Finance and Economics Discussion Series
Divisions of Research & Statistics and Monetary Affairs
Federal Reserve Board, Washington, D.C.

Financial Fire Sales: Evidence from Bank Failures

Rodney Ramcharan and Raghuram Rajan

2014-67

Financial Fire Sales: Evidence from Bank Failures

Raghuram Rajan[1]
(Chicago Booth and RBI)

Rodney Ramcharan
(Federal Reserve Board)

June 30, 2014

Abstract

Theory suggests the reduction in financing capacity after the failure of a financial intermediary can reduce the value of financial assets. Forced sales of the intermediary's assets could consume liquidity, depressing the liquidation value of the assets of healthy intermediaries and causing contagious runs. These financial fire sales can both cause, and exacerbate, real fire sales, the focus of previous studies. This paper investigates the relevance of financial fire sales using new datasets covering bank failures during the farm depression in the United States just before the Great Depression, as well as bank failures during the Great Depression. Using differences in regulation as a means of identification, we find that the reduction in local financing capacity as a result of bank failures reduces the recovery rates on failed assets of nearby banks, depresses local land prices, renders land markets illiquid, and is associated with subsequent distress in nearby banks. All this indicates a rationale for why bank failures are contagious.

[1] Rajan benefited from funding support from the National Science Foundation and the Stigler Center, the Fama-Miller Center, and the IGM Center at the University of Chicago's Booth School. This paper reflects the opinions of the authors only and does not reflect the views of the Reserve Bank of India, the Board of Governors of the Federal Reserve or the Federal Reserve System. We are grateful to Effi Benmelech, Mark Carlson, Kris James Mitchener, Adair Morse, Gary Richardson, Carlos Ramirez, Nancy Wallace and seminar participants at the Federal Reserve Bank of Atlanta, Berkeley, Cornell, the Federal Reserve Board, FIRS, London Business School, UC-Davis, the NBER Summer Institute, Federal Reserve Bank of New York, and the Western Finance Association for helpful comments.

In their seminal paper, Shleifer and Vishny (1992) argue that the sale price of an asset may depart from fundamental value if the best users of the asset are heavily indebted. This departure from fundamental value arises because users may be forced to sell the asset to buyers with money but with less capacity to use the asset well. Since then, there has been an explosion of research on the extent to which real assets are discounted when sold by users.[2] What has been less well studied empirically is the extent to which financial fire sales—a decline in the value of financial assets because of limited financing capacity in the market—might occur (see Benmelech and Bergman (2011), Coval and Stafford (2007), and Shleifer and Vishny (2011) for a comprehensive review).[3]

To the extent that financial assets represent promises of payment that can be equally well assessed and enforced by anyone in the market, financial assets should not be prone to fire sales. But to the extent that buyers need special knowledge or capabilities to assess, or collect on, financial assets, they may have a limited set of buyers. Financial fire sales may then occur if the potential buyers of financial assets have limited financing capacity. Indeed, financial fire sales can cause, or exacerbate, real fire sales. In this paper, we study the liquidation value of the financial assets of failed U.S. banks in the run up to the Great Depression, as well as during the early years of the Depression itself, to see how the value realized varied with the financing capacity of the market.

Let us be more specific. The forced sale of real assets can occur because the owner has too little internal equity to be able to roll over maturing debt. A number of papers since Pulvino

---

[2] See, for example, Campbell, Giglio and Pathak (2011), Pulvino (1998), Benmelech (2009), Benmelech and Bergman (2008), and Benmelech, Garmaise, and Moskowitz (2005).

[3] There is a nascent empirical literature in the wake of the recent financial crisis focused on financing capacity in the market and asset prices. See for example Buraschi, Sener and Meguturk (2012), Garleanu and Pedersen (2011), Mancini-Griffoli and Ranaldo (2011), Mitchell and Pulvino (2011), as well as the discussion in Allen and Carletti (2008).

(1998) have uncovered a discount on real assets when distressed borrowers sell assets to second best users. The *real fire sale* discount has to do with the drop in fundamental value as the first best users of an asset give up ownership.

Forced sales of financial assets can similarly occur when a lender, such as a bank, does not have the ability to roll over loans (see Acharya, Shin, and Yorulmazer (2011) or Allen and Gale (2000)). One alternative for the bank is to sell its loans to healthier banks. If loans are liquid assets with a large market – if there is no specificity between lender and borrower -- there should be no discount from fundamental value in such sales. Since the real asset will stay with the original borrower, there will be no real or financial fire sale.

Discounts from fundamental value on sold loans can, however, be large if special knowledge is required to make a loan or special expertise is required to recover payment (see Diamond and Rajan (2001, 2005)) and there is too little financing capacity in the market among those with similar knowledge or expertise to take the loans over. Even if the loan sales market is competitive, the limited cash available with knowledgeable banks for loan purchases puts an upper limit on what can be paid for sold loans. A shortage of available, knowledgeable liquidity, sometimes termed *cash in the market* pricing, would mean that even though the value of the loan is high in the hands of the original lender, its realized value in a loan sale is lower and depends on available financing capacity (see Allen and Gale (1994) for an early exposition and Allen and Gale (2005) or Brunnermeier and Sannikov (2013) for comprehensive reviews). Here, any discount on the sold loan relative to its value in the originator's hands is a pure *financial fire sale discount*, since the real asset stays with the original borrower.

An alternative possibility when a bank fails is that its solvent borrowers may also be called upon to repay their loans, especially if they have borrowed short term. Clearly, those borrowers that have cash or liquid assets will be able to repay the full face value of their borrowing easily. In contrast, the capacity of illiquid borrowers to repay will depend on their ability to secure new financing from elsewhere. Even though the borrowers may have the internal equity to continue rolling over loans from the original bank, once that bank is short of financing and has to recall loans, there may be few financiers that can match its lending skills. If so, a number of borrowers may have to go to less capable new lenders and may be able to borrow significantly less. Indeed, loans may dry up and borrower assets may be seized and liquidated (or sold to second-best users at a discount to their value in best use). So in addition to a financial fire sale discount, loan recovery may be subject to a real fire sale discount as the underlying real asset changes hands.

Thus limited aggregate local financing capacity can independently lead to a financial fire sale discount, as well as cause, or add on to, any real fire sale discount. The existence of financial fire sales imply the recovery rate for a failed bank on its assets (that is, its loans) should be lower if there is less aggregate financing capacity available in the local economy. Furthermore, the depressed value of financial assets in the local economy can lead to a contagion of bank failures and a widespread slowdown in real activity (see, for example, Allen and Gale (2005), Bernanke (1983), Detriagache, Dell'Arricia and Rajan (2008), Diamond and Rajan (2005), and Klingebiel, Kroszner and Laeven (2007), Ramcharan, Verani and Vandenheuvel (2012)).

To examine the impact of changes in local financing capacity on recovery rates, we analyze data on failures of nationally chartered banks in the period leading up to the Great Depression – between 1920 and 1927. Bank failures before the Depression were often driven by a common source of distress, agricultural loans gone sour, allowing us to construct a fairly comprehensive and comparable dataset on failed banks. With the onset of the Depression, the number of bank failures mounted significantly within a relatively short period. And although the sources of economic distress were more varied in the 1930-1934 period, the sheer number of failures provides another rich laboratory to study the importance of financing capacity, and to undertake additional tests of our underlying thesis. Moreover, this sample may also reflect financial fire sales to a greater extent since the authorities took actions to prevent "real" fire sales.

Historical institutional features also allow us to overcome many of the traditional hurdles associated with measuring and identifying the impact of changes in financing capacity. In particular, in order to measure financing capacity in the market, we make use of the fact that in the early 20th century, physical distance made credit markets local. During this period, few farmers had cars or phones. So proximity to the lender was essential. Indeed, even in the late 20th century, Petersen and Rajan (2002) find that physical proximity was important in determining credit access for small potential borrowers.[4] Operationally then, for a given county, the banks within that county as well as the banks in physically proximate counties constitute the local market willing to finance a failed bank's borrowers.

Using the county as the unit of data, we find that the fraction of a failed bank's assets recovered within three years after failure – the three-year recovery rate -- is strongly negatively related to subsequent bank failures in that county. Moreover, the relative size of the failed bank in the county is also related to recovery rates – higher the relative size of the failed bank, and

[4] In 1992, the median distance between a household and the bank in which the household maintained a checking account was just 2 miles. The distance between the household and its mortgage credit provider was 9 miles. Only with the significant technological changes over this period did these distances expand: in 2004 the median distance between a household and its mortgage credit supplier widened to 25 miles; the median checking account distance remained constant (Amel, Kennickell, and Moore (2008)).

thus lower the relative residual financing capacity in surviving banks, lower the subsequent recovery rate.

There are, however, alternative explanations of this finding than the diminution of financing capacity available in the local market; Recovery rates may have been lower in areas with more subsequent failures only because economic conditions were worse in those areas.[5] In other words, poor economic conditions could be an omitted variable that drives both recovery rates and subsequent bank failures. We include proxies for local economic conditions, most importantly, an annual index for average crop values in the county. However, as with any such endeavor, we cannot be confident that our proxies correct fully for local economic conditions.

Similarly, economic conditions are likely to be really bad if a large (and well diversified) bank fails. It may then not be surprising if the relative size of the failed bank in the county appears to be negatively correlated with subsequent recovery rates. We do correct for the absolute size of the bank, and the effect of relative size still persists. Nevertheless our interpretation could be questioned. More generally, any proxy for a loss of local financing capacity is likely also to be a proxy for local distress. It is therefore hard to disentangle the effects of a loss in financing capacity from the effects of an increase in economic distress on recovery values.

Limitations imposed by bank regulation do, however, offer a way of telling the two effects apart. Consider a county surrounded by other counties. Because the local financing market is likely to extend to neighboring counties, the recovery rate on a failed bank's assets is likely to be depressed by the failure of banks in neighboring counties, and hence the loss of local financing capacity. Of course, because economic conditions are likely to be similar in

[5] Using aggregate time series data, Anari, Kolari and Mason (2005) show that the liquidation of national bank assets may have also had real economic consequences.

neighboring counties, bank failures there could be a proxy for economic conditions in the county of interest – thus far we have not solved the basic problem of identification.

However, in the 1920s and 1930s, states prohibited out-of-state banks from operating branches in their territories (see, for example, Kroszner and Strahan (1999)). Mortgage lending across state borders was prohibited by a number of states, and made significantly more difficult in others through regulations on the registration of collateral and requirements for bank director residency. So bank failures in neighboring *in-state* counties proxy both for poor local economic conditions *and* a loss in local financing capacity, while bank failures in neighboring *out-of-state* counties proxy primarily for poor local economic conditions – since out-of-state banks typically did not lend to borrowers in the county of interest (also see the evidence in Rajan and Ramcharan (2014)). By examining the differential effects of neighboring in-state bank failures and neighboring out-of-state bank failures, we can identify the effect of a loss in local financial capacity.

We find that bank failures in neighboring in-state counties had a significantly more adverse effect on the recovery rate from a failed bank's assets than bank failures in neighboring out-of-state counties. Perhaps more compelling, we make use of the fact that Federal Reserve Bank district borders sometimes divided states, and national banks did not lend across national bank district borders. Therefore, if indeed the negative association between suspensions and recovery rates is driven by a loss of financing capacity, then for two counties in the same state separated by a Federal Reserve district border, the national bank suspension rate across the district border should not influence recovery rates in counties on this side of the border. Because the restriction on across-Reserve-Bank-district lending within the same state did not apply to state banks, we would still expect a negative association between the recovery rate and the suspension rate of nearby in-state but across-Reserve-Bank-district state banks. We find evidence consistent with these predictions.

In addition to depressing recovery rates, the prospect of fire sales should lead to both a fall in current asset prices (as investors anticipate the eventual fire sale) as well as a fall in transaction volume (see Diamond and Rajan (2011)). We find evidence consistent with this. Finally, we also find that a reduction in local financial capacity does foretell subsequent bank failures, suggesting the financial contagion predicted by the theory.

