1930: First Modern Crisis

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October 18, 2020

Abstract

Modern financial crises are difficult to explain because they do not always involve bank runs, or the bank runs occur late. For this reason, the first year of the Great Depression, 1930, has remained a puzzle. Industrial production dropped by 20.8 percent despite no nationwide bank run. Using cross-sectional variation in external finance dependence, we demonstrate that banks' decision to not use the discount window and instead cut back lending and invest in safe assets can account for the majority of this decline. In effect, the banks ran on themselves before the crisis became evident.

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We thank Andy Law, Chase Ross, Alex Yang, and Arwin Zeissler for research assistance. We thank Josh Hausman, Filippo Mezzanotti, and Nicolas Ziebarth for comments on the paper. We thank Joshua Rosenbloom and William Sundstrom for sharing their Census of Manufacturing data with us; see Rosenbloom and Sundstrom (1999). We also thank Mrdjan Mladjan for sharing his data on the instruments used in Mladjan (2016).

1 Introduction

One reason it has been hard to understand modern financial crises is that they all appear different. If financial crises are always due to the vulnerability of short-term debt to runs, shouldn't we always see bank runs? Indeed, before the existence of central banks, crises were clearly triggered by bank runs. However, the presence of a central bank complicates matters rendering a modern crisis timeline different and varied. Bank runs, if they occur at all, may happen late in the crisis. Or there could be no runs at all if, for example, a credible guarantee is issued.[1]

Nowhere is this dynamic more evident than 1930, the first year of the Great Depression. At the start of the Great Depression there were no nationwide bank runs and banks did not avail themselves of the discount window. Yet, output dropped substantially: industrial production fell over 20% (we plot monthly industrial production index in Figure 1 Panel A). As a consequence, 1930 is viewed as a puzzle. For example, Romer (1988) writes: "The primary mystery surrounding the Great Depression is why output fell so drastically in late 1929 and all of 1930" (p. 5). Romer (1990) writes: ". . . 1930 is . . . the most puzzling year of the Great Depression" (p. 599). And Bernanke (1983) notes in his study of the effects of bank failures on output: "it should be stated at the outset that my theory does not offer a complete explanation of the Great Depression (for example, nothing is said about 1929-1930)" (p. 258).

In this paper we show that a large part of the output drop in 1930 can be explained by bank actions: the reduction in loans and the switch to safe assets such as Treasuries, Munis, currency, and banker's balances. We argue that that banks realized the severity of economic conditions and took precautionary measures to protect against a potential fallout.

We further argue that this exemplifies a common feature of modern crises where a central bank is present. Banks reduce loans prior to the crisis while depositors stand pat to see what the central bank does, even if they already recognize crisis conditions. The true start of the crisis, then, can occur before any obvious indications of stress, such as bank failures. Indeed, Boyd et al. (2009) examine the dating of crisis in four crisis databases and find that large reductions (25 percent) in loan growth *predict* crisis start dates. But no threshold change in deposits has predictive power. Without observing these actions by the banking sector, modern crises may appear to be idiosyncratic events without a common core element.

Our empirical strategy to ascertain the role of banks in output declines in 1930 combines state-industry level data on output with state-level data on the banking sector. We use data from the Federal Reserve to construct state-level measures of banking sector behavior; we use historical Moody's manuals to measure industry level external finance dependence; we employ data from the

[1] The Laevan and Valencia (2008) crisis database covers the period 1970-2007, during which there were 124 systemic banking crises globally. They find that 62 percent of the crises in their data experienced bank runs, defined as a sharp reduction in total deposits.

Biennial Census of Manufacturers to construct measures of state-industry level performance.

In order to identify the effect stemming from the banking sector's decision to cut back—and not from demand side effects—we use an approach along the lines of Rajan and Zingales (1998). We hand-collect firm balance sheet data reported in Moody's Manuals from the period of 1922 to 1928 and calculate a measure of external finance dependence. We include this measure of external dependence as a treatment intensity in a cross-sectional regression of industry output on contemporaneous changes in the state-level aggregate bank balance sheet.

We find that from 1929 to 1931, the output of industries that are more dependent on external finance is more severely affected by reductions in loans, reductions in total assets, reductions in deposits, and increases in holdings of safe assets by their home state banks, allowing for both state- and industry-level fixed effects. Because of the Census data availability our main outcome variables are output measures from 1929 to 1931. We discuss various methods to overcome this data limitation in in Section 3, where we show that this conclusion continues to hold if we measure the bank balance sheet changes from 1929 to 1930 only. We further demonstrate that bank failures do not account for the variation in output drops: our results still hold if we control for share of deposits in failed banks from 1929 to 1931.

The behavior of banks during this early stage of the Great Depression is evident from the aggregate balance sheet of the banking sector, shown in Table 1. From 1929 to 1931 banks cut back on loans by over 15%, and increased the share of total assets invested in safe assets by 6 percentage points, where safe assets are Treasuries, Munis, currency, and banker's balances. At the same time, there was little action stemming from the household side: aggregate deposits fell by just 1.9%. This contrasts with a drop in deposits of 27.4% in the subsequent two years. Our estimates suggest that the reduction in loans accounted for a substantial share of the output decline in 1929-31. Extrapolating from the cross-sectional estimates and nationwide totals in total bank loans, we estimate an approximately 30% drop in the three output measures.

