clearinghouse loan certificates (Sprague, 1910; Gorton, 2012; Gorton and Tallman, 2015). Wicker (2006) studied the effect of the panic on both New York and interior banks, but also only used aggregate measures and qualitative information.

Secondly, we show how financial shocks may be transmitted through networks, a key area of theoretical research (Allen and Gale, 2000; Leitner, 2005; Gai et al., 2011; Elliot et al., 2014; Acemoglu et al., 2015). While there is a growing interest in how financial networks play a role in financial contagion, empirical work on this topic has been sparse due to the difficulties in acquiring data that identifies linkages across financial institutions. Recently, some papers have focused on the National Banking Era, constructing interbank networks and examining the effect of network structure on contagion. Paddrik et al., (2015) construct bank networks before and after the National Banking Acts of 1863–1864 and study how the newly established reserve requirements changed the structure of bank networks and affected the stability of the banking system. Relatedly, Calomiris and Carlson (forthcoming) construct bank networks for national banks and study their effect on interior banks during the panic of 1893. Others have looked at the transmission of financial shocks through networks today. For instance, Puri et al., (2011) construct a dataset on the German banking system and examine the broader effects of the US financial crisis on global lending to retail customers. Along the same lines, Iyer and Peydro (2011) use a dataset on the Indian banking sector and show how a failure of a bank transmits to the rest of the financial system. Using a similar empirical strategy, we show that the bailout of systemically important banks likely helped to prevent a shock to the rest of the financial system.

Thirdly, we show empirically that collective or common support mechanisms can stabilize the financial sector during a financial crisis. Several theoretical models show that public interventions create financial fragility by inducing moral hazard and risk taking behavior (Acharya and Yorulmazer, 2007; Diamond and Rajan, 2012; Farhi and Tirole, 2012; Keister, 2015), but contribute to financial stability by preventing contagion (Freixas et al., 2000; Allen and Gale, 2000; Diamond and Rajan, 2005; Dell' et al., 2013). Empirically, many papers provide evidence that public or collective assistance encourages bank risk taking (Gropp, et al., 2014; Duchin and Sosyura, 2014), but no paper as far as we know has examined whether public or collective interventions have prevented contagion during financial crises.

Pennsylvania in the 1880s presents an ideal laboratory for several reasons. First, the structure of the U.S. banking industry during the National Banking Era makes it easy for us to identify systemically important banks. During this period, New York City banks functioned as the ultimate depository institutions where interior banks sent their interbank deposits to satisfy their reserve requirements. Due to the high degree of concentration of bank reserves in New York City, disturbances in New York City banks created disruptions for interior banks. Second, the new dataset on state-chartered Pennsylvania banks that lists the amount of "due-froms" on a debtor bank-by-debtor bank basis enables us to determine the location of the bank's correspondent and the degree of exposure to that correspondent. Lastly, due to the geographical proximity to New York City, Pennsylvania banks generally made deposits directly in correspondent banks in New York City instead of relying on correspondent banks in reserve cities. This alleviates a potential identification problem arising from indirect exposures to New York City via correspondent banks in reserve cities that made deposits in New York City. By aggregating the amount of interbank deposits by the city or town level, we calculate the level of each Pennsylvania state bank's exposures to New York City banks.

The paper proceeds as follows: Section 2 presents some historical background on the Panic of 1884; Section 3 provides data and summary statistics on the sample of Pennsylvania state banks;

[2] Of the various government support programs introduced during the recent financial crisis, the actions of the NYCH in 1884 are most analogous to the FDIC's Debt Guarantee Program (Black, Hoelscher, and Stock, 2014).

Section 4 outlines our econometric approach and presents the results; and Section 5 concludes.

2. Historical background

This section delves into three key aspects of the U.S. banking system in the 1880s: (1) the correspondent banking system, which was characterized by the concentration of bank reserves in reserve and central reserve cities and to systemic banking sector fragility; (2) the New York Clearing House Association, which would take actions on behalf of its members and even decide on bailouts during financial crises; and (3) the Panic of 1884, which precipitated collective action by the members of the New York Clearing House.

2.1. Correspondent banking system

One defining characteristic of the United States national banking era was the concentration of country national bank funds in the cities. The National Banking Acts of 1863–1864 designed the reserve pyramid with three distinct tiers. The top tier consisted of banks located in central reserve cities. New York City was designated as the only central reserve city in the original act with Chicago and St. Louis being added to the list in 1887. The middle tier of banks was reserve city banks. The number of reserve cities changed over time as new cities were added and some cities were removed from the list, from 18 at the time of the original act to 15 in 1881, to 20 in 1887. The bottom tier of the pyramid was country banks.

The newly created reserve requirements reinforced and reflected a reserve pyramid in which country banks around the United States deposited reserves in banks in reserve cities which in turn deposited reserves in New York City, which served as the central money market for financial institutions throughout the United States. This long-standing structure shaped the clientele of banks in different locations and the structure of their balance sheets.

Reserve requirements reflected the different degree of liquidity needs that financial institutions faced based on a bank's location. Central reserve city banks were required to hold a 25% specie reserve on deposits. Central reserve city banks had to keep all their reserves in their vault. Reserve city banks were required to hold a 25% reserve on deposits. They were allowed to hold one-half of the 25% as deposits with a correspondent bank in a central reserve city with the rest in cash. Lastly, country banks were required to hold a 15% reserve on deposits. They could keep three-fifths of the 15% as deposits with a correspondent bank in a reserve or central reserve city with the rest in their vault.[3]

Pennsylvania state banks enjoyed greater freedom than national banks with regards to reserve holdings. Since Pennsylvania state banks did not have reserve requirements, they were allowed to hold any liquid asset of their choice.[4] As a result, Pennsylvania state banks held a large portion of liquid assets in the form of interbank deposits rather than currency. In addition, due to its proximity to New York, many state banks held their interbank deposits directly in New York instead of using Philadelphia and Pittsburgh. Using these facts, we exploit the differential exposure to banks in New York to understand how the Panic of 1884 affected the banking system.

2.2. New York Clearing House association

Clearinghouses emerged during the 1850s to facilitate the exchange of checks. The first clearinghouse appeared in New York in 1853, followed by Boston, Baltimore, and Philadelphia in 1858. Before the creation of clearinghouses, each bank settled its balances with other banks bilaterally, with any individual bank may at the same time be making payments to one bank while receiving payments from another. After the creation of clearinghouses, each bank settled its balances with one institution, the clearinghouse and only paid the net across all other banks. By meeting in a single place at a specified time and exchanging with only one other party, the clearinghouse, check clearing was dramatically simplified.