Instead of examining the consequences of the loss of financing capacity, we can also examine the effects of variation in ex ante available financing capacity directly. Our basic regression includes the share of assets in the bank relative to ex ante deposits in the county (in 1920). This is negatively correlated with the recovery rate, suggesting that relatively large banks consume more of available local financing capacity, and have lower recovery rates. Building on this idea, and our basic identification, we also include the assets in the bank relative to deposits in neighboring counties. Greater assets in a failing bank relative to bank deposits in neighboring in-state counties should have a negative effect on recovery rates if financing capacity matters, while greater assets in a failing bank relative to bank deposits in neighboring out-of-state counties should have more limited effect. This is indeed what we find.

Taken together, these findings suggest that the loss of financing capacity can disrupt the local economy, over and above any real fire sales, as suggested in Bernanke (1983). And they suggest one mechanism through which a real shock might propagate itself through time -- the rapid liquidation of a failed bank's financial assets and the concomitant decline in asset prices engender further bank failures and asset price deflation. The rest of the paper is as follows. In section 1, we describe the historical background and, in section 2, the data. In section 3, we present the main results, and supporting results in sections 4 and 5, after which we conclude.

I. Historical Background

The banking failures of the early 1920s had their origins in the preceding commodity price boom (see Rajan and Ramcharan (2014)). Despite the growing number of failures in that decade, policy interventions to contain financial sector distress in the agricultural areas came only towards the end of the decade. This absence of any systematic policy interventions, along with the fact that we have good proxies for the shock to agricultural fundamentals, help to make the 1920s an almost ideal period to identify the impact of changes in local financing capacity on asset recovery rates.

In the period leading up to 1920, farm land prices in the United States and the value of farm output boomed. The boom had its roots in strong US growth, but it accelerated as World War I disrupted European agriculture, even while demand in the United States was strong. The Russian Revolution in 1917 further exacerbated the uncertainty about supply, and intensified the commodity price boom, especially the price of wheat and other grains. The widespread belief was that "…European producers would need a very long time to restore their pre-war agricultural capacity…" (Johnson (1973, p178)). The national average of farmland values was 68 percent higher in 1920 compared to 1914, and 22 percent higher compared to 1919.

However, European agricultural production resumed faster than expected after the war's sudden end, and in need of hard currency, the new Russian government soon recommenced wheat and other commodity exports. As a result, agricultural commodity prices plummeted starting in 1920 and declined further during the 1920s (Blattman, Hwang and Williamson (2007), Yergin (1992)).[6] Farm incomes fell 60 percent from their peak in 1919 to their depth in 1921. Farm incomes did recover steadily after that. Indeed, by 1922, farm incomes were back to the level they reached in 1916, before the 1917-1920 spike, and by 1929, were 45 percent higher still (though still short of their 1919 levels). So the "depression" in agricultural incomes was only relative to the heady levels reached in the period 1917-1920 (Johnson (1973), Alston, Grove, and Wheelock (1994)).

During the long boom, credit became widely available, as competition between state and national banks led to the chartering of thousands of new banks. Traditional commercial banks also competed with life insurance companies, joint stock land banks and Federal land banks in some areas to provide credit (Alston (1983a, b)). And the long history of rising land prices gave lenders confidence that they would be able to sell repossessed land easily if the borrower could not pay, so lending standards fell and banks lent and refinanced willingly.[7]

Mortgage debt per acre increased 135% from 1910 to 1920, approximately the same rate of increase as the per acre value of the ten leading crops (Alston, Grove, and Wheelock (1994) citing Federal Reserve documents). Borrowers often only had to put down 10 percent of the amount, obtaining 50 percent from a bank, and getting a second or junior mortgage for the remainder (Johnson (1973)). Loan repayments were typically bullet payments due only at maturity, so borrowers had to make only interest payments until maturity. And as long as refinancing was easy, borrowers did not worry about principal repayment. Debt mounted until

[6] The price of a bushel of wheat fell from $3.08 in May 1920 to $1.68 in December; corn fell from $2.00 to $0.76 over the same period (Benner (1925)).
[7] C.D. Brener (p. 38, 1935) observes "When war prosperity came, it was looked upon as a normal acceleration of the universal course of events, and the possibility of a reaction was seldom, if ever, considered…the unlimiting granting of charters to all applicants, resulting in the admission to the banking fraternity of thousands of incompetent individuals and the establishment of a bank in practically every village or hamlet, the enactment of banking statutes of the flimsiest substance, and extreme laxity of supervision—would undoubtedly have resulted in the realization that it would be impossible to escape the consequences of such fair-weather banking."

the collapse in commodity prices put an end to the credit boom. With borrowers unable to repay, banks started failing.

In the two decades before the collapse of the boom, banking failures were relatively rare (Figure 1), but around 4,000 state chartered banks and 690 national banks were suspended in the period 1921-1927—a time when industry was largely booming. Suspended state banks were generally smaller than national banks, and suspended deposits during this period totaled $30 billion, roughly evenly split between state and national banks. Figure 2 shows the geographic range of the FDIC bank suspension rate across counties in the period 1921-1927. This agricultural depression before the Great Depression, characterized by a spate of bank suspensions concentrated in agricultural counties, offers us a way to test theories of asset liquidity and liquidation values.

The Office of the Comptroller of Currency's (OCC) approach to liquidating national banks throughout much of the1920s, along with prevailing federal policy, also provide an especially useful institutional context in which to study theories of asset liquidity and liquidation values.[8] For most of the sample period, it was generally rare for closed banks to be entirely taken over by existing banks. Instead, receivers usually sought to liquidate the assets of failed national banks as quickly possible, selling these assets on the open market in a decentralized manner within the local community (Upham and Lemke (1934)). That is, once court approval was obtained, loans were collected upon. If repayment was not forthcoming, the receiver seized collateral such as farms, livestock, bonds, stocks and furniture (Popejoy (1931)) and attempted to sell it. Thus, to the extent that borrowers could get refinanced or loans could be transferred, the recovery value of the failed bank's assets would reflect financial fire sale discounts. To the

[8] The National Bank Act of 1864 provided for the appointment of receivers by the Office of the Comptroller of Currency (OCC) for failed national banks. State supervisory authorities managed the liquidation of failed state banks.

extent that they could not, recovery values would reflect the extent of real fire sales. In either case, of course, local financing capacity would matter.

However, as the number of failures increased, it became increasingly apparent that the dislocations caused by the rapid forced selling of these assets into the community tended to push down local farm land prices, hampered asset recovery and increased the legal and administrative costs of liquidating the bank. Falling land prices often made recovery from the failed bank's debtors more difficult, prompting many receivers to resort to expensive litigation in order to collect from these debtors (University of Nebraska (1931)).

To help reduce these dislocations, centralized approaches to asset liquidation eventually became more common, and federal intervention deepened dramatically in the 1930s.[9] In 1931, the federal government encouraged the formation of a private corporation, the National Credit Corporation, which was intended to allow stronger banks to aid weaker banks. In 1932, the federal government created the Reconstruction Finance Corporation (RFC) to help stem the wave of bank suspensions by directly lending to troubled banks. The RFC also began making loans to closed banks after the 1933 banking holiday in order to prevent receivers from having to dump large blocks of loan securities on an "abnormally low market" (Federal Reserve Board (1936)). In other words, real fire sales became less common, even while financial fire sales – where loans were transferred or assumed from the distressed bank at discounted prices – may have continued.

So compared to the 1920s, the sample of failures in 1930-34 may differ both in the causes of failure (not just agriculture) and in the resolution process. But the sheer magnitude of banking

[9] For example, rather than selling locally, the OCC announced in February 1932 that the sale of bonds formerly held in failed national banks would be concentrated in a board located in New York City. Variations of the "Spokane Plan", which sought to induce healthy banks to take over failed banks without directly selling assets into the local market, and was first used in 1928, also became increasingly common (Upham and Lemke (1934)). Likewise, states, such as Ohio, also adopted similar rules to "operate with centralization of policy without detriment to the individual localities" (Whitsett (1938)).

sector distress between 1930-1934 (see Figure 3) as well as the possible relative importance of financial fire sales in the 1930s sample, provides another potentially useful context in which to study the impact of changes in local financing capacity on recovery rates We now describe the data.

II. Data

We first focus on the agricultural depression of the early 1920s, and hand-collected annual data between 1920 and 1927 on insolvent national banks placed in receivership as reported by the Office of the Comptroller of Currency (OCC) in its various Annual Reports. We then turn to the Great Depression, and use the OCC Annual Reports in 1936 to collect data on national banks that were suspended between 1930-1933. Throughout, we organize the samples based on the date the receiver was appointed, which is not always the same as the date of suspension—there can be lags between the decisions to suspend and then liquidate a bank (OCC (1936)). This is why we have a number of banks placed in receivership in 1934, though few banks were suspended that year. We now describe the data from each period in turn.

1920s

These OCC Annual Reports identified 587 banks between 1920-1927. By comparison, data from the FDIC, available in electronic form, cover around 690 suspended national banks during this period (and also less detailed data on suspended state banks). Banks can be suspended and then possibly reopened without necessarily being placed in receivership, and data from the FDIC are based on this more general measure of banking distress. Nevertheless, as Table 1 suggests, there appear to be no systematic differences in coverage across regions between the FDIC data on suspensions, and the OCC's coverage of national banks in receivership. In what follows, we will use both sources of data, the more detailed OCC data for asset recoveries from banks placed into *receivership*, and the broader coverage of the FDIC data for the total number of *suspended* banks (state and national) in a county.

For each bank in receivership, the OCC's Annual Report provides information about the bank at the time of failure: capital stock at the time of the bank's organization; the date of organization; the date of failure; deposits at the time of failure; and total assets at the time of failure. Total assets are further decomposed into the value of assets expected to be recovered—"estimated good assets"; those assets of "doubtful value"; and those viewed to be "worthless" by the appointed receivers. In addition, the OCC reports annual information on asset recovery. For each bank, we collected this information on asset recovery over a three year window, beginning in the year of failure. Once a bank's assets have been collected to the extent possible, the bank is considered resolved.[10] Figure 4 contains pages from the report.

Importantly, we know the county in which the failed bank was headquartered. Because banking sector distress was initially driven by falling agricultural prices, we hand collected data from the 1920 Decennial Census on the acreage in each county devoted to five principal crops: corn, wheat, tobacco, cotton, and grains. Multiplying the share of acres devoted to each crop by the change in the world price of the crop, and then taking the sum of these acreage weighted price changes provides county level variation in the perceived shock to local agricultural fundamentals over the 1920s. Figure 5 depicts this county level variation in the perceived shock to local agricultural fundamentals, averaged over 1921-1927. Counties in the upper Midwest and the South suffered some of the sharpest deterioration in agricultural fundamentals during this period.

[10] The National Bank Act requires receivers to collect "all debts due and claims belong to a bank, and upon the order of a court of competent jurisdiction, to sell or compound all bad or doubtful debts, and to sell all real and personal property in order to pay depositors and creditors, and the balance, if any to stockholders." See the Act of June 30 1876 Sec. 1; 19 Stat L. 63, and Sec 5234.

We also hand collected data from the US Agricultural Census of 1920 on the average mortgage debt to farm value ratios at the peak of the credit boom in 1920. Additionally we obtained annual data on land prices per acre, to serve as an additional measure of asset price declines. These data are hand collected from the Department of Agriculture (DOA) on actual market transactions of farm land for an unbalanced panel of counties observed annually from 1907-1936. These data are recorded from state registries of deed transfers, and exclude transfers between individuals with the same last name in order to better capture arm's length market transactions.