Aggregate data on the cost of bank credit also backs up this view. In Figure 1 Panel B we show that the spread between loan rates charged by banks and short-term Treasuries increased markedly in 1930, consistent with the view that banks sought to curtail credit. In fact, as Table 2 shows, the largest increase in this spread occurred 1930.

Our main source of identifying variation is the cross-industry difference in industry exposure to external finance, following Rajan and Zingales (1998). To provide further evidence that this methodology establishes a causal effect from the banking sector to the economy we employ two state-level instruments of financial sector fragility constructed by Mladjan (2016). These instruments rely on the historical developments in each states' respective banking systems (we discuss the instruments in more detail in Section 3.3.) We show that instrumenting the bank balance sheet measures results in regression estimates that are very close to the baseline results.

Our empirical approach is close to Mladjan (2016) and Lee and Mezzanotti (2017). In both of these papers, the authors look at interactions of measures of firm dependence on external finance interacted with bank failures to show effects on measures of economic performance. Mladjan (2016) studies the effects of bank failures on output in a panel of state-industry observations over the years 1929-1933. Lee and Mezzanotti (2017) study a sample of 29 cities over the period 1929-1933. They also find that in locations where bank failures were high, the more financially dependent industries show reductions in the same three outcome variables we use: total output, employment, and value added. Both these papers use the same external dependance measure than here, based on Rajan and Zingales (1998). Nanda and Nicholas (2014) use the external finance dependence measure to show that financial distress contributed to a slowdown in innovation during the Depression. In other related work, Benmelech et al. (2019) employ identification stemming from differences in bond maturity show that credit frictions played a large role in the employment drop from 1928 to 1933.

In contrast to these studies, we focus on the seemingly anomalous year of 1930. We demonstrate that the early part of the Great Depression, where bank failures were not substantial, can also be explained by the impact of the banking sector on the real economy. We argue there is a large causal impact of the contraction of bank lending on macroeconomic activity *before* the major bank runs of the Depression. One other recent paper has focused on 1930: Hausman et al. (2019) show that the contraction in 1930 was particularly pronounced for farm-intensive areas.

Finally, we place the crisis dynamics of the Great Depression in a broader context. We find that the unfolding of the Great Depression is typical of modern crises. At the start of the crisis there is no widespread bank run, but output falls. In contrast, panics during the National Banking Era, 1863-1914, occurred near business cycle peaks. With the establishment of the Federal Reserve in 1914, banks had the opportunity to borrow from the discount window. During one of the first recessions to occur under the watch of the newly-established Fed, the recession of 1920-1921, banks made extensive use of the Fed discount window, which was giving out loans at an attractive rate. The broad use of the Fed's discount window to avoid a panic was hailed at the time as having precluded a panic (see Gorton (1988)). As we describe in Section 4, the discount window subsequently became stigmatized as the Fed tried to ensure that it was not used as a permanent source of funding. Indeed, as demonstrated in Anbil (2018), the stigma associated with seeking government assistance was a major consideration of depositors during the Great Depression. We hypothesize that because the use of the discount window had become stigmatized banks mostly anticipated that they would not make use of it and instead opted to cut back on lending, and tilted towards a safer portfolio.

To provide empirical evidence regarding the importance of discount window stigma, we rank Fed districts by the relative tightness of discount window lending in the pre-1929 sample. We show that our results are particularly pronounced in Fed districts that saw lower-than-median amounts of discount window borrowing in the pre-1929 period. Secondly, we compare the early stage of

the Depression, 1929-1931, with the prior recession in 1920-21. We re-estimate the exact same empirical specification and find that bank balance sheet changes do not account for the cross-sectional disperion in output during the 1920-21 recession.

Our findings regarding the unfolding of the Great Depression suggest a reason for the common thread underlying all modern financial crises. As shown in Boyd et al. (2009), modern crises are typically preceded by banks reducing loans. These authors examine the dating of crisis starts in the four main modern crisis databases: (1) Demirguc-Kunt and Detragiache (2002) and Demirguc-Kunt and Detragiache (2005); (2) Caprio et al. (2005); (3) Reinhart and Rogoff (2008); (4) Laevan and Valencia (2008). These databases pin down the starting dates using an event methodology, usually noting some form of government intervention. Boyd et al. (2009) find that large reductions in loan growth *predict* the crisis start dates in the four databases, roughly a year before the traditional start date. In contrast, similar magnitude deposit changes do not predict the start dates. Depositors appear to wait, perhaps due to explicit or implicit deposit insurance. Loans are reduced significantly but deposit reductions—meaning runs—only come later, if at all. In other words, banks realize the crisis conditions before any public signs of stress. Also related is Baron et al. (2019) who argue that "quiet crises"—drops in bank equity value without panics—are associated with subsequent credit contractions.