During the National Banking Era, members of clearinghouses assumed collective responsibility and decided upon bailouts of members during banking crises. Clearinghouses took three actions to quell the drain of reserves from its member banks. First, it would organize itself as a single entity and suppress bank-specific information in order to minimize the failure of banks due to information externalities. During panics, banks were vulnerable to runs because depositors were unable to perfectly distinguish healthy (solvent) from unhealthy (insolvent) banks, leading them to sometimes run on ex ante healthy banks and thereby fuel cascading failures. The suppression of information avoided revealing weak banks. In addition, under these circumstances, the failure of an individual bank could cause changes in depositors' perception, so other banks could experience runs as well. In order to prevent this, the clearinghouse suspended the publication of individual bank balance sheet information. Only aggregate information was available, in particular the reserve surplus.[5]

Second, it would provide temporary liquidity by issuing clearinghouse loan certificates, which were joint liabilities of the clearinghouse members. The loan certificates were backed by member banks' portfolios, parts of which were submitted as collateral. An individual clearinghouse member bank which needed currency to satisfy its depositors' demands applied to the clearinghouse loan committee, submitting some of its loans and bonds for examination as collateral. Upon accepting the collateral, the clearinghouse issued certificates in the amount of no more than 75% of the perceived value of the collateral, although the 'haircut' varied. The borrowing bank agreed to pay 6% interest. The certificates could then be used to replace currency in the clearinghouse settlements.

Lastly, it would impose a suspension of convertibility of deposits into cash in order to limit the drain of cash reserves out of the banking system. In general, these suspensions were partial suspensions, which allowed some currency to be made available to depositors at a discounted value. Depositors had to pay a currency premium since there was an excess demand for cash during panics.

Among all clearinghouses, the New York Clearing House played the most important role. Interior banks deposited cash in New York City national banks and those deposits qualified as reserves meeting reserve requirements established by the National Banking Acts.

[3] While only balances at a national bank in reserve and central reserve cities satisfied reserve requirements, examiners' reports show that many national banks held their balances at country banks which were both national and state chartered institutions. This was because interbank balances were not only used to satisfy their reserve requirements, but also to facilitate their customers' business needs. In addition, many interior banks held their balances directly with banks in a central reserve city instead of relying on their reserve city banks.

[4] While national banks were subject to uniform reserve requirements and monitored by the Office of Comptroller of Currency, state banks faced different reserve requirements based on the regulations imposed by state banking departments. In the case of Pennsylvania, the state banking department did not impose any reserve requirements until May 1907 when "an act to provide for the creation and maintenance of a reserve fund in all banks, banking companies, savings banks, savings institutions, companies authorized to execute trusts of any description and to receive deposits of money, etc." was passed.

[5] Clearinghouses facing a panic suppressed bank balance sheet information that would normally be published in major newspapers. However, regulatory agencies did not suppress bank-specific information in their regular publications. For example, the Office of Comptroller of Currency published June balance sheets for national banks in its annual reports. Similarly, state banking departments published balance sheets for state banks at various frequencies.

As a result, reserves held in New York City also had become increasingly concentrated at the big banks. Because the big New York national banks sat at the top of the reserve pyramid, their ability to rearrange reserves combined with the supervisory capabilities of the New York Clearing House over its members presented them with nascent central bank powers.

During the National Banking Era, 1863–1914, there were five major panics which required collective action by the members of the New York Clearing House. All five panics required the suppression of bank-specific information and circulation of clearinghouse loan certificates. Three of the five panics (1873, 1893, and 1907) required the suspension in the convertibility of deposits to cash. It is notable that the timing of the issuance of clearinghouse loan certificates and of the announcement of suspension were separate decisions in prior National Banking Era panics, while in 1907 they were made simultaneously.

2.3. Panic of 1884

All banking panics, with the exception of the panic of 1893, began in New York with an unexpected financial shock: the collapse of a brokerage or merchant banking house or houses and/or the failure of a state or national bank or trust company, the immediate effect being a loss of depositor confidence manifest by bank runs that were usually bank-specific. Panics spread from there to the rest of the country as the interior banks, especially the country banks, reacted by withdrawing their balances and by contracting their loans and deposits due to a sudden change in actual or perceived insolvency.[6]

The Panic of 1884 does not qualify as a full-scale banking panic for the following reasons. First, depositor confidence did not wane either in New York or the interior. Second, deposit runs and bank closures were bank-specific. Third, the prompt action by the New York Clearing House in coming to the aid of the distressed banks by authorizing the issue of clearing house loan certificates were responsible for preventing the banking difficulties in New York from worsening and from spreading to the interior. Lastly, there was no suspension of cash payment.

The Panic of 1884 began with the closure of Marine National Bank, which had made uncollectible loans to the failed brokerage house of Grant and Ward. Then a run ensued on the Metropolitan National Bank, which led to its temporary closure, after the rumors that it was involved in fraudulent activity emerged (Gorton, 2012). The closing of the Metropolitan bank raised concerns among members of the New York Clearing House since it had extensive relations with other banks.

On May 14th, the New York Clearing House promptly stepped in and bailed out the Metropolitan National Bank and other key banks by issuing clearinghouse loan certificates on their behalf, ending the crisis.[7] The amount of certificates issued was large. The first were taken out on May 15, and reached $21,811,000, their maximum amount outstanding, on May 24, only nine days from the first issue. The last certificates were issued June 6. All remaining certificates were retired by September 1886, more than two years after the date on which issuance began.

During the Panic of 1884, only the New York Clearing House operated emergency programs by issuing loan certificates and suppressing bank-specific information.[8] While it issued loan certificates and suppressed bank-specific information, it did not suspend convertibility. Since the issuance of loan certificates and suppression of bank-specific information were intended to assist specific institutions, rather than a general situation as in the other panics, a suspension of convertibility was not necessary (Sprague, p. 143). The panic was confined principally to New York City and was of short duration.

During the panic, there were several runs and bank closings in Pennsylvania. Two banks failed in Bradford: Tuna Valley and the Exchange Bank. Runs followed on three other banks in Bradford. However, only the failure of Tuna Valley Bank, which held correspondent balances with the Metropolitan National Bank, can be directly linked with the panic in New York. Other failures were local in nature caused by the collapse of the oil market following the stock market crash. In other words, most bank failures were local or bank-specific in nature rather than spillovers from New York (Sprague, 1910, p. 108). The loss of confidence did not reach the interior banks.[9]

To conclude, the Panic of 1884 did not turn out to be a systemic event. It was largely confined in New York City due to the prompt and effective action of the New York Clearing House. The issue of loan certificates and the rescue of the Metropolitan Bank prevented a larger panic in New York and thereby prevented its spread to the interior, as evidenced by the continuation of cash payments.