From 1920 onwards, the FDIC provides data in electronic form on the total number of banks and the quantity of deposits in each county within both the state and national banking systems. The FDIC also provides data on the number of suspended state and national banks, as well as the fraction of deposits in suspended banks, in each county every year. We will use these data as a measure of the loss of local financing capacity.

In the top panel of Table 2, we present summary data in 1920 for those counties that had national banks present in 1920, but no national bank suspensions throughout the decade. The bottom panel contains summary data for the subset of counties that experienced at least one national bank suspension in the decade. Across both subsamples, the level of leverage appears similar, as does the local run-up in commodity prices and the subsequent distress in agriculture in the county.

However, consistent with the results in Rajan and Ramcharan (2014), credit availability at the peak of the boom in 1920, as proxied for by either the log number of banks or banks per capita, is significantly greater in those areas that also suffered greater banking sector distress. It would seem then that pre-existing local economic conditions, along with the local structure of banking, could matter both for subsequent banking fragility and the evolution of asset recovery rates within in a county. In what follows, we consider a number of ways to control for these and other potential explanations when assessing the importance of local financial capacity in shaping asset recovery.

1930s

The FDIC recorded 1,951 national bank suspensions between 1930 and 1934. As indicated earlier, not all suspended banks are liquidated, and we collected detailed data from the 1936 OCC Annual Report for 1,072 national banks in receivership in 1936. Table 3 shows the regional variation in the data, again suggesting little difference in coverage across regions between the FDIC data on suspensions, and the OCC's receivership data.

Table 4 summarizes the recovery rate three years after failure for those banks placed in receivership in the 1920s. For those banks placed in receivership between 1930-1934, the recovery rate is observed in 1936. The median recovery rate for the 1920s sample is around 52 percent and is similar to the recovery rate for those banks placed in receivership amid the early panics of 1930 and 1931, although in this latter sample asset recovery, observed in 1936, would have been ongoing for nearly twice as long as in the 1920s sample. However, for the 1933-1934 subsample, which coincides with the formation of the RFC in 1932 and the more aggressive efforts to limit fire sales, asset recovery rates are considerably higher than in the earlier periods despite the much shorter recovery period. We now examine the role of local financing capacity in shaping recovery rates.

III. Results from the 1920s

III A. Basic Analysis of Liquidation Values

We start by documenting some basic correlations between bank suspensions and asset recovery rates for the more homogenous 1920-1927 sample. The dependent variable in the regression in column 1 in Table 5 is the fraction of the book value of assets that are recovered in a failed national bank within three years after the bank is placed in receivership. The key explanatory variable, which we include along with state indicators, is the sum of deposits in both state and national banks suspended in that county over the same three year window expressed as a fraction of total deposits within the county in the year of failure. Note that in what follows, whenever we measure financing capacity (or the loss of financing capacity due to suspensions), we include both state and national banks in the computation, since aggregate bank financing capacity in the county is what matters.[11]

As predicted, recovery rates are strongly negatively correlated with the share of subsequent failed deposits. As we move from the 50th to the 75th percentile in the share of failed deposits, about a 16 percentage point increase, there is a 3.2 percentage point decline in the three year recovery rate. To put these magnitudes in context, the median three year recovery rate in the sample is 51.7 percent, suggesting that the economic relationship between local financing capacity and asset recovery might be large.[12]

---

[11] We do not include other sources of finance in part because our thesis is that bank loans are special and have a limited market, which is why banking capacity matters. Comingling with other sources of finance might be inappropriate. Also, although national banks were larger and may have served somewhat larger clients than state banks, we have not found significant differences between their behavior in previous work on the dimensions we explore here. Therefore, in our view, the combined deposits of state and national banks is the best measure of aggregate financing capacity.

[12] Alternatively, in an analogous log linear specification that controls for log assets at the time of failure as well as log deposits in the county, moving from the 50th to the 75th percentile in the log value of suspended deposits over the recovery period inside the county is associated with a 5 percentage point drop in the value of recovered assets; these results are available upon request.

In column 2, we add a number of the failed bank's characteristics that might influence recovery rates. These include the log of the bank's assets (as a measure of absolute bank size), the ratio of the failed bank's assets to total county deposits at the time of failure (as a measure of the relative size of assets that need to be refinanced and, concomitantly, the relative loss of financing capacity at the time of failure), the bank's capital at the time of set up relative to total assets in the year of failure, as well as the bank's deposit to asset ratio in the year of failure.

Not all of the aforementioned bank level observables are available for each bank, so the sample size in column 2 is lower by about 12 percent. Nevertheless, the relationship between suspended deposits in a county over the three year recovery window and the recovery rate of failed banks headquartered in that county remains negative and significant at the one percent level.

The theory suggests that relatively large bank failures, with failing bank assets measured relative to total deposits in the county, might overwhelm the financing capacity of a county. Relative size is indeed associated with lower recovery rates. A one standard deviation increase in the ratio of failed bank assets to county deposits is associated with a 0.11 standard deviation decrease in the recovery rate. Interestingly, once we correct for relative size, the actual size of the failing bank does not seem to be statistically significant.

Also, failed banks that were initially organized with large amounts of capital (relative to the book assets at the time of failure) tend to have lower recovery rates. One explanation is that a bank that burnt through larger amounts of capital to fail must have experienced a larger erosion in underlying asset values.[13] Another explanation, consistent with our reading of contemporary documents, is that capital requirements may have affected bank risk taking incentives. The

[13] The coefficient estimate on deposits to assets is positive, though statistically insignificant at usual levels. The sign of the coefficient is consistent with the argument that banks with higher initial leverage fail when asset values are not as eroded.

Economic Policy Commission (1935) observes for example that as the pool of “good business” shrank during the agricultural depression of the 1920s, banks organized with large amounts of capital may have sought lower quality loans in order to generate earnings commensurate with their capital investment. As an aside, this suggests that higher capital requirements are not a panacea for the problem of bank risk taking; they may exacerbate it unless accompanied by appropriate asset side regulation and supervision.

Thus far, the evidence is consistent with the idea that local financing capacity might be important in shaping recovery rates. But the correlation between recovery rates and subsequent bank failures might also be driven by deteriorating economic fundamentals in the county, as the latter can both depress bank recovery rates and also engender more local bank failures.

In column 3, we attempt to control for some of these fundamentals by including a number of demographic, geographic and economic controls. These controls include the log of total population, the log urban, and log African-American populations in the county; the log number of people between the age of 5-17 years old; the log number illiterate; the share of manufacturing value added in the county; the log value of crops; the log number of farms; the log of the number of banks in the county; the log area of the county, and the log of the county centroid's distance in miles from key waterways. These variables are observed in 1920 and help measure potentially important pre-existing county characteristics.

We also include the commodity index observed both at the time of failure and averaged over the subsequent recovery window, as well as the annual change in imputed state per capita income averaged over the subsequent recovery window. The negative correlation between bank suspensions and asset recovery reported in column 3 remains virtually unchanged in magnitude and statistical significance from that in column 2.[14] While this evidence suggests that a loss of financing capacity might lead to fire sales and depressed recovery rates, it remains possible that subsequent bank failures in the county might themselves portend a worsening of economic conditions, and a deterioration in the fundamental value of local assets. We now turn to bank regulations of the era to better identify the role of financing capacity in shaping asset recovery.

III B. In-state and out-of-state neighbors

In 1920, regulatory prohibitions on inter-state bank branching meant an in-state bank could not open branches across state lines to originate out-of-state loans. To prevent bankers from simply seeking a bank charter across state lines to gain out-of-state business, some states, such as Florida, also imposed residency requirements on the directorate of banks (The Bankers Encyclopedia, 1920).[15] Concerned about the illiquidity of real estate collateral, states also severely restricted the types of mortgage related transactions that their banks could engage in across state lines, imposing limits for example on the types of properties that could be used as collateral, aggregate limits on out-of state exposures, as well as more general limits on the size and duration of the mortgage portfolio (Barnett (1911), Weldon (1910)).

State laws also typically required the recording of both real estate and chattel mortgages in both the county in which the property was located, as well as in the county of loan origination. For any bank seeking to originate credit across state lines, these requirements significantly increased origination costs, as seizing collateral in the case of non-repayment required these

[14] Consistent with the contemporary observations that forced asset sales and the absence of ready buyers not only tended to depress recovery rates, but raise the cost of recovery, we also document a positive association between the ratio of liquidation expenses to recovered assets and the local bank suspension rate over the recovery period. Results are available on request. Also available upon request are results that show that the effects of local financing capacity on asset recovery is more muted when a greater fraction of assets are “generic”, like US Treasury bonds. This suggests that because these generic assets require little special knowledge to evaluate, the set of potential buyers is likely wider than just local banks.

[15] Florida for example required 60 percent of a bank's board to have been state residents the previous year.

often small rural banks to be familiar with judicial practices across state lines, and to retain lawyers able to practice across state lines (The Bankers Encyclopedia, 1920).[16] These judicial practices differed dramatically across states, largely for idiosyncratic historical reasons (Ghent (2013)). For instance, narratives around this period observed that the cross-state variation in foreclosure costs significantly limited the flow of mortgage credit across state borders (Bridewell (1938)).

These regulations made cross-state-border lending more difficult, and provide a relatively powerful test to help distinguish the importance of financing capacity in shaping asset recovery. The test builds on the idea that the large costs of banking at a distance implies the potential lending market is local, and includes both in-county banks as well as banks in neighboring counties but not banks in distant counties. These neighboring counties could be *in-state* or *out-of-state*. Because of the difficulty, if not outright prohibition on cross-state-border lending, while bank suspensions in neighboring in-state counties proxy both for poor local economic conditions *and* a loss in local financing capacity, bank suspensions in neighboring out-of-state counties proxy largely for poor local economic conditions only. That is, although economic conditions are similar across state lines, out-of-state banks would find it difficult, if not impossible, to lend across state lines, and thus the suspensions of out-of-state banks would be unlikely to detract from financing capacity across state lines.[17]

Therefore, by examining the difference in the influence of equidistant neighboring county in-state bank suspensions and neighboring county out-of-state bank suspensions on recovery

[16] These legal and other impediments to the flow of credit across state lines often had strong political motives. For example, even in the midst of the wave of Depression era banking reforms, a bill introduced by Carter Glass allowing national banks to branch in all states, *and to be able to branch up to 50 miles across the state boundary line* was defeated in 1932, led by the famous populist Huey Long (Westerfield (1939)).

[17] Available upon request are results which show that geographical features such as mean rainfall did not vary significantly across state borders among counties located within 100 miles of a state border. Also, the acreage devoted to typical crops (in 1920) also did not vary significantly across state borders, at least up to 50 miles on either side of the border.

rates, we can identify the effect of a loss in local financial capacity on recovery rates. Furthermore, even within a specific state, the influence of in-state bank suspensions on financing capacity should diminish with distance, as informational and other frictions would be expected to hinder the ability of more distant banks to influence financing capacity in the county of interest.[18]

We implement this test in Table 6. In column 1, we restrict the sample to those counties within 90 miles of a state border. The suspension rate is the total value of suspended deposits (both national and state banks) in neighboring counties within the relevant distance increment over the three years after the failure of a given bank divided by total deposits in the banking system over the same area in the year of the bank's failure. We then include in the baseline regression (Table 5, column 3) the suspension rates for banks in neighboring *in-state* counties within 30 miles of the county, within 30-60 miles, and within 60-90 miles of the county, as well as suspension rates in neighboring *out-of-state* counties within 30 miles of the county in which the failed bank is headquartered.