The paper proceeds as follows. In the remainder of this section we provide a brief literature review. In Section 2 we describe the data sources and the data construction process. Section 3 contains our main empirical results on impact of bank decisions on manufacturing output. In Section 4 we compare crises during the National Banking Era and under the Federal Reserve. We also provide a history of the development of the discount window stigma. We conclude in Section 5.

1.1 Related Literature

There is an enormous literature on various aspects of the Great Depression. Calomiris (1993) and Romer (1993) provide reviews of the literature. Perhaps closest to our work is Calomiris and Wilson (2004). They do not focus on the year 1930, but like us they find evidence of banks shedding risk. Their focus is on New York City banks where they show that in the early 1930's banks shed risk, reducing dividends and increasing their holdings of safe assets. They argue that they provide "an explanation for the decline in bank capital and the increase in bank cash" (p. 422).

Other related are papers on the effects of bank failures and suspensions on output during the Great Depression, e.g., Bernanke (1983), Calomiris and Mason (2003), Benmelech et al. (2019), Hausman et al. (2019), Lee and Mezzanotti (2017), Mladjan (2016), and Nanda and Nicholas (2014). These authors, with the exception of Hausman et al. (2019), do not examine 1930 separately. Further, several of these papers study the transmission of the shock to the banking system through the economy (e.g., by measuring dependence on bank financing), taking as given that there was a shock

to banks. While this is perhaps more evident later in the Depression, after there are widespread runs on banks, it is less clear in 1930. Our paper aims at understanding why banks shed risk early in the depression and how this contributed to economic activity.

Economists have advanced many hypotheses about the cause of the Great Depression: the stock market crash of 1929 (Mishkin (1978) and Romer (1990)); an autonomous drop in consumption (Temin (1976)); a dramatic increase in tariffs (Meltzer (1976) and Crucini and Kahn (1996)); debt deflation (Fisher (1933)); and the nonmonetary effects of banking panics (Bernanke (1983)); Friedman and Schwartz (1971) hypothesis that the primary cause of the U.S. downturn between 1929 and 1933 was that monetary policy failed to offset bank-panic induced declines in the money supply (also see Bordo et al. (2000)); and finally, Cole and Ohanian (1999) argue that technology regress can explain much of the drop in output. This is only a small sample of the vast literature.

"Cause" is not necessarily the same as "start". Indeed, many papers on the "cause" focus on the persistence and depth of depression, and not solely on the first year, which is why it remains somewhat of a puzzle. There is, however, a literature on the start of the Great Depression. Friedman and Schwartz (1971) emphasize tight monetary policy as a cause of the initial output decline in 1930, although this is disputed by Temin (1976) and Romer (1993). Romer (1990) points to uncertainty arising from the stock market crash and Olney (1999) focuses on consumer debt burdens as causes of the large decline in U.S. output before the first banking crisis. Hausman et al. (2019) argue that falling farm prices and incomes can partly explain the severity of the drop in output in 1930.

We focus on the start of the depression from the viewpoint of Boyd et al. (2009) who noted the pattern discussed above, namely that drops in loans of 10 or 25 percent forecast the starts if crises. This does not happen with large drops in deposits. So, we argue that despite the lack of depositor runs, bank behavior contributed to the output decline in 1930, as banks cut back on loans in favor of safe assets.

2 Empirical Approach

Our empirical results establish the importance of banking sector in capturing the heretofore understudied first year of the Great Depression.

2.1 Identification

We use the cross-section of state-industry level data to establish the effects of bank behavior on macroeconomic outcomes. We measure variation in the aggregate banking sector balance sheet by state in the period from 1929 to 1931 and link this to output declines in various industries in the corresponding state. To separate out the shock caused by a contraction in lending from a

demand side story (e.g., the particular state faced negative productivity shocks which drove down macroeconomic quantities as well as the demand for bank financing) we employ industry external finance dependence as a measure of treatment intensity, following Rajan and Zingales (1998).

2.2 Data

Our dataset combines information from three main sources: the Biennial Census of Manufacturers, Moody's Manuals from 1922 to 1928, and statistics published by the Board of Governors of the Federal Reserve.

The Biennial Census of Manufacturers provides biannual data disaggregated by manufacturing sector (industry) and state. This data is described in detail in Rosenbloom and Sundstrom (1999) and available online on the author's website.[2] We use three measures of output provided in the Census of Manufactures: total wages (value added), value of production (gross output), and employment. Monthly aggregate industrial production data is from the St. Louis Fed FRED database (series INDPRO).

We hand collect firm-level data from the Moody's Manuals over the period 1922-1928 to construct the measure of dependence on external finance. Firms are assigned to industries based on Ken French's industry classifications.[3] The firms that are in the industries that are captured by the Census of Manufacturers form the basis of an industry-level measure of external finance dependence, constructed after Rajan and Zingales (1998). The industry-level measure is based on 1224 firm-years.

Merging industry-level external finance dependence with the Biennial Census of Manufacturers we are left with 15 industries in 48 states and a total of 387 observations (not all industries are present in all states.) Because the Census data is collected every two years our regression evidence uses the change in the output measures from 1929 to 1931. The merged industries represent about three quarters of the total output captured by the Census of Manufacturers.