3. Data and summary statistics

The main dataset is constructed from the quarterly balance sheets for all Pennsylvania state banks and savings institutions from 1881 to 1887, as published in *The Reports of the Several Banks and Savings Institutions of Pennsylvania*. Along with the standard balance sheet data, the reports also provide information on interbank assets at the bank-level for the 1880s. In particular, "due-froms" are reported on a debtor bank-by-debtor bank basis for all state-chartered Pennsylvania banks for November of each year. We collect this information and create a dataset of the amounts due to each state-chartered Pennsylvania bank by individual debtor in the sample for each of the years 1881–1887. The final dataset consists of 3339 observations, where an observation is an amount due from a debtor bank to a creditor bank. Aggregating this information, we calculate the amount of interbank deposits held in each city for each bank.

Table 1 displays the aggregate balance sheet of state commercial banks between 1881 and 1887. On the asset side, regulators reported three types of liquid assets. These liquid assets were composed of "gold and silver in the vault of the bank" (gold), "current notes, checks and bills of other banks" (notes) and "due from solvent banks" (interbank deposits).[10] Banks preferred interbank deposits to other types of liquid assets, as interbank deposits earned interest.[11]

In addition, they reported several types of loans.[12] They were "bills and notes discounted (not under protest)," "bills and notes

[6] Wicker (2006) cites three other possible transmission mechanisms: the closure of troubled banks in New York and the subsequent closure of the affiliates in other cities, the geographical diffusion of panic as a result of the failure of the collapse of a large New York bank, and the suspension of cash payments in New York and the subsequent suspension of cash payments in the rest of the country.

[7] For more information on the examination of New York City banks by the New York Clearing House association and regulators during the Panic of 1884, see Gorton and Tallman (2015).

[8] The New York Clearinghouse stopped publishing bank specific information on May 24, 1884. It began publishing individual bank balance sheets on June 7, 1884 (Gorton and Tallman, 2015). By contrast, Philadelphia and Pittsburgh did not suppress bank information during the Panic, nor issue loan certificates.

[9] While bank failures occurred in New Jersey and Pennsylvania, these failures were not accompanied by the loss of depositor confidence (Wicker, 2006).

[10] Although state-chartered banks used both state and national banks to make interbank deposits, the majority of interbank deposits were held by national banks. Moreover, all interbank deposits in reserve city were held by national banks.

[11] In general, demand deposits earned 2% interest and time deposits earned 4% interest.

[12] The classification of these asset types as loans is suggested by Weber (2003). While Weber (2003) does not fully describe explain how he combined asset categories to construct the loan category, he has posted both raw and standardized bal-

Table 1
Bank balance sheet structure and definitions, 1881–1887.

Assets	Liabilities
Gold and silver in the vault of the bank	Capital stock actually paid in
Current notes, checks, and bills of other banks	Deposits
Uncurrent notes, checks, and bills of other banks	Certificates of deposit
Other obligations of other banks	Due to the Commonwealth
Bills and notes discounted, (not under protest)	Due to banks
Bills and notes discounted, (under protest)	Due to individuals
Mortgages held and owned by the bank	Claims against the bank in controversy
Assessed value for 188- of the real estate bound by said mortgages	Surplus, contingent, or sinking fund
Judgments held and owned by the bank	Earnings
Real estate held and owned by the bank	All other items of indebtedness not embraced in foregoing specifications
Due from solvent banks	
Due from insolvent banks	
Public and corporate stocks and loans	
Bonds held by the bank	
Treasury notes	
Claims against individuals or corporations, disputed or in controversy	
All other debts and claims either due or to become due	
Expenses	
Value of any other property of the bank, as the same stands charged on the books, or otherwise	

Source: State Banking Reports

Table 2
Summary statistics.

	Before the panic			After the panic		
	N	Mean	Std. Dev.	N	Mean	Std. Dev.
Liquid assets/assets	1100	18.33	11.37	1075	17.28	10.42
Gold/assets	1100	2.25	3.41	1075	3.77	6.71
Notes/assets	1100	5.32	8.33	1075	4.90	7.44
Interbank deposits/assets	1100	11.52	8.29	1075	10.66	7.63
Loans/assets	1100	60.95	17.41	1075	62.94	18.32
Nonperforming loans/assets	1100	3.17	7.92	1075	3.64	9.46
Equity/assets	1100	28.88	16.38	1075	29.63	14.39
Deposits/assets	1100	68.74	17.17	1075	67.48	15.95
Total assets ($)	1100	461,629.10	473,597.10	1075	500,152.90	482,317.50
Total deposits ($)	1100	337,458.30	339,994.50	1075	355,247.60	343,867.90

Note: The table is created with quarterly level balance sheets. Ratios are shown in percent.

discounted (under protest)," "mortgages held and owned by the bank," "judgments held and owned by the bank," "claims against individuals or corporations, disputed or in controversy," "all other debts and claims either due or to become due." Among these, "bills and notes discounted (not under protest)" was the largest component. Following Weber (2003), we defined loans as the sum of these components. We also use a measure of loan quality, defined as the share of nonperforming loans over total loans. Nonperforming loans are the sum of "claims against individuals or corporations, disputed or in controversy," "all other debts and claims either due or to become due," "bills and notes discounted (under protest)," and "judgments held and owned by the bank." Nonperforming assets are the sum of nonperforming loans plus assets "due from insolvent banks." We also construct a Texas-style ratio as the ratio of nonperforming assets to equity capital (defined below).

The liability side of the balance sheets was mainly composed of capital and deposits. These two types of liabilities comprise about 80% of total liabilities. To calculate the amount of equity capital, we summed "capital stock actually paid in," "surplus, contingent, or sinking fund," and "earnings." In a similar manner, we calculated the amount of total deposits by summing "deposits," "certificates of deposit," "due to the Commonwealth," "due to banks," "due to individuals."

Table 2 contains sample means and standard deviations for state banks and savings institutions in Pennsylvania before and after the Panic of 1884. Pennsylvania banks were largely funded with deposits and thus were highly leveraged. While state banks were not subject to any reserve requirements, they still maintained liquid balance sheet structures. State banks held on average about 30% of liquid assets against deposits. It shows Pennsylvania state banks were liquid, holding on average 18% of their assets in the form of liquid assets. Interbank deposits accounted for about two-thirds of liquid assets. The other major asset category is loans, which accounted for about 60% of assets. In addition, the liability side of the balance sheets shows that banks were largely funded with deposits.