The evidence suggests that local financing capacity significantly influences asset recovery. The point estimate on the suspension rate within the county remains negative, large, and significant at the one percent level. But the coefficient on the suspension rate in in-state counties up to 30 miles away is only slightly smaller in magnitude and is significant at the five percent level. This coefficient suggests that a one standard deviation increase in the suspension rate in close neighboring in-state counties is associated with a 0.14 standard deviation decrease in the recovery rate. These effects also decay with distance. Neither the coefficients on in-state bank failures in the 30-60 mile or the 60-90 mile increments are statistically significantly

[18] The role of distance in shaping lending would be expected to be larger in unit banking versus branching states. In the latter, banks could use branches to more easily supply credit to farmers away from major towns. However, about 80 percent of the failed national banks occurred in unit banking states, and we do not have enough data to examine the effects of differences in branching regulations across states.

different from zero. Their magnitudes indicate significantly less adverse effects on recovery rates.

Perhaps most relevant, the coefficient on the suspension rate in counties up to 30 miles away but across state lines is small, statistically insignificant, and different from the corresponding equidistant in-state coefficient at the five percent level (p-value=0.02). Consistent with the theory, in-state suspensions in neighboring counties reflect a true loss in financing capacity for the bank in receivership, and reflect adversely on recovery rates, while out-of-state suspensions in equally proximate counties do not reflect a loss in financing capacity (though the counties may have similar economic conditions) and do not affect recovery rates adversely.

We replicate the analysis using different border intervals. In column 2 of Table 6, we include in-state counties within 80 miles of the failed bank's county, broken into 40 mile increments, while in column 3, we include in-state counties within 100 miles of the border, but in 50 mile increments.[19] Throughout, the point estimate on the bank suspension rate within the reference county remains largest, closely followed by the point estimate on the suspension rate in the nearest in-state distance increment. The negative impact of neighboring county bank suspensions on the recovery rate from the failed bank's assets diminishes with distance, and is never large or statistically significant when the neighboring counties are across state borders. In what follows, we will use counties within 100 miles as our baseline -- regressions for other distances are available from the authors.

We have the one year recovery rate on failed bank assets. While one year may be too short a time to capture the full recovery on assets, we can combine the three year and one year recovery rates to create a panel. The panel structure in turn allows us to use fixed effects to

[19] Because waterways sometimes coincide with state borders and also might lead to economic differences on either side of the state border, we have run these regressions excluding counties within 100 miles of the Mississippi river. The results are unchanged and available upon request.

control non-parametrically for any time invariant bank level unobservable variables --geography, bank management and local market structure at the time of failure—that might influence asset recovery, and possibly local financing capacity. In Table 7 column 1, we again see evidence of local financing capacity in shaping asset recovery; the adverse effects of the increase in neighboring county bank suspensions between 1 to 3 years after a bank's failure on the reduction in asset recovery over that period are seen only for nearby in-state counties.

An issue of independent interest is how much the eventual realizations from assets might be a surprise relative to what was anticipated at the time of the bank's failure. We have data on the estimates made by bank examiners of "good" assets at the time of the bank's failure. In Table 7 column 2, the dependent variable is the ratio of the value of assets recovered over the three year window relative to the value of assets estimated "good" at the time of failure, with all columns also including the standard suite of bank, county and state controls. To control for the impact of local banking sector distress on the formation of these asset recovery expectations, we control as well for the suspension rate in the county the year before failure.

From column 2 of Table 7, nearby in-state suspensions over the three year recovery window appears to lower asset recovery volumes relative to initial expectations. A one standard deviation increase in the suspension rate within 50 miles is associated with a 0.17 standard deviation decline in the ratio of recovered assets relative to assets judged "good" at the time of failure. By contrast, the coefficient on suspensions in out-of-state counties is about 2.5 times smaller than its equi-distant in-state counterpart and statistically insignificant.

Interestingly, the coefficient estimate for in-county bank suspensions is smaller in magnitude than the coefficient estimate for in-state nearby county bank suspensions (this seeming anomaly is observable in some later estimations also). This is less puzzling when we recognize that suspensions within county have a higher variance than suspensions averaged across nearby counties. Since the “true” suspension rate is measured with greater error for in-county suspensions, the coefficient estimate is likely to be more biased towards zero. On the other hand, because the standard deviation of in-county bank suspensions is higher compared to the standard deviation of suspensions in nearby counties, the usual ways of measuring economic impact would offset this bias – a one standard deviation increase in the in-county suspension rate is associated with a 0.23 standard deviation decline in the ratio of recovered assets relative to assets judged "good" at the time of failure.

IIIC Positive measures of financing capacity

The state borders and distance results suggest that the negative association between suspended deposits and recovery rates are unlikely to be explained by latent economic fundamentals. Instead, these results are consistent with the hypothesis that the loss of financing capacity associated with bank failures might lead to diminished asset recovery rates, in part through financial fire sales. But it remains possible that aggressive attempts at asset recovery could themselves lower local asset prices and cause subsequent bank failures, with contagion taking place through low asset prices. This contagion channel would in turn also lead to a negative association between suspended deposits and recovery rates.

Therefore, to understand better the importance of local financing capacity in shaping these results, we construct tests based on the potential residual liquidity, observed before the time of failure and likely free of any contagion, on the subsequent asset recovery rate for the failed bank. These tests build on the idea that recovery rates are likely to be high in those areas where the size of the bank that failed is relatively small compared to the initial available liquidity in the market. In contrast, asset recovery is likely to be considerably lower when the quantity of assets to be liquidated dwarfs the potential aggregate liquidity available from nearby banks in the area—when residual financing capacity is low. Indeed, recovery rates are likely to be lowest when there are no nearby banks able to purchase the assets of the failed bank.

In Table 8, the dependent variable is the three year recovery rate. The explanatory variables (along with those in the baseline regression) are the ratio of the failed bank's assets scaled by deposits of banks in the county other than the failed bank, as well as assets of the failed bank scaled by deposits in nearby counties, with all deposits and assets measured in 1920. The right hand side variables are thus a measure of the potential relative financing capacity outside the bank in 1920 for the bank's assets. Large banks would have relatively low outside financing capacity, as would banks in areas that have little banking in neighboring counties. Moreover, by measuring potential aggregate liquidity in 1920, well before any failures were envisaged, our results cannot be easily explained by any contagion channel emanating from attempts at asset recovery.

The estimates in Table 8 suggest that asset recovery rates were higher for those failed banks that were small relative to aggregate liquidity in 1920 in the local area. Also, consistent with the idea that these results are not driven by latent economic factors, these effects are large for banking capacity in neighboring (within 50 miles) counties, but do not extend across state borders. The magnitude of the coefficient on relative banking capacity in neighboring out of state counties is 1/6th the size of the coefficient on neighboring in-state counties at the same distance. Thus available banking capacity to buy failed bank assets does seem to matter, as it directly affects eventual recovery rates.

IV: Including data from the 1930s

One virtue of the data from the 1920s is that the causes of failure are fairly similar (agricultural distress). Not only did the causes of bank failures during the Depression become more varied, but the policy interventions of the 1930s aimed at containing real asset fire sales may hamper inference. At the same time, the sheer number of failures during this period (we have over twice the number of failed banks in this sample relative to the 1920s) also allows us to conduct important robustness checks for our main results.

In Table 9A, we present estimates based upon the sample of national banks that were placed in receivership between 1930-1934. The dependent variable is the recovery rate observed in 1936, and we include the standard bank level controls, including the number of years since the bank was placed in receivership, as well as the available county demographic and economic controls observed in 1930.

From the basic regression in column 1 of Table 9A, a one standard deviation increase in the suspension rate, measured between 1930-1934, in the county is associated with a 1.6 percentage point or 0.11 standard deviation drop in the recovery rate—an impact statistically similar to that observed in the 1920s sample. In column 2, we present estimates similar to those in Table 6 column 3 (using the 100 mile window). As before, the evidence suggests that local financing capacity significantly influences asset recovery. The point estimate on the suspension rate within the county, as well as for suspensions in counties up to 50 miles away, remains negative, large, and statistically significant at the five percent level. For suspensions at distances beyond 50 miles in-state, and also suspensions within 50 miles across state lines, the point estimates are small and not different from zero.[20]

Thus far, the key measure of financing capacity has not distinguished between state and national banks, emphasizing that the aggregate bank financing capacity in the county of interest is likely to matter most for absorbing the liquidation of national bank assets. However, national banks were generally larger than their state counterparts, served different clienteles, and their precise rights to make real estate loans remained a matter of debate for some time (see Sylla (1969) and Keehn and Smiley (1977)). The larger sample from the 1930s gives us enough data to determine whether these potential differences in the business models of national and state banks led to differences in their ability to absorb the liquidation of nearby national banks.

This disaggregation between national and state banks provides another useful way of testing the financing capacity hypothesis. Federal Reserve Bank district borders sometimes cut across a state (Figure 6). The Federal Reserve Act of 1913, while allowing national banks to more freely engage in mortgage lending, also greatly limited the ability of these banks to make real estate loans across district borders. While the McFadden Act of 1927 relaxed slightly this geographic restriction (Preston (1927)), states banks were never subject to these restrictions on cross-district lending. These regulatory differences between state and national bank lending suggest a further test.

If indeed the negative association between suspensions and recovery rates are driven by the loss of local financing capacity rather than poor fundamentals, then for two counties in the same state separated by a Federal Reserve district border, the national bank suspension rate across the district border should not influence recovery rates on the other side of this border. Because the

[20] Also, the suspension rate in counties up to 50 miles away in-state, as well as across state lines is nearly identical. The 50 mile in-state suspension rate has a mean of 0.13 with a standard deviation of 0.10. The 50 mile out-of-state suspension rate has a mean of 0.13 with a standard deviation of 0.15.

restriction on across-Reserve-Bank-district lending within the same state did not apply to state banks, we would still expect a negative association between the recovery rate and suspensions of state banks in nearby in-state but across-Reserve-Bank-district counties. This test gives us a persuasive way of addressing concerns that our results might primarily be driven by economic differences in proximate counties across state borders.

In Table 9B, we report the estimates from this test. The direct impact of national and state bank suspensions in the county of interest on recovery rates are nearly identical, supporting our earlier decision to club state and national bank suspensions together. But consistent with the hypothesized financing capacity channel, within-district national banks in counties up to 50 miles away continue to exert a statistically significant negative impact on asset recovery, while the coefficient estimate on equi-distant in-state national banks located across district lines is small and statistically insignificant. As before, the estimates on out of state national bank suspensions or distant in state national bank suspensions are not significant. Perhaps most compelling, the point estimate for state banks suspensions within 50 miles is negative, similar in magnitude regardless of the district line, and is actually statistically significant across district lines (it is not statistically significant within district lines because of high standard errors). The difference in coefficient estimates for national and state bank suspensions based on whether they occur in proximate areas where regulations permit the banks to lend (or not) strongly supports the hypothesis that the loss of financing capacity might matter for asset recovery rates.

V. Land Prices and Bank Failures

IVA. Land Prices and Transactions

A fall in financing capacity as a result of bank suspensions should lead directly to more severe fire sale pricing as well as a direct fall in transaction volume (see, for example, Diamond and Rajan (2011)). To test this potential connection between bank suspensions, asset prices, and transaction volume, we collected annual data from 1920-1933 on the average price of land for a panel of about 350 counties, as well as data on the number of land transactions in each of those counties. To reduce the impact of noise in the estimation, we collapse the annual data into a panel of four non overlapping periods:1920-1923, 1924-1926, 1927-1929, and 1930-1933, averaging the price level in each county in each period.

In Table 10, we report the results from estimating the impact of the ratio of suspended deposits to total deposits on the log of the average price of land in each county, where we report the somewhat more conservative standard errors that cluster by both state and time period (Cameron, Gelbach, and Miller (2011)). We continue to include bank suspensions both in the reference county as well as in nearby in-state and out-of-state counties, computed over various distance increments. We also control for state and time fixed effects, along with the log price of land in the previous period.