State-year level bank balance sheet data is from *All-Bank Statistics: United States, 1896-1955* published by the Federal Reserve Board of Governors. With this data we measure changes in state-level total assets, and total loans, and total deposits. We also construct a measure of share of safe assets ("Safeshare"), defined as the sum of Treasuries, Munis, currency and coin, and banker's balances, normalized by total assets. *All-Bank Statistics* is also the source for bank loan rates, and short Treasury rates.

Annual data on deposits in suspended banks is from the *Federal Reserve Bulletin*, September 1937,

[2] `http://joshua-rosenbloom.squarespace.com/data-sets/`

[3] `http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.`

available online at the St. Louis Federal Reserve Bank FRASER database.[4]

Finally, Fed district level data on the use of the discount window is from *Banking and Monetary Statistics, 1914-1941*, published by the Federal Reserve Board of Governors and available online at the St. Louis Federal Reserve Bank FRASER website.[5]

A key difficulty facing our empirical approach is the coarse frequency of industry-level output data, and a mismatch in the timing of the three data sources. The Census of Manufactures was carried out every two years, with questionnaires sent out to respondents in January of 1930 and January of 1932. Therefore our dependent variable measuring period bleeds into late 1931 where bank suspensions increased in magnitude. In contrast, the bank balance sheet data is captured annually at the end of June and discount window usage is captured at the end of the year. We discuss various methods to overcome this data limitation in Section 3.

2.3 Measuring Firm External Finance Dependence

For each firm-year we calculate dependence on external funding as capital expenditures (Capex) minus lagged cash flow from operations (CFO), divided by Capex:

$$\mathrm{CX}_t = \frac{\mathrm{Capex}_t - \mathrm{CFO}_{t-1}}{\mathrm{Capex}_t} \tag{1}$$

We lag CFO because the time t variable is not known when capital expenditure decisions are made. We then sort the firm-year measures into ten buckets, and assign integer values to each bucket. We do this to allow for potential nonlinearities in the relationship between CX and the bank measures.

The industry-level measure is the firm asset weighted sum of CX bucket values in industry i:

$$\mathrm{Dep}_i \equiv \sum_{k \in I} \mathrm{CX}_k^{\mathrm{bucket}} \left(\frac{\mathrm{TA}_k}{\sum_{k \in I} \mathrm{TA}_k} \right) \tag{2}$$

where i indexes industries; k indexes firms; and I represents the set of all firms in industry i.

The Census of Manufactures contains state-level data on the output and employment of 21 industries. In order to calculate industry finance dependence we map individual companies from Moody's manuals to the Census industries. We proceed as follows:

1. Start with Moody's individual firm-years where each firm has an associated Permno.
2. Use company Permno to match SIC codes provided by CRSP.

[4] `https://fraser.stlouisfed.org/files/docs/publications/FRB/1930s/frb_091937.pdf`
[5] `https://fraser.stlouisfed.org/title/38/item/6408/toc/334457`

3. Match SIC codes to industry classifications by Ken French [6]

4. Match Ken French classified industries to Census industries.

With the industry match in hand, we collapse firm-level finance dependence measures into an industry-level quantity.

Table 3 shows the 15 Census industries for which we are able to construct a finance dependence measure, and corresponding distinct firms and firm-years in the sample. The Table also shows the number of states for which we have output data in that category.

The 15 of 21 industries that we are able to match to the external finance measure represent a majority of the output captured by the Census of Manufacturers. Namely, the matched industries represent 74% of the employment, 67% of total wages, 75% of value of production. The total value of production captured by the Census in 1929 was 28 billion. The GDP at the time was just over 100 billion USD.

The CX measure constructed in this section is not specific to bank finance, but instead captures dependence on all sources of external finance. However, we find that bank lending constituted a substantial share of external finance at the time. As shown in Table 1, total bank loans in 1929 were nearly 42 billion USD. For reference, the total market cap of the 856 companies listed on the NYSE was 89.7 billion USD in August 1929, as reported in McGrattan and Prescott (2004).

3 Results

3.1 Aggregate Balance Sheet

The dynamics we describe are evident in the aggregate balance sheet of the banking sector. Table 1 shows the levels, the change in the levels, and percentage changes in the aggregate balance sheet items of all U.S. banks during the Great Depression (based on *All-Bank Statistics: United States, 1896-1955*). Corresponding to our output measures, the data is shown for the years 1929, 1931, and 1933.

Most interesting in the table are the categories that show large increases and large declines from 1929-1931. Total loans, loans for securities, and all other loans show large declines. Safe assets including Treasuries, Munis, cash, and banker's balances show substantial increases. These changes are consistent with the findings of Calomiris and Wilson (2004) who focus on New York City, the most important banking center in the U.S. They show that during the year 1930 total loans divided by cash plus Treasuries declined 81 percent. This was primarily due to loans declining and safe

[6] `http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html`.

assets increasing. Note that total deposits only declined by 1.9 percent in 1929-1931—the big declines in deposits occurred starting in 1932. The time-series behavior of these aggregates is shown in Figure 2.