Fig. 1 maps correspondent bank networks in 1883. Pennsylvania state banks had extensive correspondent bank networks. They had correspondent banks in Pennsylvania and other states, especially in the Northeast and Midwest regions. Some correspondent banks were located outside the country, which indicates that a few banks engaged in international banking during this period.

Table 3 provides information on the extent of the correspondent relationships for state banks in Pennsylvania. They show that state banks had a number of correspondent banks. The average number of other banks from which a bank had amounts due was 6; the median number was approximately 4. The range was be-

ance sheets, allowing the mapping to be inferred (see http://cdm16030.contentdm.oclc.org/cdm/search/collection/p16030coll5 for the data, accessed July 2015).

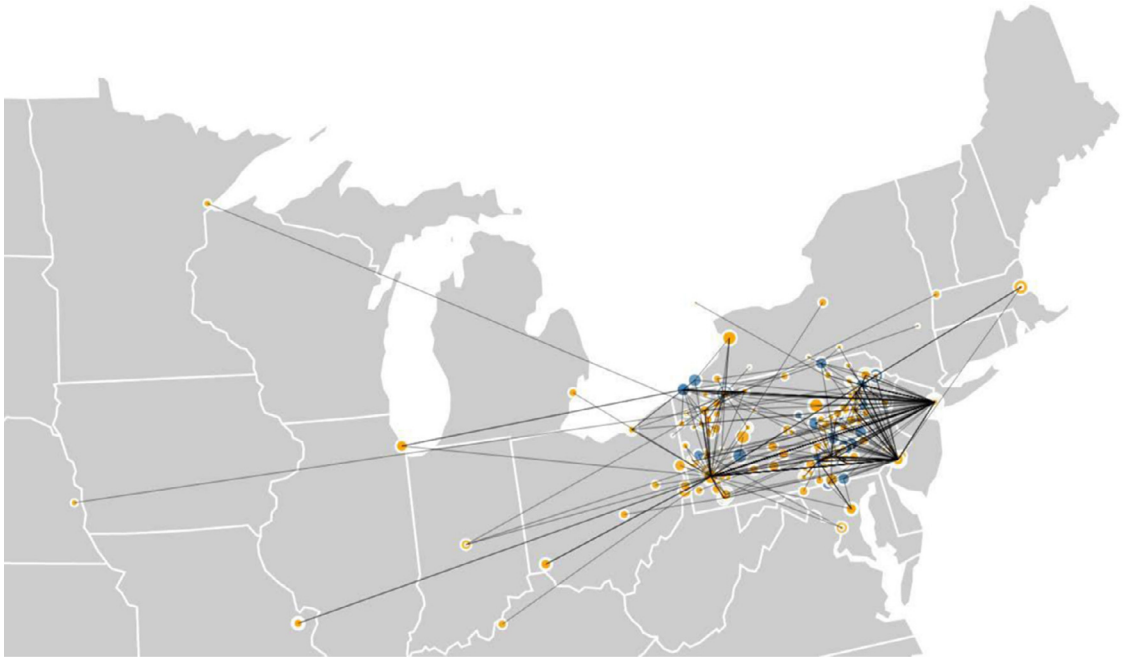

Fig. 1. Correspondent bank network, 1883. *Source: State Bank Reports (1883). Note:* Banks placing deposits in other banks are respondents (colored yellow) and banks providing the deposit services are correspondents (colored blue).

Table 3
Summary statistics of interbank network Relationships, 1881–1887.

	Year							
Statistic	1881	1882	1883	1884	1885	1886	1887	Overall
Number of banks in sample	79	79	77	79	77	76	77	
Philadelphia	6	6	6	8	6	5	4	
Pittsburgh	17	17	17	19	19	19	19	
Country banks	56	56	54	52	52	52	54	
Average relationships per bank	5.7	5.5	6.3	6.1	6.6	6.5	5.9	6.1
Philadelphia	4.3	3.3	4.0	5.8	11.3	11.0	1.5	6.0
Pittsburgh	6.0	4.8	5.5	4.8	4.5	4.5	4.9	5.5
Country banks	5.8	5.9	6.8	6.6	6.8	6.7	6.5	6.4
Number of relationships to	454	431	484	481	506	491	451	3298
New York	95	89	101	100	101	96	89	671
Philadelphia	83	73	90	94	89	90	88	607
Pittsburgh	41	44	44	50	46	49	47	321
Country banks in PA	191	183	204	187	215	200	189	1369
Reserve cities – Other State	30	28	29	26	25	32	21	191
Country banks – Other State	14	14	15	14	21	18	17	113
Foreign	0	0	1	10	9	6	0	26
Total number of states	13	13	16	17	23	20	15	29

tween 1 and 41. Many correspondent banks were located outside reserve and central reserve cities because state banks had many in-state correspondent banks outside reserve cities. Among all correspondent banks located in Pennsylvania, only about 30% were located in reserve cities. In contrast, for all correspondent banks located outside Pennsylvania, about 80% were in reserve cities. Interestingly, notice that the numbers of relationships to New York, Philadelphia, and Pittsburgh have rough peaks in 1884, declining thereafter.

While banks had a large number of "due-from" banks, some interbank relationships were not strong because state banks held most of their interbank deposits in one or two major correspondent banks. These major correspondent banks were mostly located in reserve and central reserve cities—New York City, Philadelphia, and Pittsburgh. In addition, state banks kept local correspondent banks in business hubs along transportation routes.

Table 4 shows the distribution of liquid assets and interbank deposits for three different types of banks: Philadelphia banks, Pittsburgh banks, and country (interior) banks. This is because reserve city status may have influenced banks' choice of liquid assets and where they held interbank balances. While Philadelphia and Pittsburgh both served as reserve cities, Philadelphia banks and Pittsburgh banks behaved differently. From the distribution of liquid assets, we can see that Pittsburgh banks behaved more like country banks than Philadelphia banks. Philadelphia banks held more gold and less correspondent deposits while Pittsburgh banks and country banks held less gold and more correspondent deposits. In addition, the three classes of banks held their interbank

Table 4
The distribution of liquid assets and interbank deposits.