There is a large significant negative estimated association between bank suspensions within the county of interest and the log price of land in Table 10. A one standard deviation increase in the within county suspension rate is associated with a 0.017 standard decline in the log price of land. A similar increase in the suspension rate computed over in-state counties up to 50 miles away is associated with a 0.025 standard decline in the log price of land. The coefficient on neighboring out-of-state suspensions is small and statistically insignificant. Available upon request are results that measure the impact of financing capacity on the transaction volumes in the land market, measured in both the number of properties transacted as well as the acreage. A decline in nearby in-state financing capacity is associated with a drop in land transactions for the 350 counties for which we have these data.

IVB. Bank Failures

Fire sales suggest a channel of contagion. If land prices are depressed because of a loss of financing capacity, it should depress the values of solvent banks, and perhaps lead some of them to fail. This argument would then suggest a positive association between past banking sector distress in a location and subsequent distress within the same location. Moreover, if indeed this positive association reflects a loss of financing capacity and contagion rather than omitted adverse economic shocks, then any positive association between past and current banking sector distress should be considerably smaller across state lines.

In Table 11, the dependent variable is the bank suspension rate computed from the FDIC data, in county i observed annually between 1920 and 1933. We include the suspension rate within the county in the previous period, as well as the suspension rate computed in nearby in-state and out-of-state counties. A one standard deviation increase in the suspension rate within the county of interest is associated with a 0.06 standard deviation increase in the suspension rate the next year. A one standard deviation increase in the bank suspension rate in the previous year among in-state counties located within 50 miles of the county of interest is associated with a 0.02 standard deviation increase in the suspension rate in the reference county in the current year. The point estimate on suspensions among out-of-state counties is not statistically significant, and is much smaller than its in-state counterparts.

VI. Conclusion

Can the loss of financing capacity cause assets to sell at a discount relative to fundamental value? Can it also render asset markets more illiquid? And can these forces lead to contagion, propagating shocks through time. This paper has used a new dataset drawn from the epidemic of national bank failures just both before the Great Depression, as well from 1930-1934, in order to shed light on these questions. For most of the sample period, banking regulators liquidated the assets of failed banks as quickly as possible. At the same time, state regulations, which limited bank branching across state lines, combined with the transactions costs imposed by distance, helped to segment local banking markets. We then have an almost ideal laboratory to study these questions.

We find evidence that recovery rates among failed banks were significantly lower in areas with more banking sector distress. We also find that local financial sector distress was associated with lower land prices and a decrease in land transactions. Finally, bank suspensions were spatially and temporally correlated, but only within those geographically proximate areas in the same state, suggesting that contagion stemming from the effects of asset liquidation on local land prices might be a key channel in transmitting banking sector distress.

Not only does our work verify that assets trade at a discount relative to fundamental value when they are sold by distressed owners, as suggested by Shleifer and Vishny (1992) (see also Campbell, Giglio and Pathak (2011), Benmelech (2009), Benmelech and Bergman (2008), Benmelech, Garmaise, and Moskowitz (2005), and Pulvino (1998)), it also shows that this phenomenon extends to financial assets such as bank loans. More importantly, it supports the Shleifer and Vishny view that the capacity of industry insiders (neighboring banks in our work) to buy the assets matters. Finally, bank failures reduce buying capacity, and could lead to a contagion of failures, as suggested by a growing literature in banking.

We are, of course, not the first to suggest that financial liquidity matters. However, by tying the decline in recovery rates, asset prices, and transaction volume to a loss in local financing capacity, this paper may provide tentative evidence in favor of theories that emphasize aggregate liquidity, or equivalently, “cash in the market” pricing, as an important source of financial distress and crises (see Allan and Gale (2000), for example). As banks fail, aggregate liquidity to fund asset purchases dries up, even while the assets sold by failing banks absorb residual liquidity (see Diamond and Rajan (2005)), precipitating further bank failures. The scope for further work is clear.

References

Anari, Ali, James Kolari and James Mason. 2005. “Bank Asset Liquidation and the Propagation of the Great Depression. *Journal of Money, Credit and Banking,* August, pp 753-773.

Viral V. Acharya & Hyun Song Shin & Tanju Yorulmazer, 2011. "Crisis Resolution and Bank Liquidity," *Review of Financial Studies*, Society for Financial Studies, vol. 24(6), pages 2166-2205.

Allen, Franklin, and Douglas Gale, 1994, "Limited Market Participation and Volatility of Asset Prices", *American Economic Review* 1994, 84, 933-955.

Allen, Franklin, and Douglas Gale, 2000, Financial contagion, *Journal of Political Economy* 108, 1–33.

Allen, Franklin, and Douglas Gale, 2005, "From Cash-in-the-Market Pricing to Financial Fragility," *Journal of the European Economic Association*, April-May 2005, 3(2-3), 535-546.

Franklin Allen, Elena Carletti (2008), The Role of Liquidity in Financial Crises, *2008 Jackson Hole Conference Proceedings*, Federal Reserve Bank of Kansas City, 379-412.

Alston, Lee J., “Farm Foreclosures in the United States during the Interwar Period,” *Journal of Economic History*, 43.4 (1983), 885-903.

Alston, Lee J., Wayne A. Grove, and David C. Wheelock, “Why Do Banks Fail? Evidence from the 1920s,” *Exploration in Economic History*, 31.4 (1994), 409-31.

Bremer, C.D. “American Bank Failures”. 1935. Columbia University Press: New York

Brunnermeier, Markus, and Yuliy Sannikov, “The I Theory of Money”, mimeo, Stanford University.

Efraim Benmelech, 2009. "Asset Salability and Debt Maturity: Evidence from Nineteenth-Century American Railroads,"*Review of Financial Studies*, Society for Financial Studies, vol. 22(4), pages 1545-1584, April.

Efraim Benmelech & Nittai K. Bergman, 2011. "Bankruptcy and the Collateral Channel" *The Journal of Finance,* Vol. 66, 2011.

Efraim Benmelech & Nittai K. Bergman, 2008. "Liquidation Values and the Credibility of Financial Contract Renegotiation: Evidence from U.S. Airlines,"*The Quarterly Journal of*

Economics, MIT Press, vol. 123(4), pages 1635-1677, November.

Efraim Benmelech & Mark J. Garmaise & Tobias J. Moskowitz, 2005. "Do Liquidation Values Affect Financial Contracts? Evidence from Commercial Loan Contracts and Zoning Regulation,"*The Quarterly Journal of Economics*, MIT Press, vol. 120(3), pages 1121-1154, August.

Blattman, Christopher, Jason Hwang, and Jeffrey G. Williamson, "Winners and losers in the commodity lottery: The impact of terms of trade growth and volatility in the Periphery 1870-1939," *Journal of Development Economics*, 82 (2007), 156-179.

Bridewell, David A. 1938. "Effects of Defective Mortgage Laws on Home Financing, the." *Law & Contemporary Problems.* 5: 545.

Buraschi, A., Sener, E. and Meguturk, M.: 2012, The dynamics of limits to arbitrage: An empirical investigation. Imperial College Working Paper.

Campbell, John, Stefano Giglio and Parag Pathak "Forced Sales and House Prices", *American Economic Review*, 101:2108-2131, August 2011.

Diamond, Douglas W., and Raghuram G. Rajan, "A Theory of Bank Capital," *Journal of Finance*, 55.6 (2000), 2431-65.

---, "Liquidity Risk, Liquidity Creation and Financial Fragility: A Theory of Banking", 2001, *Journal of Political Economy* , vol 109, 2, 287-327.

---, "Liquidity Shortages and Banking Crises," *Journal of Finance*, 60.2 (2005), 615-47.

---, "Fear of Fire Sales, Illiquidity Seeking, and Credit Freezes," *Quarterly Journal of Economics*, 126.2 (2011), 557-91.

Federal Reserve Board. "Bank Suspensions, 1892-1935". Document No. 332.11. 1936

Garleanu, N. and Pedersen, L. H.: 2011, Margin-based asset pricing and the law of one price, Review of Financial Studies 24, 1980–2022.

Ghent, Andra. The Enduring Legacy of Populism: A Brief History of America's Mortgage Laws, (2013), unpublished manuscript.

Johnson, David G., *World Agriculture in Disarray*. (London, UK: Macmillan Publishing Ltd., 1973).

Kroszner, Randall S., and Philip E. Strahan, "What Drives Deregulation? Economics and Politics of the Relaxation of Bank Branching Restrictions," *Quarterly Journal of Economics*, 114.4 (1999), 1437-67.

Mancini-Griffoli, Tommaso and Angelo Ranaldo. 2011. Limits to Arbitrage During the Crisis: Funding Liquidity Constraints and Covered Interest Parity, working paper

Mitchell, M. and Pulvino, T.: Arbitrage crashes and the speed of capital, Journal of Financial Economics, Volume 104, Issue 3, June 2012, Pages 469scien

Petersen, Mitchell A., and Raghuram G. Rajan, "Does Distance Still Matter? The Information Revolution in Small Business Lending," *Journal of Finance*, 57.6 (2002), 2533-70.

Popejoy, Tom L. "Analysis of the Causes of Bank Failures in New Mexico, 1920 to 1925," The University of New Mexico Bulletin, Vol 1., No 1. October 1, 1931.

Preston, H. "The McFadden Act". *American Economic Review*, 1927, vol 17. No.2, pp 201-218.

Pulvino, Todd, "Do Fire-Sales Exist? An Empirical Study of Commercial Aircraft Transactions," *Journal of Finance*, 53.4 (1998), 939-78.

Rajan, Raghuram, "Insiders and Outsiders: The Choice between Informed and Arm's-Length Debt," *Journal of Finance*, 47 (1992), 1367-1400.

Rajan, Raghuram and Rodney Ramcharan (2014), "The Anatomy of a Credit Crisis: The Boom and Bust in Farm Land Prices in the United States in the 1920s," working paper, University of Chicago.

Ramcharan, Rodney, Stephane Verani and Skander J. Van den Heuvel (2013). "From Wall Street to Main Street: The Impact of the Financial Crisis on Consumer Credit Supply," forthcoming, *Journal of Finance*

Sharpe, Steven A., "Asymmetric Information, Bank Lending and Implicit Contracts: A Stylized Model of Customer Relationships," *Journal of Finance*, 45 (1990), 1069-87.

Shleifer, Andrei, and Robert W. Vishny, "Liquidation Values and Debt Capacity: A Market Equilibrium Approach," *Journal of Finance*, 47.4 (1992), 1343-66.

---,"Fire Sales in Finance and Macroeconomics," *Journal of Economic Perspectives*, 25.1 (2011), 29-48.

University of Nebraska, "National Bank Failures in Nebraska", Nebraska studies in Business No.

29, November 1931.

Upham, Cyril and Edwin Lamke. 1934. “Closed and Distressed Banks: A study in public administration,” The Brookings Institution: Washington DC.

Whitsett, J.M., “Ohio Bank Suspension and Liquidations, 1920-1937”. Ohio State University, December, 1938.

Yergin, Daniel, *The Prize: The Epic Quest for Oil, Money, and Power*. (New York, NY: Simon and Schuster, 1992).

Figures and Tables

Figure 1. Number of Bank Suspensions per 100 Active Banks, 1900-1935.