3.2 Regression Evidence

The goal of our empirical analysis is to measure the impact of changes in the various bank balance sheet items on contemporaneous output measures. Specifically, our regressions take the form

$$\Delta\text{Outcome}_{i,s} = \alpha_i + \beta_s + \gamma \text{CX}_i \times \Delta\text{Bank}_s + \epsilon_{i,s}, \tag{3}$$

where the outcome variable is defined as

$$\Delta\text{Outcome}_{i,s} = \log(\text{Measure}_{i,s,1931}) - \log(\text{Measure}_{i,s,1929}) \tag{4}$$

for value added, gross output, and total employment of industry i in state s. In our baseline regressions we weight observations by total assets of all banks in the state.

Similarly, the right-hand-side banking measures Bank_s are defined as

$$\Delta\text{Bank}_s = \log(\text{Bank}_{s,1931}) - \log(\text{Bank}_{s,1929}), \tag{5}$$

with the exception of Safeshare which is measured as a percentage point change. We show the aggregate time-series behavior of the output measures in Figure 2.

The variable CX_i is an industry level measure of external finance dependence, constructed in Section 2.3. The terms α_i are industry level fixed effects, and the terms β_s are state level fixed effects. The specification does not include time fixed effects because the regression is a pure cross-section.

By studying the interaction term of the state-level bank measure with industry-level external finance dependence index, we are able alleviate concerns about reverse causality. The underlying assumption is that in a given state, the output in industries with different exposures to external finance would have shrinked at the same rate—relative to the corresponding industry-wide averages—without the shock from the banking sector. Because the states differ in the magnitude of the banking sector shocks, we are able to identify the effect on output stemming from the shock to external finance availability—and not the effect from the demand side. Put differently, our empirical approach requires that the measure of external finance dependence is not correlated with the exposure of the industry to consumption shocks, or any other demand-side determinants of loan quantities. Note we cannot include the CX_i and Bank_s terms separately because of the full slate of state- and industry-level fixed effects.

The baseline regression results are shown in Table 4. Panel A examines value added as measured by wages during from 1929 to 1931. Panel B repeats the analysis with gross output as the dependent variable. Panel C repeats the same analysis with employment. In all three panels, reduction in total loans, and total assets are associated with decreases in the output measures, and this relationship is in all cases statistically significant. In the specifications with value added and employment as the dependent variable, an increase in average Safeshare in the state is a statistically significant covariate of output changes.

In order to put the estimated magnitudes in context, we calculate the output drop implied by the estimated coefficients of an industry with median exposure to external finance (meaning CX=5) facing a banking sector whose balance sheet mirrors the national aggregate change. This calculation is provided in Table 5. In the table, "Implied Aggregate" refers to the aggregate change in the right-hand side variable from 1 under these assumptions. While all four measures of bank balance sheet are estimated to have a strong impact on output, the cutback in loans was the deepest, and as such imply the largest output loss with estimates ranging from 27% to 44%.

3.3 Robustness of Main Findings

We now turn to discussing the robustness of our main finding in Table 4.

The first set of issues concerns the timing of the output measures. As discussed in Section 2, the Census of Manufactures was carried out every two years, limiting us to studying industry-level output from 1929 to 1931. The inclusion of late 1931 is potentially problematic as this period saw the first nationwide banking crisis during the Depression era. We seek to demonstrate that the inclusion of late 1931 is unlikely to drive our results by multiple robustness checks.

Firstly, we re-estimate the regressions by using bank-balance sheet measures from 1929-1930 only. These results are reported in Table 6. With the exception of specifications with Safeshare, the results are practically identical to those reported with the two year change in bank balance sheet measures. That is, we find that the drop in bank total assets, bank loans, and bank deposits in 1929-1930 are significant determinants of the drop in 1929-1931 output measures.

Secondly, we include the share of deposits in failed banks as a control variable in our main regressions. Existing work in Mladjan (2016) has shown that suspended deposits are a strong determinant of output contraction over the entire Depression era. In keeping with the other right-hand-side variables, we calculate state-level two year change in suspended deposits and interact it with the industry-level external finance dependence measure. The results in Table 7 show that bank balance sheet variables continue to be strong determinants of industry output when controlling for deposits in suspended banks. We conclude that our results are not likely driven by the inclusion of late 1931.

Our identification strategy uses industry differences in external finance dependence to ascertain the impact of bank decisions. Of course, any demand-side shock that is proportional to this dependence could have caused the changes in bank balance sheet measures. To alleviate this reverse causality concerns we re-estimate the main regressions by using two state-level instruments of financial sector fragility constructed by Mladjan (2016). In the IV specifications we instrument the cross term $\text{DEP}_i \times \text{Bank}_s$ with:

1. Percentage of state's bank offices that belong to branch banks in 1920 $\times$ DEP_i
2. Growth of farm land value in 1910s $\times$ DEP_i.

More information on the construction of these instruments is available in Mladjan (2016).

The instrumental variables results reported in Table 8 are consistent with the WLS estimates presented in Table 4, with the exception of specifications with Safeshare which are no longer statistically significant.