	Philadelphia banks			Pittsburgh banks			Country banks		
	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.
A. ratio against total assets									
Gold	39	7.62	11.30	126	1.64	3.12	384	2.90	3.35
Notes of other banks	39	18.06	28.55	126	3.63	4.37	384	4.50	3.15
Interbank deposits	39	6.65	6.94	126	12.36	8.41	384	10.74	7.49
B. ratio against total assets									
New York	39	1.60	3.16	126	2.49	4.01	384	2.95	3.74
Philadelphia	39	4.64	5.01	126	1.04	3.03	384	4.15	5.58
Pittsburgh	39	0.01	0.03	126	8.43	7.18	384	1.30	3.44
Country banks in PA	39	0.03	0.05	126	0.47	2.20	384	2.17	4.31
Reserve cities – Other State	39	0.16	0.55	126	0.18	0.56	384	0.17	0.73
Country Banks – Other State	39	0.57	1.91	126	0.13	0.47	384	0.20	0.72
Foreign									
C. ratio against total interbank deposits									
New York	39	44.16	40.41	126	18.37	24.33	384	28.85	30.27
Philadelphia	39	42.89	43.10	126	5.92	13.48	384	35.58	34.90
Pittsburgh	39	1.98	6.21	126	72.57	30.72	384	11.85	25.44
Country banks in PA	39	2.59	5.27	126	4.37	16.97	384	20.22	26.31
Reserve cities – Other State	39	0.41	1.46	126	0.28	0.84	384	0.24	0.97
Country Banks – Other State	39	4.45	11.72	126	0.90	3.23	384	2.70	10.47
Foreign	39	0.51	2.51	126	0.00	0.05	384	0.01	0.09

Note: The table is with bank balance sheets at the annual frequency due to the availability of disaggregated information on interbank deposits at the fourth quarter of each year. Ratios are expressed in percent.

balances in different locations. Philadelphia banks kept a majority of their interbank deposits in New York and Philadelphia, around 44% and 43%, respectively. Pittsburgh banks kept most of their interbank deposits in Pittsburgh (nearly 75%). Country banks spread their interbank deposits across New York (almost 30%), Philadelphia (about 35%), and Pittsburgh (over 10%), but also maintained a large portion of their deposits in local business hubs and elsewhere (around 25%).

In the next section, we describe our empirical approach and the results of the analysis.

4. Empirical approach and results

To assess how the banking unrest and the subsequent bailout during the panic of 1884 affected the interior banks in Pennsylvania, we undertake a difference-in-difference analysis of state bank-level responses to the panic. The key identifying assumption for our analysis is that banks with direct, pre-existing balance sheet exposure to New York City banks would experience the effects of any panic in New York City more strongly than those that did not have such an exposure. The degree of correspondent deposit exposure to New York City is calculated as the ratio of a bank's correspondent deposit holdings in New York City to their total assets. With this exposure variable in hand, we can compare the responses of banks with larger versus smaller direct exposures to New York City before and after the panic in the third quarter of 1884.[13]

We examine the behavior of total assets, financing (equity or deposits), liquid assets, and loans before and after the banking unrest. On the liabilities side, more exposed banks might need to rely on equity to absorb any expected losses from the panic. They might also be forced to shift towards deposits as an alternative financing source. On the asset side, banking disturbances were historically characterized by the drain of currency from reserve city and New York City banks to bolster the reserves of interior banks. Hence, banking unrest would create two possible changes in banks' liquidity management behavior.[14] First, we would expect to see an increase in liquid assets as a result of an increase in cash reserves. Second, even if the amount of cash reserves were unchanged in bank portfolios, there could be a substitution from interbank deposits and loans to gold and silver coins in order to mitigate counterparty risk. In the following regressions, we examine these possibilities.

The difference-in-difference estimation is implemented at a quarterly frequency for most variables, but on annual frequency (Q4 of each year) for correspondent deposit variables, since that is the frequency at which the information is available. We use the previous year's interbank deposit exposure to New York City as assessed in Q4.

Our first statistical analysis assesses whether or not there is a change in a bank's behavior immediately around the panic, conditional on their direct exposure to New York City correspondents. The baseline analysis regresses the bank balance sheet variables on an exposure variable, defined as a ratio of the interbank deposits in New York City to total assets. Specifically, the baseline linear regression specification is:

$$\Delta y_i = \alpha + \beta x_i + Z_i'\gamma + \varepsilon_i, \tag{1}$$

where Δy represents the change in dependent variable of interest; x indicates the ratio of New York City correspondent deposits over total assets; Z is a column vector of other bank-level characteristics for which we wish to control (the equity-to-assets ratio, liquid assets-to-assets, and the loan quality ratio); and ε is a mean-zero, possibly heteroskedastic error term. α is a constant and γ is a column vector of slopes for the controls. β is the key parameter of interest, as it represents the effect of the panic given pre-existing, direct exposure to New York City. As mentioned earlier, the analysis is done at both the quarterly and annual frequencies: for quarterly data, we use the change from the second to third quarter of 1884; for annual data, we use the change from the fourth quarter of 1883–1884. The key advantage of this specification is its simplicity—the difference-in-difference estimate of the impact effect may be read off directly from the coefficient estimate.

[13] As mentioned in the introduction, there are other papers that similarly use the existence of financial relationships to understand the transmission of shocks across the financial system. For examples, see Puri, et al. (2011), Iyer and Peydro (2011), and Hochfellner, et al. (2015).

[14] For some evidence on exposed banks' portfolio rebalancing towards liquid assets during financial crisis episodes, see Ashcraft, et al. (2011); Calomiris, et al. (2011); and Park and Van Horn (2015).

The dependent variables of interest include the growth rates (log differences expressed in percent) of the overall balance sheet and its components (equity, deposits, liquid assets, and loans), plus the changes in balance sheet composition, including the ratios of equity, deposits, liquid assets, and loans to total assets (expressed in percentage points).[15] To see if there is substitution of interbank deposits from New York to other reserve cities, we also look at the interbank deposits in New York City-to-total assets ratio, interbank deposits outside New York City-to-total assets ratio, and total interbank deposits-to-total assets ratio in the analysis at the annual frequency.

Our second statistical analysis uses a classic fixed effects linear regression with distributed lags, relating an indicator for the Panic of 1884, the direct asset exposure to New York City banks, and the interaction of the two variables to various aspects of bank behavior (conditional on a set of bank-level controls). In this case, the model takes the form:

$$y_{i,t} = \alpha_i + \sum_{k=0}^{K}[\beta_{1,k}D_{i,t-k} + \beta_{2,k}x_{i,t-1-k} + \beta_{3,k}D_{i,t-k}\cdot x_{i,t-1-k}] + Z'_{i,t-1}\gamma + \delta t + \varepsilon_{i,t}, \quad (2)$$

where i indexes banks, t indexes time (whether years or quarters), k indexes the distributed lag terms (going from 0 to K periods in the past), y is the dependent variable of interest, D is an indicator taking the value 1 in either 1884 or 1884:Q3 and 0 otherwise, x and Z are defined as above, and ε is a mean-zero, possibly heteroskedastic and autocorrelated within-bank error term. α_i is a bank-level fixed effect, γ is defined as above, and δ represents the effect of a linear time trend (if there is one). The panel specification is more encompassing that the simple cross-sectional specification, but also more complex, since it involves the direct effect of the panic to all banks as well as distributed lag terms. However, with the distributed lag terms, we obtain estimates of the dynamic and cumulative effects of the panic, allowing us to observe whether or not any effects change over time. The key coefficient of interest is β_3, which captures the change in the effect of pre-existing, direct exposure to New York City banks at the time of the Panic of 1884. Given our limited sample size, degrees of freedom concerns (particularly in the annual dataset) drive our selection of lags. In the quarterly analysis, we take $K = 3$, covering a full year of potential effects, while for the annual, we take $K = 1$ (the impact and the following years). Much like the previous specification, all specifications condition on a set of once-lagged bank characteristics, including the equity-to-assets ratio, liquid assets-to-assets, and the loan quality ratio (definitions given in Section 3).