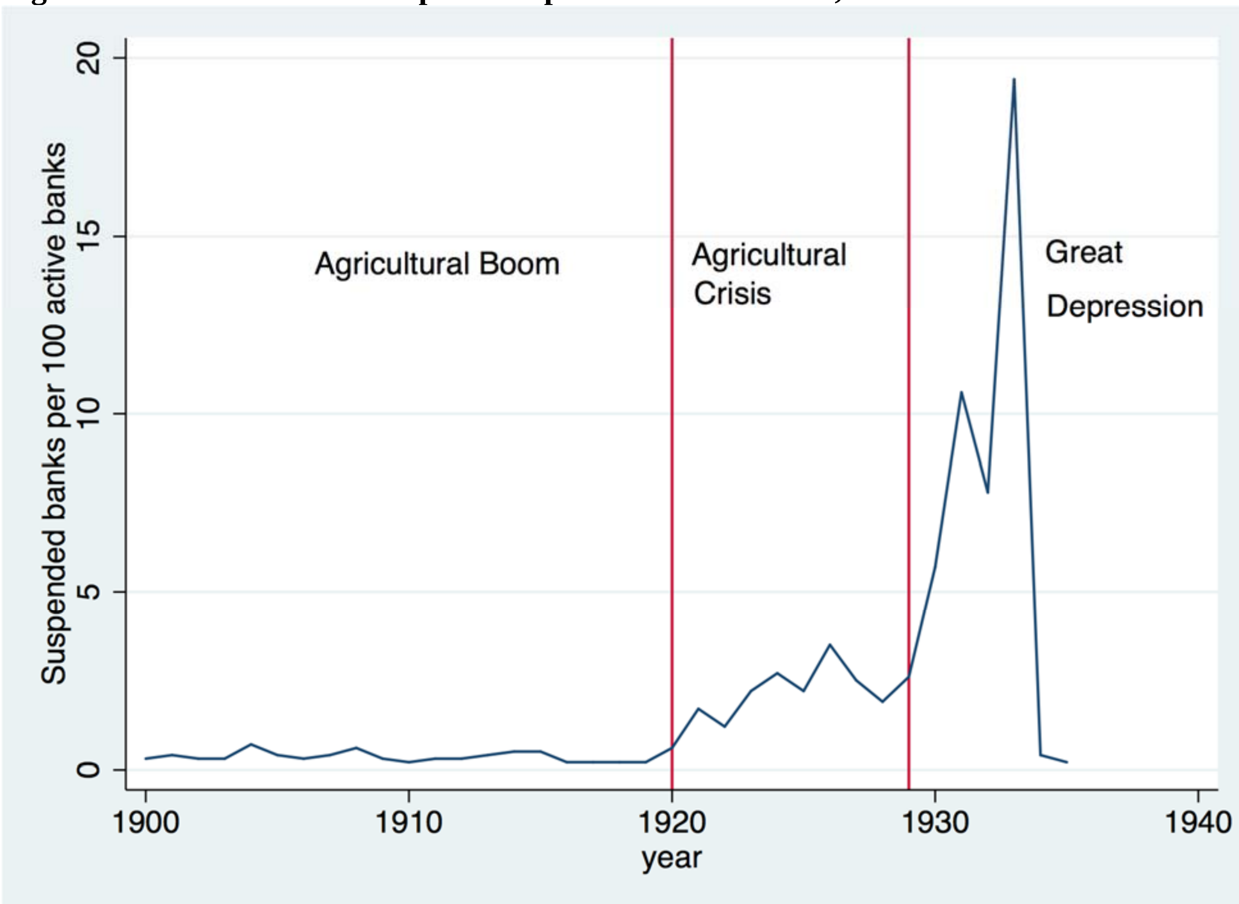

Figure 1 shows the number of suspended banks per 100 active banks in the United States, 1900-1935**.** Source: Federal Reserve Board (1936).

Figure 2. Bank Suspension Rate (FDIC data) by County, 1920-1927.

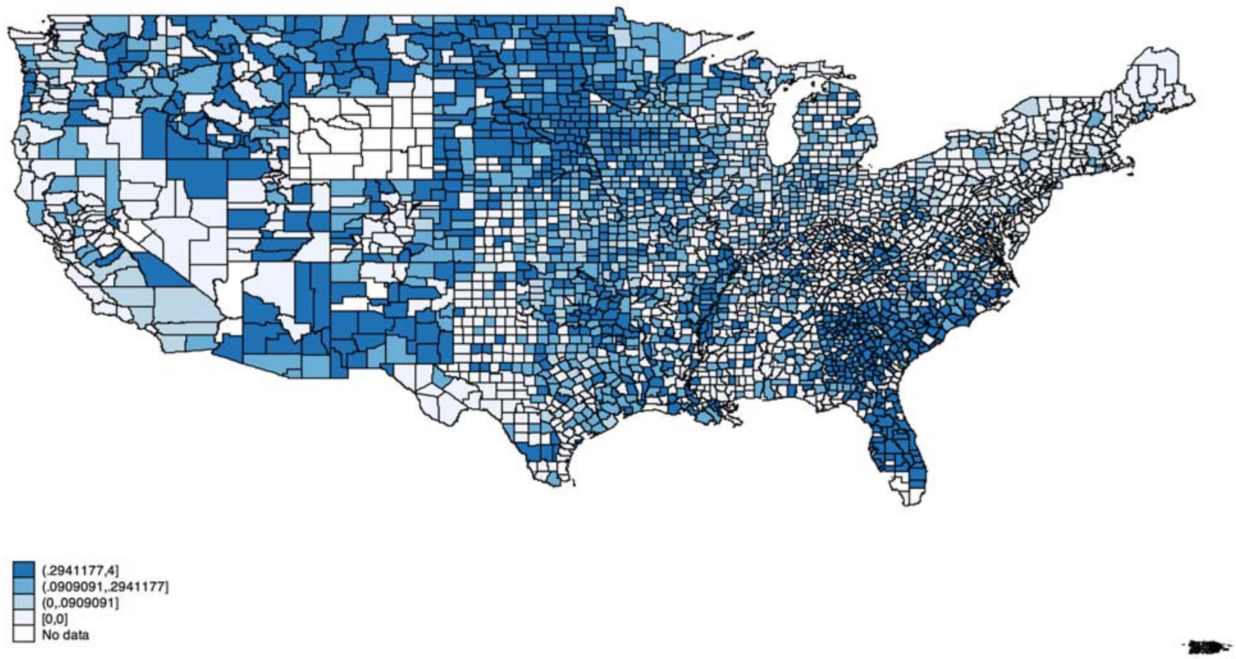

Figure 2 shows the bank suspension rate for US counties, 1920-1927.The bank suspension rate is the total number of banks suspended from 1921-1927 divided by the total number of banks in 1920, and it is plotted for US counties. The data are from the FDIC dataset.

Figure 3. Bank Suspension Rate (FDIC data) by County, 1930-1934.

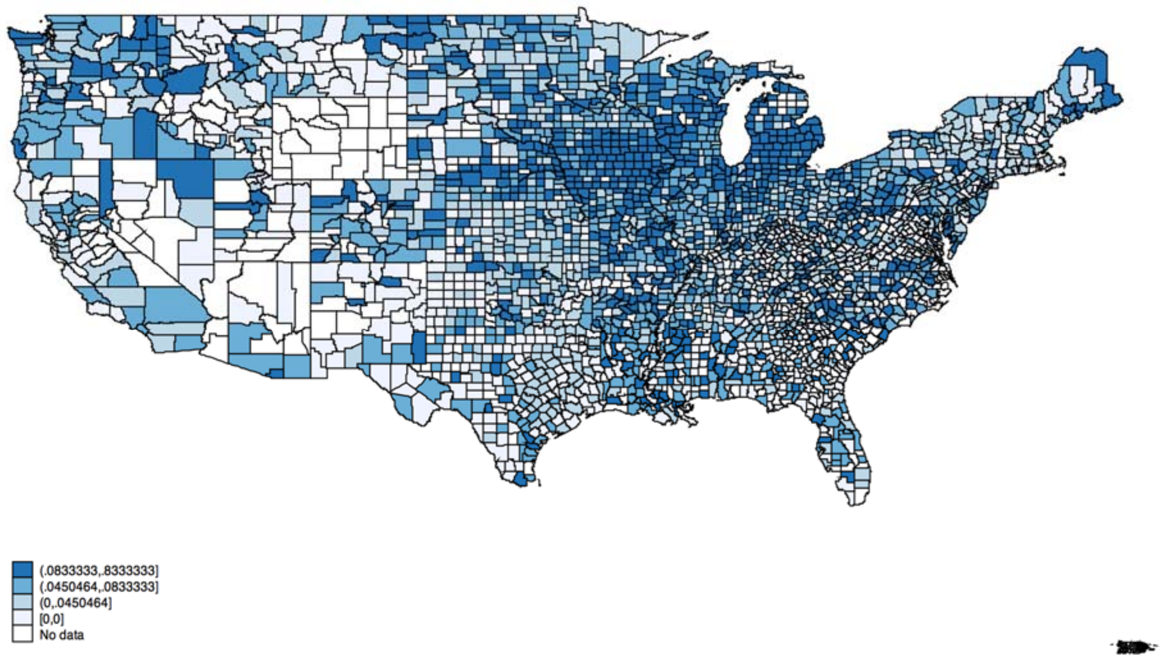

Figure 3 shows the bank suspension rate for US counties, 1930-1934. The bank suspension rate is the total number of banks suspended from 1930-1934 divided by the total number of banks in 1929 and is plotted for US counties. The data are from the FDIC dataset.

Table 1. OCC Failures and FDIC Suspensions, by Census Regions, 1920-1927.

Region	OCC	FDIC Suspended	Number of

	Failed Banks 1920-1927	National Banks 1920-1927	National Banks in 1920
New England	3	3	410
Mid Atlantic	12	18	1593
East North Central	39	41	1386
West North Central	259	286	1598
South	102	114	1306
Border	49	71	805
Mountain	99	122	480
Pacific	24	29	442

Table 1 lists the number of national banks in receivership by the OCC (column 1); the number of national banks suspended; and the number of active national banks in 1920, all by US Census geographic regions.

Figure 4. A Sample of Raw Data

1924

214 REPORT OF THE COMPTROLLER OF THE CURRENCY

TABLE No. 43.—*National banks in charge of receivers, dates of organization, amounts collected from all sources, loans paid and other disbursements, losses on assets returned to stockholders to year ended October 31, 1924*

	Title and location of bank	Date of organization	Capital stock	Receiver appointed
400	Pynchon National Bank, Springfield, Mass.	Apr. 7, 1865	$200,000	June 24, 1901
469	Farmers and Drovers National Bank, Waynesburg, Pa.	Feb. 25, 1865	200,000	Dec. 12, 1906
513	First National Bank, Billings, Mont.	Dec. 27, 1883	150,000	July 2, 1910
515	Mount Vernon National Bank, Mount Vernon, N. Y.	Dec. 11, 1906	200,000	Apr. 19, 1911
523	Second National Bank, Clarion, Pa.	Sept. 12, 1883	50,000	June 21, 1912
531	Traders National Bank, Lowell, Mass.	June 10, 1892	200,000	Oct. 20, 1913
533	Mesa County National Bank, Grand Junction, Colo.	May 31, 1905	100,000	Nov. 29, 1913
542	First National Bank, Pensacola, Fla.	Aug. 10, 1880	500,000	Jan. 22, 1914
549	First National Bank, Sutton, W. Va.	Aug. 17, 1902	50,000	Aug. 29, 1914
554	First National Bank, Uniontown, Pa.	Feb. 20, 1864	100,000	Jan. 19, 1915
582	First National Bank, Bowling Green, Ohio	May 23, 1889	50,000	Jan. 5, 1917
587	First National Bank, St. Cloud, Fla.	Mar. 24, 1912	50,000	Jan. 2, 1918
590	First National Bank, Bluffton, Ohio	Nov. 19, 1900	50,000	Nov. 17, 1919
591	First National Bank, Newman, Calif.	May 29, 1910	50,000	Jan. 31, 1920
593	First National Bank, Eureka, S. Dak.	Nov. 28, 1919	50,000	Aug. 20, 1920

1924

REPORT OF THE COMPTROLLER OF THE CURRENCY 215

appointment of receiver, and closing, with amounts of nominal and additional assets, assets, expenses of receiverships, claims proved, dividends paid, and remaining