Finally, our main estimates weight observations by total assets in each given state's banking sector. In Table 9 we re-estimate the regressions in an OLS setting. We find a smaller implied response to the bank balance sheet variables, suggesting that the effect we stems mostly from large states.

3.4 Importance Discount Window Stigma: Comparison with the 1920-21 Recession and District Discount Window Tightness

Like we show in Figure 2, banks made little use of the discount window in 1929-1931. Instead, they opted to cut back on lending. The regression evidence suggests that the decision to cut back on lending had a strong impact on economic output.

In order to illustrate the importance of the decision not to go to the discount window, we repeat the analysis presented in Table 4 for the 1920-1921 recession. This recession started in January 1920; the trough, according to the NBER, was July 1921. Unlike during the Great Depression, the discount rate offered by the Fed was below market rates. As a result, and in direct contrast to the Great Depression, banks made extensive use of the Fed's discount window during the Recession of 1920-1921. Correspondingly, as we report in Table 10, the four measures of bank balance sheet changes have little explanatory power over industry level outcome. Of course, these regressions assume that the external finance dependence we estimated in the 1922-1928 sample is applicable to the prior period as well. In Appendix Table 11 we show the evolution of the aggregate bank balance sheet during the 1920-21 recession. We interpret this as evidence of the importance of discount window stigma during the Great Depression. In Section 4 we provide a narrative account on the Fed's attempt to introduce a discount window stigma after the 1920-21 recession.

To provide further evidence that the discount window stigma contributed to banks' decision-making in 1929-1931 we seek to exploit the feature that discount window conditions were set separately by each Fed District. As described in Richardson and Troost (2009), districts differed in the tightness of discount window borrowing.[7] In order to capture local discount window tightness we calculate the average share of discount window window borrowing to total bank assets in a given year. We then rank Fed Districts each year and calculate the average annual rank from 1915 to 1928. We interpret this rank as a measure of a given Fed District's discount window strictness.

We then re-estimate the baseline regressions by including a dummy variable for states that are predominantly in Fed districts that were below median in discount window borrowing intensity during the period of 1915 to 1928. In Appendix Table 12 we show that our baseline results are particularly pronounced in states where discount window borrowing was tight before 1929. The triple interaction term of bank balance sheet measure with finance dependence with low discount window usage is responsible for most of the dependence of output on bank balance sheet measures.

Of course, this does not establish causality from discount window strictness to output changes in 1929-31, but we view this as suggestive evidence in favor of the view that discount window stigma was paramount.

4 Bank Panics in the National Banking Era and in the Great Depression

As discussed, the lack of discount window borrowing in the early part of the Great Depression stands in contrast to the recession of 1920-1921. In this section we summarize the history of earlier banking panics in the U.S. Then we provide a brief history of the Federal Reserve's discount window policy and the development of stigma.

4.1 The National Banking Era

The National Banking Era began with legislation in 1863 that introduced a system of "national banks" that could issue their own currency, but that required backing by U.S. Treasuries. The legislation was aimed at developing a demand for U.S. Treasuries so as to finance the North in the Civil War. But, in addition, it was thought that with Treasury backing, creating a uniform currency (i.e., one without discounts from face value as had occurred with private bank money prior to the Civil War), there would no longer be banking panics—which did not turn out to be the case. In the National Banking Era panics depositors sought to withdraw their cash in National Bank notes.

[7] Others have used differences in Fed district level policies, see Ziebarth (2013) and Rieder (2019).

Gorton (1988) analyzes seven panics that occurred during this period: 1873, 1884, 1890, 1893, 1896, 1907, and 1914. These panics occurred at or just after business cycle peaks; see Gorton (1988) and Calomiris and Gorton (1991).[8] Gorton (1988) showed that banking panics during the National Banking Era, 1863-1914, were information events. The panics occurred when depositors observed an innovation in a leading indicator of recessions, namely the liabilities of failed businesses.[9] If this measure exceeded a threshold it indicated that a large recession was coming and, upon observing this information, there would be a panic. There was never a panic without this threshold being exceeded and there was no case where the threshold was exceeded without a panic. Subsequent to the Federal Reserve System coming into being this threshold can be used to determine the counterfactual of when panics could have occurred.

4.2 Federal Reserve System and the Discount Window

The purpose of the Federal Reserve System was to prevent banking panics by having a permanent discount window which banks could always access.[10]

According to the measure of innovation in the liabilities of failed businesses, estimated over the period 1873-1934, there were two shocks exceed the threshold: June 1920 and December 1929.[11] These two dates just follow business cycle peaks, just as in the pre-Fed period. However, there was no panic at the start of the recession of January 1920-July 1921. Banks heavily used the discount window during the 1920-21 recession. Figure 2 shows the dramatic use of the window during the 1920 recession. The successful avoidance of a panic in 1920 was was widely remarked upon at the time. For example, Herbert Hoover, then the Commerce Secretary, said that "we know now that we have cured [bank panics] through the Federal Reserve System."[12] And Wesley Mitchell wrote in 1922 that: "We have learned how to prevent crises from degenerating into panics" (see Mitchell (1922)).