4.1. Threats to inference

A potential pitfall for this analysis arises from the non-random nature of commercial banks' correspondent relationships: banks do not randomly choose correspondent relationships, creating possible selection bias. If banks choose correspondent banks in New York City due to omitted (uncontrolled for) bank characteristics motivating different reserve holding strategies, this could bias our results.

The historical characteristics of the National Banking Era provide some protection against such issues. Typically, the location of creditor banks dictated the amount of bank reserves held not the location of debtor banks. Hence, it is unlikely that creditor banks chose their correspondent banks in order to pursue different reserve holding activities. In addition, as documented by Weber (2003), these correspondent relationships were mainly driven by business and trade patterns of bank customers, who wanted to clear their payments.

Another problem is that the estimated effects of the panic may be biased if we incorrectly measure the degree of banks' exposure to New York. The National Banking Act dictated that banks should hold their interbank balances either in reserve or central reserve cities to satisfy their reserve requirements. If banks deposited their funds with banks in Pittsburgh and Philadelphia, which in turn deposited their funds in New York, then these banks are indirectly exposed to New York.

If second-order exposure to New York City banks is as or nearly as important a contagion channel as the first-order or direct exposure, then our estimate of the effect of the Panic of 1884 will be underestimated. In other words, if a majority of correspondent banks were located outside New York City and functioned as financial intermediaries between "due-to" banks and New York banks, then our identification assumption will fail as we are unable to control for second- and higher-order connections to New York City banks; we cannot measure the effect of disturbances on "due-to" banks through these financial intermediaries.

However, as shown above, due to its proximity to New York City, Pennsylvania state banks either directly deposited in a New York City bank or deposited in a Philadelphia bank, which tended to have few interbank deposits at New York City banks and thus little exposure to New York City.[16] In addition, many Pittsburgh banks had deposits in Pittsburgh banks instead of New York banks. The lack of the three-tier reserve pyramid structure allows us to include both reserve city and country banks for estimation instead of focusing only on reserve city banks. Moreover, the fact that the New York Clearing House stood alone in the issue of loan certificates alleviates the identification concern that shocks may be coming from other financial centers rather than New York. During other banking panics, multiple clearinghouses, including the Philadelphia and Pittsburgh Clearing Houses, issued clearinghouse loan certificates to stop the panic when the panic from New York City spread to the interior.[17] The fact that the clearinghouses in these two other reserve cities did not issue clearinghouse loan certificates bolsters the argument that the panic was confined to New York City and did not spread to the interior. This fact alleviates concerns that the shock may be confounded with shocks elsewhere.

While we are able to observe bank characteristic such as town or city, and a host of other traits, there are admittedly some characteristics we do not observe. The advantage of the differences-in-differences empirical strategy is that it ensures that any unobserved, time-invariant characteristics that are correlated with banks' choice of correspondent banks and the amount of interbank deposits in these institutions, do not bias the estimated average effect.

Lastly, our identification strategy cannot separately identify the effect of the bailouts from the effect of bank suspensions. Until the New York Clearinghouse intervened, there were runs on four Wall Street banks and five Brooklyn savings banks. Hence, we might be estimating the effect of bank distress in New York City rather than the effect of bailouts if these suspensions spilled over into the rest of the banking system in New York.

[15] Changes in the balance sheet ratios are taken to allow for the possibility that there is a structural break in bank balance sheet composition choices as a result of the panic. Moreover, there is some evidence that the levels of these ratios display a unit root in our relatively short time dimension panel, suggesting that they should be differenced.

[16] Paddrik, et al. (2015) find that the behavior of national banks in Philadelphia was similar to that of national banks in New York City in 1867, This result suggests that both Philadelphia and New York City banks acted as bankers' banks.

[17] The Philadelphia clearinghouse offered support for the Penn Bank of Pittsburgh, one of the larger Pittsburgh banks that faced distress due to the difficulties of the oil industry in 1884 (Wicker, 2006). However, it did not issue loan certificates during the panic of 1884 (Cannon, 1911).

Table 5
The effect of the panic of 1884 on state banks in Pennsylvania, quarterly, 1884:Q2 to 1884:Q3.

	(1) Δ Assets Growth	(2) Δ Equity Growth	(3) Δ Deposits Growth	(4) Δ Liquid Asset Growth	(5) Δ Loan Growth	(6) Δ Equity/ asset Ratio	(7) Δ Texas Ratio	(8) Δ Deposit/ asset Ratio	(9) Δ Liquid asset/ asset Ratio	(10) Δ Loans/ asset Ratio
Interbank deposits in NYC to asset (t-1)	0.799*	−1.249	1.952**	6.256***	−0.498	−0.214**	−0.130	0.213*	0.358***	−0.329**
	(0.453)	(0.781)	(0.818)	(2.203)	(0.606)	(0.094)	(0.092)	(0.121)	(0.117)	(0.130)
Equity to assets (t-1)	−0.028	−0.521	−0.073	0.003	0.001	0.045**	0.027	−0.058*	0.043	−0.029
	(0.138)	(0.470)	(0.251)	(0.551)	(0.158)	(0.021)	(0.033)	(0.032)	(0.047)	(0.043)
Liquid assets to assets (t-1)	−0.355	−0.256	−0.828*	−3.244***	0.463	0.071	−0.025	−0.105	−0.307***	0.243***
	(0.280)	(0.502)	(0.463)	(1.023)	(0.323)	(0.043)	(0.045)	(0.078)	(0.087)	(0.090)
Loan quality (t-1)	−0.122	−0.182	0.096	−0.617	0.137	0.021	−0.053	0.007	−0.098*	0.089**
	(0.155)	(0.232)	(0.279)	(0.610)	(0.245)	(0.035)	(0.054)	(0.038)	(0.051)	(0.044)
Constant	−5.215	22.880	−8.921	24.360	−14.480**	0.108	0.390	0.115	2.070	−1.395
	(4.659)	(25.820)	(8.583)	(23.750)	(6.563)	(0.838)	(1.871)	(1.095)	(1.329)	(1.386)
Observations	79	79	79	79	79	79	79	79	79	79
R-squared	0.094	0.073	0.135	0.239	0.074	0.19	0.029	0.16	0.298	0.232

Note: Columns (1) through (5) are changes in log differences (approximating growth rates). Columns (6) through (10) are the change in balance sheet ratios. All variables are denoted in percentage points. Dependent variables are the change in the indicated series from 1884:Q2 to 1884:Q3, bracketing the Panic of 1884 in May. Heteroskedasticity robust standard errors shown in parentheses underneath their associated coefficient estimate. *,**,*** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 6
The effect of the panic of 1884 on state banks in Pennsylvania, quarterly, 1881:Q1 to 1887:Q4.