Nominal assets at date of suspension			Additional assets received since date of suspension	Total assets	Offsets allowed and settled	Loss on assets compounded or sold under order of court	
Estimated good	Estimated doubtful	Estimated worthless					
$755,664	$942,113	$8,482	$124,059	$1,830,318	$39,884	$280,140	400
814,783	2,013,406	130,499	2,060,394	5,019,082	546,299	1,422,242	469
1,087,304	505,016	552,201	629,583	2,774,104	218,280	131,667	513
158,243	413,533	199,574	225,397	996,747	39,047	594,714	515
126,110	294,805	19,304	52,807	493,026	49,067	83,630	523
1,610,081	1,603,429	30,913	130,168	3,374,591	148,383	379,443	531
200,412	248,785	165,264	52,069	666,530	32,124	209,679	533
1,488,390	507,052	401,444	1,072,359	3,469,245	647,368	690,698	542
310,050	80,899	27,210	35,199	453,358	12,883	16,668	549
1,080,785	2,388,710	47,999	970,193	4,487,687	330,370	193,610	554
580,259	283,028	46,827	179,140	1,089,254	202,146	289,986	582
98,696	138,332	210,960	35,281	483,269	46,715	27,629	587
453,226	121,751	6,352	93,369	674,698	117,300	13,441	590
260,893	454,549	510,587	195,190	1,421,219	195,097	579,534	591
750,777	192,169	32,304	122,116	1,097,366	92,811	23,499	593
279,978	78,894	125,972	62,271	547,115	164,770	90,151	594

1924

216 REPORT OF THE COMPTROLLER OF THE CURRENCY

TABLE No. 43.—*National banks in charge of receivers, dates of organization, amounts collected from all sources, loans paid and other disbursements, losses on assets returned to stockholders to year ended October 31, 1924*—Continued

	Nominal value of remaining assets	Collected from assets	Collected from assessment upon shareholders	Total collections from all sources	Loans paid and other disbursements	Dividends paid	Legal expenses	Receivers' salary and other expenses
400	-----	$1,510,294	$44,483	$1,554,777	$353,507	$1,130,337	$22,377	$39,298
469	$1,456,909	1,593,632	149,271	1,742,903	283,472	1,286,325	51,749	66,155
513	560,204	1,863,953	7,500	1,871,453	299,448	1,387,675	25,975	137,632
515	1	362,985	81,730	444,715	102,544	272,397	39,765	26,916
523	63,764	296,565	28,736	325,301	8,107	269,707	9,226	22,323
531	158,531	2,688,234	91,071	2,779,305	31,588	2,659,658	15,851	66,302
533	105,652	319,075	35,135	354,210	28,192	239,033	5,789	29,183
542	318,593	1,812,586	73,748	1,886,334	293,584	1,472,354	32,934	67,863
549	29,255	394,552	25,180	419,732	24,132	315,272	39,166	25,716
554	612,850	3,350,857	-----	3,350,857	1,033,139	1,665,079	55,986	129,234
582	-----	597,122	41,695	638,817	15,183	562,519	20,339	30,877
587	253,556	155,369	45,161	200,530	25,315	139,774	4,288	21,367
590	68,539	475,418	47,900	523,318	34,039	422,775	7,913	30,577
591	-----	646,588	44,772	691,360	224,189	415,502	10,395	35,063
593	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Figure 4 reproduces an excerpt of the 1924 Report of the Comptroller of Currency.

Figure 5. Change In Commodity Price Index by County

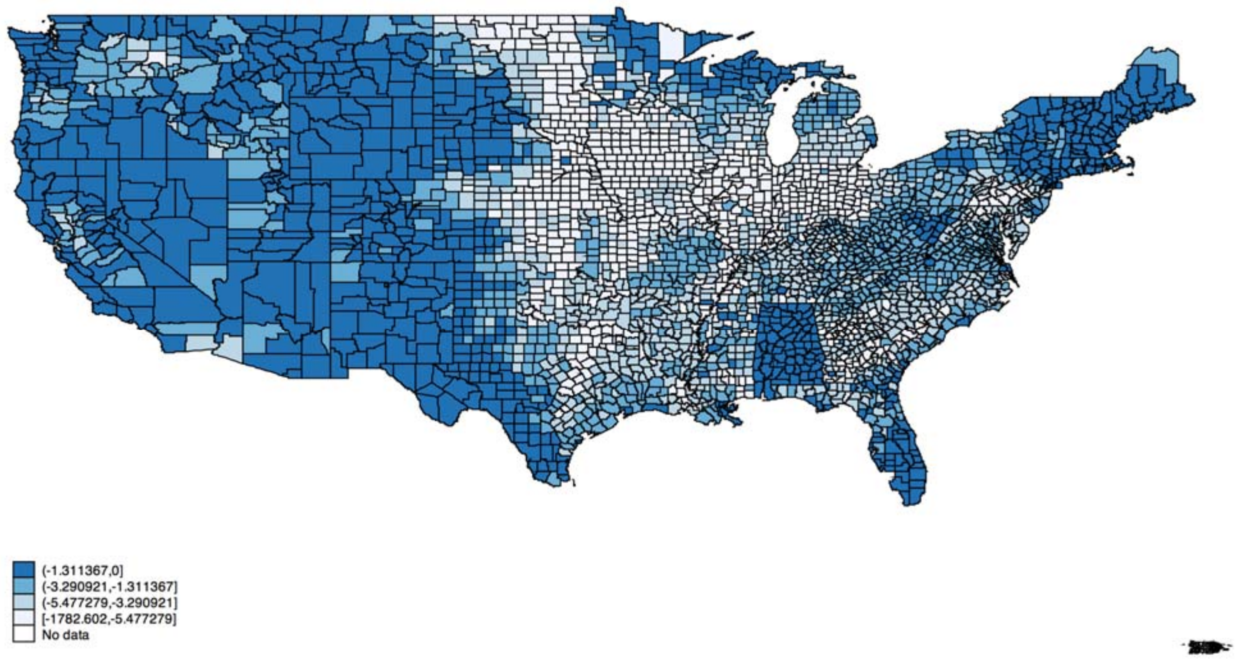

Figure 5 shows the county level variation in the commodity price index. The commodity index is computed as the average annual percent change in world commodity prices between 1920-1927 weighted by the percent acreage of agricultural land devoted to that commodity in the county in 1920.

Table 2. Selected Summary Statistics

	National banks present in county, no national bank suspensions in county, 1920-1927			
	Mean	Median	Standard deviation	Number
Debt per acre, 1920	30.15	21.54	39.29	1689
Log banks	2.27*	2.30	0.64	1775
Banks per area	8.21	6.48	7.18	1759
Banks per capita	0.47*	0.38	0.33	1761
Commodity Shock, 1917-1920	414.4	3.76	3.03	1735
Commodity Shock, 1921-1929	-433.8*	-321.9	1130.3	1777
Bank suspension rate	1.41*	0.26	2.13	1772
Deposit suspension rate	0.90*	0.00	1.69	1772
	At least one national bank suspension in county, 1920-1927			
	Mean	Median	Standard deviation	Number
Debt per acre, 1920	30.83	23.21	28.01	473
Log banks	2.53*	2.56	0.60	506
Banks per area	8.13	6.96	6.33	497
Banks per capita	0.74*	0.63	0.44	497
Commodity Shock, 1917-1920	437.6	4.23	3.20	559
Commodity Shock, 1921-1929	-560.7*	-347.2	4390.6	642
Bank suspension rate	5.43*	4.63	3.78	498
Deposit suspension rate	4.98*	4.07	3.92	498

Table 2 presents selected summary statistics for a sample of counties with national banks in 1920, but no national bank failures in the period 1920-1927 (top panel), and for a sample of counties with at least one national bank failure in the period 1920-1927 (bottom panel). Bank suspensions include the suspension of state banks.
* denotes that the means across the two subsamples are statistically different at the ten percent level of better.

Table 3. OCC Failures and FDIC Suspensions, by Census Regions, 1930-1934.

Region	OCC Failed National Banks 1930-1934	FDIC Suspended Banks 1930-1934	Number of National Banks in 1929
New England	26	125	379
Mid Atlantic	209	775	1726
East North Central	295	2438	1308
West North Central	199	2377	1272
South	173	1097	1264
Border	86	578	724
Mountain	31	269	300
Pacific	53	277	376

Table 3 reports the number of OCC recorded failed banks, FDIC suspended banks, and the number of national banks in 1929, by Census geographic regions.

Table 4. Recovery Rates for Failed National Banks, Summary Statistics

Recovery Rates of Banks in Receivership in Years:	Observations	Mean	Median	Standard Deviation
1920-1927	433	0.52	0.52	0.13
1930	81	0.55	0.55	0.13
1931	249	0.55	0.56	0.13
1932	218	0.56	0.58	0.15
1933	246	0.63	0.65	0.14
1934	205	0.63	0.66	0.17

Summary statistics for the recovery rates of national banks in receivership. Row 1 (1920-1927) summarizes the recovery rate three years after a bank was first placed in receivership. Row 1 only includes those banks first placed in receivership in the period 1920-1927. The remaining rows summarize recovery rates for banks first placed in receivership in the years 1930 through 1934. Recovered assets are observed in 1936 for the 1930-34 subsample. In all cases, the recovery rate is defined as the ratio of recovered assets to the book value of assets at the time of failure. Note that the date the receiver was first appointed does not always coincide with the date of suspension.

Table 5. Basic Analysis of Asset Recovery.
Dependent Variable: Three Year Asset Recovery Rate for National Banks in Receivership

	(1)	(2)	(3)
VARIABLES	no controls	bank controls	bank&county controls
bank (deposits) suspension rate over failure horizon	-0.201***	-0.171***	-0.162***
	(0.0287)	(0.0314)	(0.0331)
capital asset ratio		-0.168**	-0.182**
		(0.0716)	(0.0808)
deposit asset ratio		0.0436	0.0451
		(0.0358)	(0.0361)
assets to county deposits		-0.0271***	-0.0222*
		(0.00725)	(0.0114)
log of bank assets		0.0128	0.0152
		(0.00976)	(0.0133)
Observations	433	378	363
R-squared	0.376	0.435	0.488

Standard errors are clustered at state level (in parentheses): *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is defined as the ratio of recovered assets three years after the bank was placed in receivership to the book value of assets observed at the time the bank was placed in receivership. All regressions include state fixed effects, and year dummies based on year of failure. Column 3 also includes the county's log area, the log distance of the country centroid from the Mississippi, Atlantic, Pacific and Great Lakes. Other controls include the log African-American population, log urban population, log illiterate population, log 5-17 year old population, the log total population; the county's share of manufacturing value added, log value of crops, log number of banks, log number of farms, commodity index value at time of failure, and the change in the index over the recovery period, all observed in 1920.

Table 6. Recovery Rates and Bank Suspensions across Borders and at a Distance 1920-29
Dependent Variable: Three Year Asset Recovery Rate for National Banks in Receivership

	(1) 30 miles	(2) 40 miles	(3) 50 miles
bank (deposits) suspension rate over failure horizon	-0.104***	-0.173***	-0.128***
	(0.0288)	(0.0304)	(0.0353)
In-State, bank suspension rate, within 30 miles	-0.0943**		
	(0.0450)		
In-State, bank suspension rate, 30-60 miles	-0.0579		
	(0.0400)		
In-State, bank suspension rate, 60-90 miles	0.123		
	(0.100)		
Out-of-State, bank suspension rate, within 30 miles	0.0377		
	(0.0499)		
In-State, bank suspension rate, within 40 miles		-0.0875**	
		(0.0417)	
In-State, bank suspension rate, 40-80 miles		0.136	
		(0.114)	
Out-of-State, bank suspension rate, within 40 miles		0.0108	
		(0.0404)	
In-state, bank suspension rate, within 50 miles			-0.115**
			(0.0494)
In-state, bank suspension rate, 50-100 miles			0.110
			(0.0685)
Out-of-state, bank suspension rate, within 50 miles			0.0174
			(0.0314)
Observations	252	226	259
R-squared	0.603	0.670	0.625

The dependent variable is defined as the ratio of recovered assets three years after the bank was placed in receivership to the book value of assets observed at the time the bank was placed in receivership. Standard errors clustered at state level (in parentheses): *** p<0.01, ** p<0.05, * p<0.1. All columns include the bank and county level controls from Table 5, column 3. Columns 1-3 restrict the sample to banks in counties up to 90, 80 and 100 miles from a state border respectively. In column 1, the p-value from the test of equality between “In-state, bank suspension rate, within 30 miles” and “Out-of-state, bank suspension rate, within 30 miles” is 0.02. In column 3, the p-value from the test of equality between “In-state, bank suspension rate, within 40 miles” and “Out-of-state, bank suspension rate, within 40 miles” is 0.07. In column 3, the p-value from the test of equality between “In-state, bank suspension rate, within 50 miles” and “Out-of-state, bank suspension rate, within 50 miles” is 0.02.