At that time of the 1920-21 recession, the discount rate was below market rates because the Federal Reserve wanted to support the sale of U.S. Treasuries to pay off the debt from World War I. Background on the Fed-Treasury relations during this period can be found in Beckhart (1924), Meltzer (2003), Parker and Steiner (1926), Whittlesey (1959), Wicker (1966), and Wicker (2015),

[8] This timing is generally true. For example, Dimsdale and Hotson (2004) summarize the U.K. experience since 1825: "The general pattern is one in which financial crises occur close to business cycle peaks, and are followed by a downturn in the wider economy" (p. 26). And in the modern era it also tends to be true. See, for example, Demirguc-Kunt and Detragiache (1998) who study a large sample of developed and developing countries over the period 1980-1994 and find that "crises tend to erupt when the macroeconomic environment is weak" (p. 81).

[9] Burns and Mitchell (1946) identified this variable as a leading indicator of recession.

[10] Prior to the Federal Reserve, private bank clearinghouses opened discount windows only during crises. See Gorton and Mullineaux (1987).

[11] Gorton (1988) lined up the data with the Office of the Comptroller of the Currency Call Report dates. October 1929 was not a bank Call Report date, so the shock is essentially coincident with the stock market crash in October 1929.

[12] Quoted in Ginzberg (2004), p. 33.

among others. In any case, banks did avail themselves of the discount window to a significant extent, as seen in Figure 2. But, the Fed became concerned that banks were using the discount window as a permanent source of funding and also that banks were using the discount window borrowings to lend to speculative stock market investors. To solve these perceived problems, the Fed introduced the discount window stigma. To control discount window borrowing without raising the discount rate (to accommodate the Treasury), the Fed introduced non-pecuniary penalties. The methods used to control credit are listed by Parker and Steiner (1926): the issuance of warnings; the use of moral suasion; advising banks to reduce their outstanding lines of credit and to discriminate against speculative and non-essential loans; the rationing of credit; the attempt to drive war paper from the portfolios of reserve member banks; controlling the issue of Federal Reserve notes; closer scrutiny of paper offered for discount.

Parker and Steiner (1926) write that: "moral pressure was exercised by means of conferences with groups of banks and with individual banks to ascertain the reason for heavy borrowing and if necessary to request them to reduce their aggregate borrowings" (p. 530). In the beginning of the 1920s there was less stigma. E.g., Carlson and Burcu (2016): "There was notably less stigma associated with borrowing from the discount window in the 1920s and borrowing was fairly widespread with about one-third of all member banks borrowing in any given month (roughly 3,000 borrowers out of 9,000 member banks)" (no page). But, this changed. Armantier et al. (2015) "From the late 1920s, the DW [discount window] gradually fell into disuse as the Fed began to take a dim view of DW borrowing and adopted a stance against this practice" (no page). Whittlesey (1959): ". . . administration of the discount window, in the admonitory, moral suasion sense, has a tendency to strengthen the attitude of mind among bankers, "the instinct against borrowing," which is the basis of the tradition [against borrowing]. To be admonished is likely to seem embarrassing and even humiliating" (p. 213-214.).

4.3 The Great Depression

The introduction of non-pecuniary penalties worked. Discount window borrowing declined, but with unintended consequences. Banks did not borrow from the discount window in 1929 and 1930, as they had in 1920-21.

Wicker (1996), speaking of the localized panic in late 1930, wrote: "We can look in vain in the pages of the financial press for an event clearly designated as a panic; it was certainly not the name given to the accelerated bank suspensions in the final two months of 1930. The public had no difficulty in identifying the banking crises in 1873, 1884, 1893, and 1907. The passage of time should not have dulled the recognition of a banking crisis in 1930, especially if the events in those months bore a close resemblance to what had happened earlier" (p. 24). Our interpretation is that banks realized they were in crisis conditions but did not go, and did not expect to be going to the discount window because of the stigma.

By the end of 1930 there were bank failures as there had been in the 1920s, but the consensus view is that these were not significant in turning a recession into a depression. The significant runs came later. White (1984): " . . the [1930] banking crisis did not mark the change from a recession to a depression. These results corroborate other recent studies that . . . find that the crisis [in 1930] was primarily regional in nature and had little impact on the national economy" (p. 120); and "The importance of the banking crisis in 1930 in the history of the Great Depression appears to be somewhat inflated. The increased number of bank failures did not represent a radical departure from the 1920s. The characteristics of the banks that failed in 1930 were very similar to those failed in earlier years" (p. 138). Also, Calomiris (1993): ". . .the first banking crisis of 1930, may have been primarily of local importance and seems to have had little effect on national economic activity" (p. 65).

While the bank failures in late 1930 were limited, banks did start to fail later during all out panics in 1931 and 1933, as described by Friedman and Schwartz (1971), for example.

5 Conclusion

The first year of the Great Depression appears to be an anomaly. Industrial output dropped by over 20% but there were no immediate signs of banking troubles evident during prior crises. In this paper we show that the banks' decision to significantly cut back on lending and invest instead in safe assets contributed to the drop in output. Consistent with the results of Boyd et al. (2009), we find large declines in loan growth preceding the start of the crisis. As these authors show, loan growth predicts the start dates of modern financial crises that are based on the date when the government or central bank responds.