	(1) Assets Growth	(2) Equity Growth	(3) Deposits Growth	(4) Liquid Asset Growth	(5) Loan Growth	(6) Δ Equity/ asset Ratio	(7) Δ Texas Ratio	(8) Δ Deposit/ asset Ratio	(9) Δ Liquid asset/ asset Ratio	(10) Δ Loans/ asset Ratio
Effect of Panic to Exposed	−8.688***	3.062*	−12.180***	−26.160***	−5.405***	2.252***	0.367	−2.858***	−2.582***	3.119***
Effect of Panic to Exposed (t-1)	−3.910***	1.227	−3.486*	−5.499	−15.460**	0.918***	5.895**	−1.078***	1.366*	−1.654*
Effect of Panic to Exposed (t-2)	−0.132	0.634	−3.289*	−5.014*	2.671*	0.595*	4.053*	−0.049	−0.383	−0.029
Effect of Panic to Exposed (t-3)	−2.181**	0.672	0.386	−3.037	−0.524	0.697**	1.240*	−0.581**	−0.608	0.719*
Cumulative Effect of Panic (no exposure)	−14.920***	6.837*	−17.440***	−41.710***	−18.460**	4.552***	6.413	−4.773***	−2.338	2.439*
Cumulative Effect of Panic Unique to Exposed	0.011	−1.242**	−1.131*	2.004*	−0.250	−0.091	5.142***	0.207*	0.131	−0.284
Total Effect of Panic to Exposed	−14.910***	5.595*	−18.570***	−39.710***	−18.710**	4.461***	11.560*	−4.566***	−2.207	2.155*
Observations	1750	1750	1744	1750	1750	1750	1750	1750	1750	1750
R-squared	0.123	0.014	0.037	0.222	0.117	0.138	0.013	0.121	0.325	0.239

Note: Columns (1) through (5) are log differences. Columns (6) through (10) are changes in balance sheet ratios. All variables are denoted in percentage points and in the case of log differences, annualized. Underlying heteroskedasticity and autocorrelation robust standard errors are clustered at bank-level. All regressions include distributed lags of the panic indicator, the pre-existing exposure to New York City correspondent deposits, and their interaction. Bank, year, and quarterly fixed effects, linear trend and the set of control variables described are also included. See the main text for further details on the specification. *,**,*** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

However, as reported in Wicker (2006) and Gorton and Tallman (2016), the prompt actions taken by the New York Clearinghouse prevented the spillovers of these suspensions into the rest of the banking system in New York City. In other words, the bailout preserved "depositor confidence" and stopped runs from occurring. New York City correspondents in our sample are likely to be the beneficiaries of the bailout given that they are not one of the suspended banks. Hence, it is more likely that we are estimating the effect of the bailout rather than that of distress.

4.2. Empirical results

The results of the analysis at the quarterly frequency are shown in Tables 5 through 6. Table 5 shows the results from specification (1), looking at the change between 1884: Q2 and 1884: Q3, while Table 6 shows the results from specification (2), based on the full panel. All regressions are estimated by ordinary least squares, with heteroskedasticity and autocorrelation robust standard errors given for the coefficient estimates (for the panel data, clustering is done at the bank-level).

In Table 5, the main coefficient of interest is the lagged value of share of correspondent deposits in NYC banks. Table 5 shows that there is some evidence that more exposed banks increased holdings of liquid assets in the immediate aftermath of the panic. At the same time, they also shifted towards more deposit-based financing (liabilities). These shifts could reflect a desire for greater liquidity and an inability to raise additional equity for financing in the face of potential volatility, leading to shifts in asset and liability composition.

Table 6 shows how these responses evolved in subsequent quarters, focusing on the effects of the panic for all banks (as an indicator variable) and its interaction with the pre-existing exposure of the bank to New York City correspondents (as described ear-

Table 7
The effect of the panic of 1884 on interbank deposits, yearly, end-1883 to end-1884.

	(1) Δ Deposits in NYC Growth	(2) Δ Deposits outside NYC Growth	(3) Δ Interbank deposits Growth	(4) Δ Deposit in NYC/asset Ratio	(5) Δ Deposit outside NYC/asset Ratio	(6) Δ Interbank deposit/asset Ratio
Interbank deposits in NYC to asset (t-1)	−16.450***	−0.119	−3.109	−0.534***	0.246	−0.287*
	(5.460)	(5.626)	(3.319)	(0.167)	(0.195)	(0.168)
Equity to assets (t-1)	4.049**	2.295	2.127	0.023	0.090	0.113
	(1.614)	(1.720)	(1.511)	(0.017)	(0.078)	(0.075)
Liquid assets to assets (t-1)	−4.787***	−4.913**	−3.936***	−0.014	−0.150*	−0.165**
	(1.293)	(2.259)	(1.024)	(0.016)	(0.086)	(0.082)
Loan quality (t-1)	1.822	0.619	1.210	0.018	−0.026	−0.008
	(1.174)	(0.942)	(1.006)	(0.015)	(0.025)	(0.025)
Constant	12.040	18.110	−3.863	0.554	0.005	0.558
	(43.470)	(55.020)	(41.690)	(0.383)	(1.711)	(1.672)
Observations	47	64	66	72	72	72
R-squared	0.340	0.075	0.125	0.420	0.097	0.145

Note: Columns (1) through (3) are changes in log differences (approximating growth rates). Columns (4) through (6) are the change in balance sheet ratios. All variables are denoted in percentage points, and in the case of log differences, annualized. Dependent variables are the change in the indicated series from end-1883 to end-1884, bracketing the Panic of 1884 in May. Heteroskedasticity robust standard errors shown in parentheses underneath their associated coefficient estimate. *,**,*** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 8
The effect of the panic of 1884 interbank deposits, yearly, end-1881 to end-1887.