Table 7. Recovery Rates and Bank Suspensions across Borders and at a Distance 1920-29: Further Checks.

	(1) Panel	(2) Expected Recovery Rate
In county bank suspension rate	-0.204***	-0.605*
	(0.0725)	(0.345)
In-state, bank suspension rate, within 50 miles	-0.127*	-1.767*
	(0.0725)	(0.918)
In-state, bank suspension rate, 50-100 miles	0.0168	0.410
	(0.0465)	(0.749)
Out-of-state, bank suspension rate, within 50 miles	0.0700	-0.709
	(0.0665)	(0.550)
Observations	251	264
R-squared	0.47	0.599

The dependent variable in column 1 is the ratio of recovered assets three years after the bank was placed in receivership to the book value of assets observed at the time the bank was placed in receivership. The panel consists of data both one year after failure as well as three years after failure. The panel includes bank fixed effects, and allows for state by year fixed effects. In column 2, the dependent variable is the ratio of the value of assets recovered over the three year window relative to the value of assets estimated “good” at the time of failure. Column 2 includes the bank and county level controls from Table 5, column 3, as well as the suspension rate in the county before the year of failure. Standard errors clustered at state level (in parentheses): *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 8. Recovery Rates 1920-27 and Relative Outside Financing Capacity in 1920

VARIABLES	
bank (deposits) suspension rate over failure horizon	-0.155***
	(0.0352)
assets scaled by deposits in county net of own deposits, log	-0.144*
	(0.0782)
assets scaled by deposits in in-state counties up to 50 miles, log	-0.0131***
	(0.00334)
assets scaled by deposits in in-state counties 50-100 miles, log	-0.196
	(0.155)
assets scaled by deposits in out-of-state counties up to 50 miles, log	-0.00215**
	(0.000973)
Observations	238
R-squared	0.542

The dependent variable is defined as the ratio of recovered assets three years after the bank was placed in receivership to the book value of assets observed at the time the bank was placed in receivership. Controls include the bank and county level variables from Table 5, column 3, as well as state fixed effects. Standard errors are clustered at the state level. *** p<0.01, ** p<0.05, * p<0.1. Assets scaled by deposits are all observed in 1920 at the relevant geographic unit.

Table 9A. Recovery Rates and Bank Suspensions across Borders and at a Distance: 1930-34

VARIABLES	(1) bank and county controls	(2) distance and state borders
In-county bank suspension rate	-0.0742***	-0.0937**
	(0.0257)	(0.0384)
In-state, bank suspension rate, within 50 miles		-0.210**
		(0.105)
Out-of-state, bank suspension rate, within 50 miles		0.0135
		(0.0355)
In-state, bank suspension rate, 50-100 miles		-0.0338
		(0.253)
Observations	1,072	560
R-squared	0.201	0.303

The dependent variable is the ratio of recovered assets (observed in 1936) to the book value of assets observed at the time of failure. Standard errors clustered at state level (in parentheses): *** p<0.01, ** p<0.05, * p<0.1. Except for the commodity index, all columns include the bank and county level controls from Table 5, column 3, along with dummy variables for the year in which the receiver was first appointed. Column 2 restricts the sample to banks in counties no more than 100 miles from a state border. Suspension rates are calculated as the sum of deposits in the relevant type of suspended banks over the geographic area of interest from 1930-1934 and are divided by the relevant bank deposits within the area of interest in 1929.

Figure 6. Federal Reserve Districts

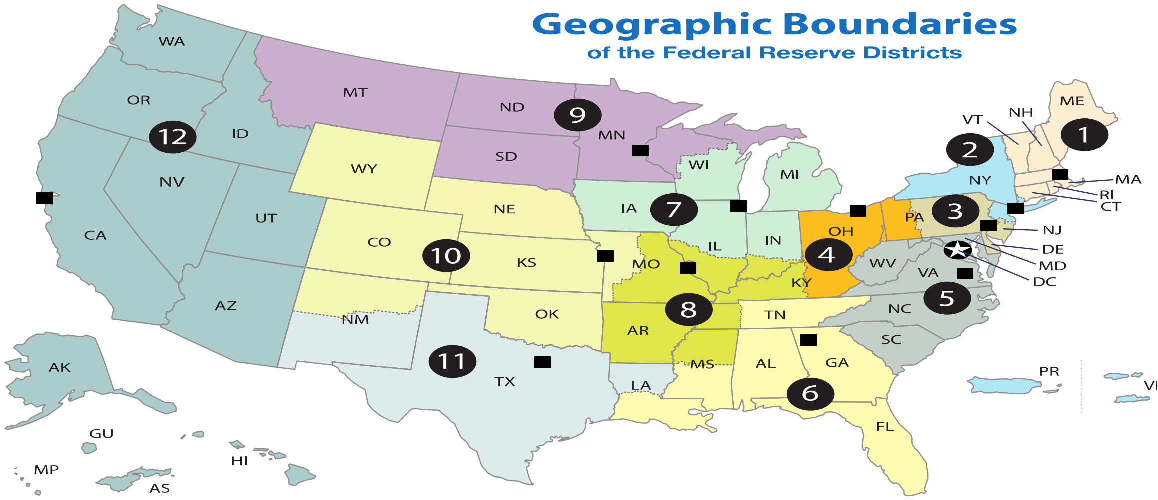

Table 9B. Recovery Rates and Bank Suspensions: Federal Reserve District Borders, 1930-34

Dependent variable: Recovery rate in 1936

ntl bank susp rate in-county,	-0.0624*
	(0.0361)
ntl bank susp rate, within 50 miles, in-state in district	-0.0736*
	(0.0373)
ntl bank susp rate, within 50 miles, in-state out district	-0.0117
	(0.0220)
ntl bank susp rate, 50-100 miles, in-state in district	0.0291
	(0.0436)
ntl bank susp rate, 50-100 miles, in-state out district	0.0921
	(0.0580)
Out-of-state, ntl bank susp rate, within 50 miles	-0.00488
	(0.0491)
state bank susp rate in-county	-0.0514**
	(0.0250)
state bank susp rate, 50 miles, in-state in district	-0.0442
	(0.0559)
state bank susp rate, 50 miles, in-state out district	-0.0650***
	(0.0226)
state bank susp rate, 50-100 miles, in-state in district	0.00215
	(0.00635)
state bank susp rate, 50-100 miles, in-state out district	0.0239
	(0.0780)
Out-of-state, state bank susp rate, 0-50 miles	0.0208
	(0.0736)
Observations	540
R-squared	0.302

The dependent variable is the ratio of recovered assets (observed in 1936) to the book value of assets observed at the time of failure. Standard errors clustered at state level (in parentheses): *** p<0.01, ** p<0.05, * p<0.1. All columns include the bank and county level controls from Table 9A, column 2.

Table 10. Land Prices and Bank Suspensions

	market transactions, 1920-1933 (1)
VARIABLES	
ratio of suspended deposits in county to total deposits in county	-0.0620*
	(0.0323)
In-state, within 50 miles, ratio of suspended deposits in counties to total deposits in counties	-0.196*
	(0.112)
In-state,50-100 miles, ratio of suspended deposits in counties to total deposits	0.146
	(0.160)
Out-of-state, within 50 miles, ratio of suspended deposits in counties to total deposits	0.0565
	(0.0459)
Observations	589
R-squared	0.954
In-state, 50 miles=Out-of-state, 50 miles (p-value)	0.0366

The dependent variable is the log market price of land available for an annual panel of counties. The estimation is undertaken after collapsing this panel into four non overlapping periods: 1920-1923, 1924-1926 and 1927-1929, 1930-1933, averaging the price level in each county in each period. Over each period, we also compute the sum of deposits in suspended bank, and divide this sum by the average value of deposits over the period (to account for the formation of new banks). The price level the previous period, along with time and state fixed effects are included, and standard errors are clustered across both state and time—significance levels remain unchanged if errors are clustered only at the state level. Standard errors (in parentheses): *** p<0.01, ** p<0.05, * p<0.1.

Table 11. Bank Failures and Contagion

	bank suspensions
ratio of suspended deposits in county to total deposits in county, previous year	0.0730***
	(0.0203)
In-state, within 50 miles, ratio of suspended deposits in counties to total deposits in counties, previous year	0.0508**
	(0.0251)
In-state,50-100 miles, ratio of suspended deposits in counties to total deposits in counties, previous year	0.134***
	(0.0334)
Out-of-state, within 50 miles, ratio of suspended deposits in counties to total deposits in counties, previous year	-0.00420
	(0.0172)
Observations	14,406
R-squared	0.091
In-state, within 50 miles=Out-of-state, within 50 miles (p-value)	(0.07)

The dependent variable is the ratio of suspended deposits in a county, defined as the total value of suspended deposits in a county divided by total deposits the previous year. The data are observed annually from 1920-1934 for an unbalanced panel of 2600 counties located within 100 miles of a state border. State and year fixed effects are included. *** p<0.01, ** p<0.05, * p<0.1.

Appendix: Variables' Definitions and Sources

Variable	Source	Definition
Number of State and National Banks Active in each county; the value of deposits in active banks; and the value of deposits in suspended banks (State and National)	Federal Deposit Insurance Corporation Data on Banks in the United States, 1920-1936 (ICPSR 07).	For a bank in receivership, the county suspension rate is the sum of deposits in both state and national banks suspended in that county over the same three year window as asset recovery for the bank in receivership, expressed as a fraction of total deposits within the county in the year of failure. In the 1930s sample, the suspension rate is the sum of deposits in both state and national banks suspended in that county between 1930-1934, and divided by deposits in active banks in the county in 1929.
Recovery Rate	Office of Comptroller of Currency (OCC) Annual Reports, 1920-1930, and 1936. http://fraser.stlouisfed.org	Defined as the ratio of total recovered assets to the book value of assets at the time of failure. In the 1920-1927 sample, recovery is observed 3 years after failure. In the 1930s sample, recovery is observed in 1936.
Urban Population; Fraction of Black Population; Fraction of Population Between 7 and 20 years; County Area; County Population; Value of Crops/ Farm Land Divided by Farm Population	United States Bureau of Census; Inter-University Consortium for Political and Social Research (ICPSR) NOs: 0003, 0007,0008,0009,0014,0017	
Distance From Mississippi River; Atlantic; Pacific and the Great Lakes.	Computed Using ArcView from each county's centroid.	
Annual Mean Rainfall	Weather Source 10 Woodsom Drive Amesbury MA, 01913 (Data Compiled from the National Weather Service Cooperative (COOP) Network	The COOP Network consists of more than 20,000 sites across the U.S., and has monthly precipitation observations for the past 100 years. However, for a station's data to be included in the county level data, the station needs to have a minimum of 10 years history and a minimum data density of 90 percent: ratio of number of actual observations to potential observations. If one or more candidate stations meet the above criteria the stations' data are averaged to produce the county level observations. If no candidate station exists within the county, the nearest candidate up to 40 miles away in the next county is substituted. The arithmetic mean and standard deviation level of rainfall are computed from the monthly data for all years with available data.