	(1) Deposits in NYC Growth	(2) Deposits outside NYC Growth	(3) Interbank deposits Growth	(4) Δ Deposit in NYC/asset Ratio	(5) Δ Deposit outside NYC/asset Ratio	(6) Δ Interbank deposit/asset Ratio
Effect of Panic to Exposed	−17.310	−2.014	−15.720*	0.092	0.272	0.364
Effect of Panic to Exposed (t-1)	−21.300	−17.770*	0.796	0.593**	0.997*	1.590**
Cumulative Effect of Panic (no exposure)	−30.780	−18.190	−6.215	1.234***	1.610	2.844**
Cumulative Effect of Panic Unique to Exposed	−7.837*	−1.585	−8.712**	−0.549***	−0.341*	−0.889***
Total Effect of Panic to Exposed	−38.610	−19.780	−14.930	0.685**	1.269	1.954*
Observations	252	332	339	348	348	348
R-squared	0.198	0.342	0.275	0.639	0.367	0.462

Note: Columns (1) through (3) are log differences. Columns (4) through (6) are changes in balance sheet ratios. All variables are denoted in percentage points and in the case of log differences, annualized. Underlying heteroskedasticity and autocorrelation robust standard errors are clustered at bank-level. All regressions include distributed lags of the panic indicator, the pre-existing exposure to New York City correspondent deposits, and their interaction. Bank and quarterly fixed effects, a linear trend, and the set of control variables described are also included. See the main text for further details on the specification. *,**,*** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

lier).[18] Considering the cumulative effect over four quarters, it is clear that all banks are hit by the panic, experiencing lower assets, liquid assets, loans, and deposits growth. In parallel, equity grows and accounts for larger share of the balance sheet (reflecting both the rise in equity growth and the fall in asset growth). However, for the part that is unique to the exposed banks (assuming a 1% of total assets exposure to New York City through correspondent deposits), only equity growth shows a difference significant at the 5% level, with more exposed banks having lower equity growth than other banks. This might reflect investors' reluctance to provide new capital to a bank perceived as more vulnerable due to its NYC exposure.

Shifting to the annual frequency analysis, Table 7 looks at the impact of the panic as estimated under specification (1), shedding light on how the distribution of interbank deposits evolves. More exposed banks saw a drop in the growth of correspondent deposits held in New York City from 1884 to 1885. Relatedly, the share of the balance sheet accounted for by correspondent deposits was also lower for the more exposed banks. Otherwise, there is little statistically significant evidence of year-to-year impacts.

Table 8 shows the estimated effects for correspondent deposits under specification (2), based on the distributed lag panel model. Due to sample size considerations, the distributed lag terms consist of only the impact and once-lagged effects of the panic (conditional on the bank exposure measure). Looking at the cumulative effects of the panic for all banks, there was a change in balance sheet composition, with greater correspondent deposit holding in New York. Banks that were more exposed to New York prior to the crisis similarly show a rise, but to lower shares of correspondent deposits in New York and correspondent deposits more broadly. Compared to other banks then, more exposed banks chose to lower their correspondent deposits, suggesting some portfolio rebalancing, perhaps in response to their higher exposure through correspondent deposits during the panic.

The findings described above are robust to excluding the one state bank in our sample that held interbank deposits directly in the Metropolitan National Bank of New York City. That bank, the Farmers' Bank of Harrisburg, unsurprisingly saw a sharp shift away from New York City interbank deposits and large changes in its balance sheet. However, apart from some minor point estimate changes, the patterns and statistical significance of effects are preserved when this bank is dropped from the estimation

[18] To economize on space, only the effects of the panic common to all banks in the sample and the effects on those with an exposure to New York City are shown for specification (2). Tables with the full set of coefficient estimates (including the control variables) are available on request.

sample. Moreover, they do not appear to be driven by either the Philadelphia- or Pittsburgh-based state banks. Dropping these banks similarly changes some of the point estimates, but not the overall patterns and statistical significance.

Overall then, the results from the analysis support the perspective that even though contagion was largely averted by the bailouts in New York City short-circuiting the run on the system, there were some short-term effects from the panic. In other words, country banks in Pennsylvania that had larger direct balance sheet exposures to the banks in New York City changed their balance sheets in response to the events during May 1884 despite the prompt action of the New York clearinghouse. However, there is no evidence that these changes were long-lasting, apart from a reduction in interbank deposit holdings.

5. Conclusion

The idea that the failure of systemically important financial institutions could entail macrofinancial instability and adverse developments in economic growth has led to public support for these institutions during the recent crisis. While policymakers are tightening regulations for these institutions and trying to end bailouts, the inability of large banks to submit credible orderly resolution plans to end reliance on government-funded bailouts means that public support might be provided again in some future crises (Hoenig, 2014). However, not much research has been done to understand whether (or how) bailouts can stabilize the financial sector.

The goal of this paper is to examine the effect of the banking unrest and subsequent private sector-orchestrated bailout of troubled banks that were deemed to be systemically important by the New York Clearing House during the Panic of 1884. We empirically examine the behavior of interior banks after the intervention by the New York Clearing House to save the Metropolitan Bank, which served as a correspondent bank for many country banks outside New York City, and short-circuit a panic. For banks more exposed to New York City, there is evidence of a shift towards more liquid assets and a greater dependence on deposits as a financing source on impact, with quarters after the panic indicating lower equity growth and an associated rise in the Texas ratio. Over the longer term though (at the annual frequency), these differences vanish; the only robust differences are declines in the use of correspondent deposits, particularly in New York City, by more highly exposed banks. These findings show that although the bailout of the Metropolitan Bank prevented a relatively mild banking perturbation from escalating into a full-scale banking panic, there were still some near- and medium-term effects on the behavior of interior banks.

Results in our paper suggest that the bailouts (whether public or private sector-orchestrated) can contribute to financial stability by stopping financial sector contagion in crises related to systemically important banks. Given that the lack of support by the New York Clearing House resulted in nationwide banking panics and depressions during the National Banking Era, as observed during the panic of 1873, the panic of 1893, and the panic of 1907, ex ante restrictions on bailouts may not be desirable either. After the financial crisis of 2007–2009, policymakers have launched ambitious financial reforms to try to address the too-big-to-fail problem, imposing higher capital buffers and strengthening the supervision of global systemically important banks (G-SIBs) to reduce the probability and cost of failure and contagion. Currently, they are working on improving domestic and cross-border resolution frameworks for large and complex financial institutions. The persistence of the too-big-to-fail problem during financial crises highlights the importance of these efforts to develop improved regulatory and other prudential policy tools.

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