This observation establishes a common thread through seemingly idiosyncratic modern financial crises. At the start of the Great Depression, depositors did not run to banks, perhaps having faith in the discount window which was used to great effect in the recession of 1920-21. In modern crises more generally, depositors wait, perhaps due to explicit or implicit deposit insurance. Therefore, the economy can be in crisis conditions without any apparent signals of distress.

Our results are complementary to Romer (1990) and Olney (1999). Romer (1990) argue that the stock market crash of 1929 created "uncertainty" which caused a reduction in household purchases. Similarly, the explanation in Olney (1999) centers on households cutting expenditures. These cuts were primarily not due to banks reducing consumer loans as banks did not make significant amounts of consumer loans until later (see Clark (1931).) With respect to Romer (1990), we offer a possible interpretation of this "uncertainty." Households observed the leading indicator shock and knew that they would have panicked prior to the Fed—but there was still uncertainty about whether the discount window would work. Banks, however, responded to the leading indicator by cutting

lending and investing in safe assets.

6 Figures

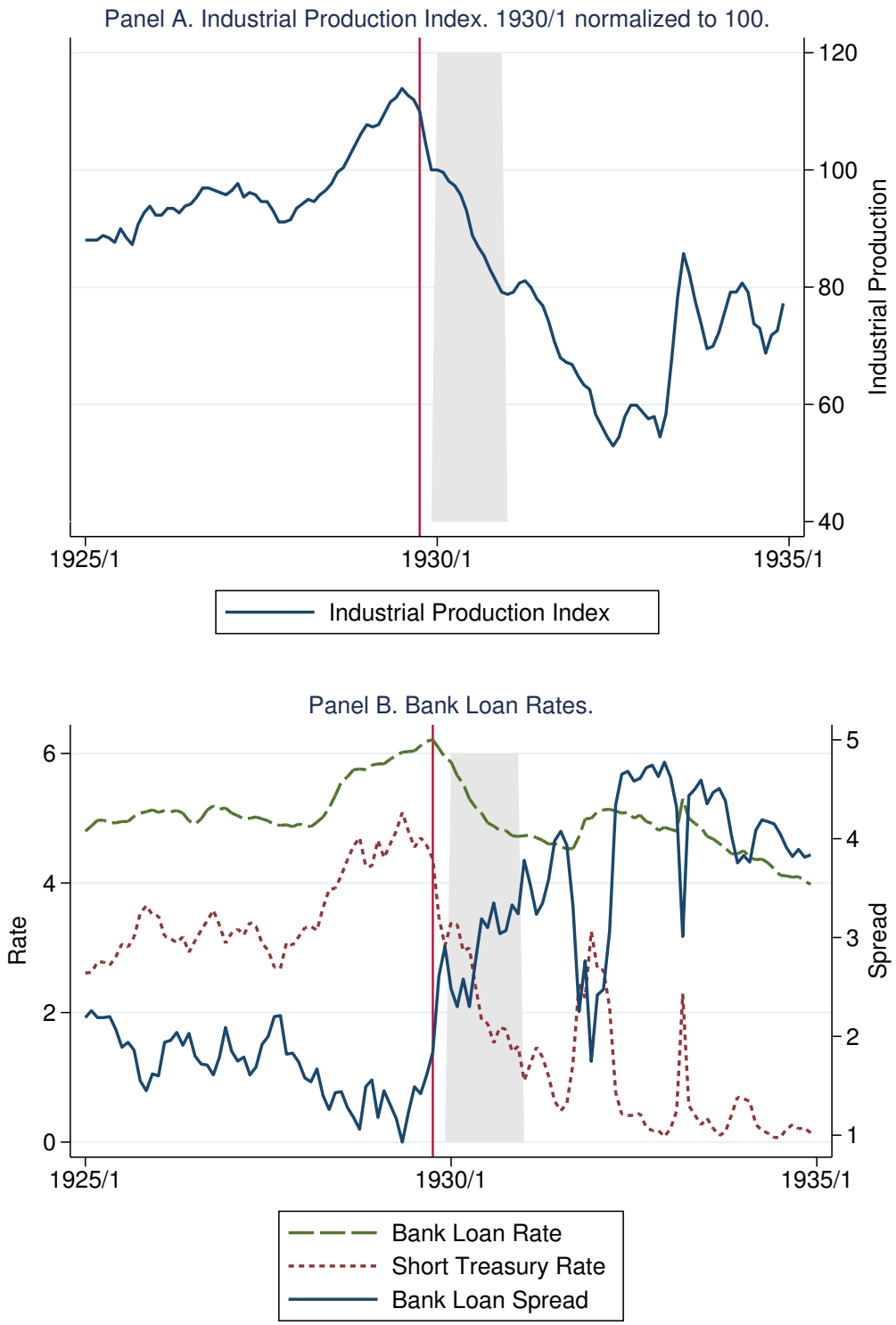

Figure 1: Industrial Production and Bank Loan Spreads. Red vertical line denotes October 1929. Shaded area denotes 1930. Monthly data. Data sources described in Section 2.2.

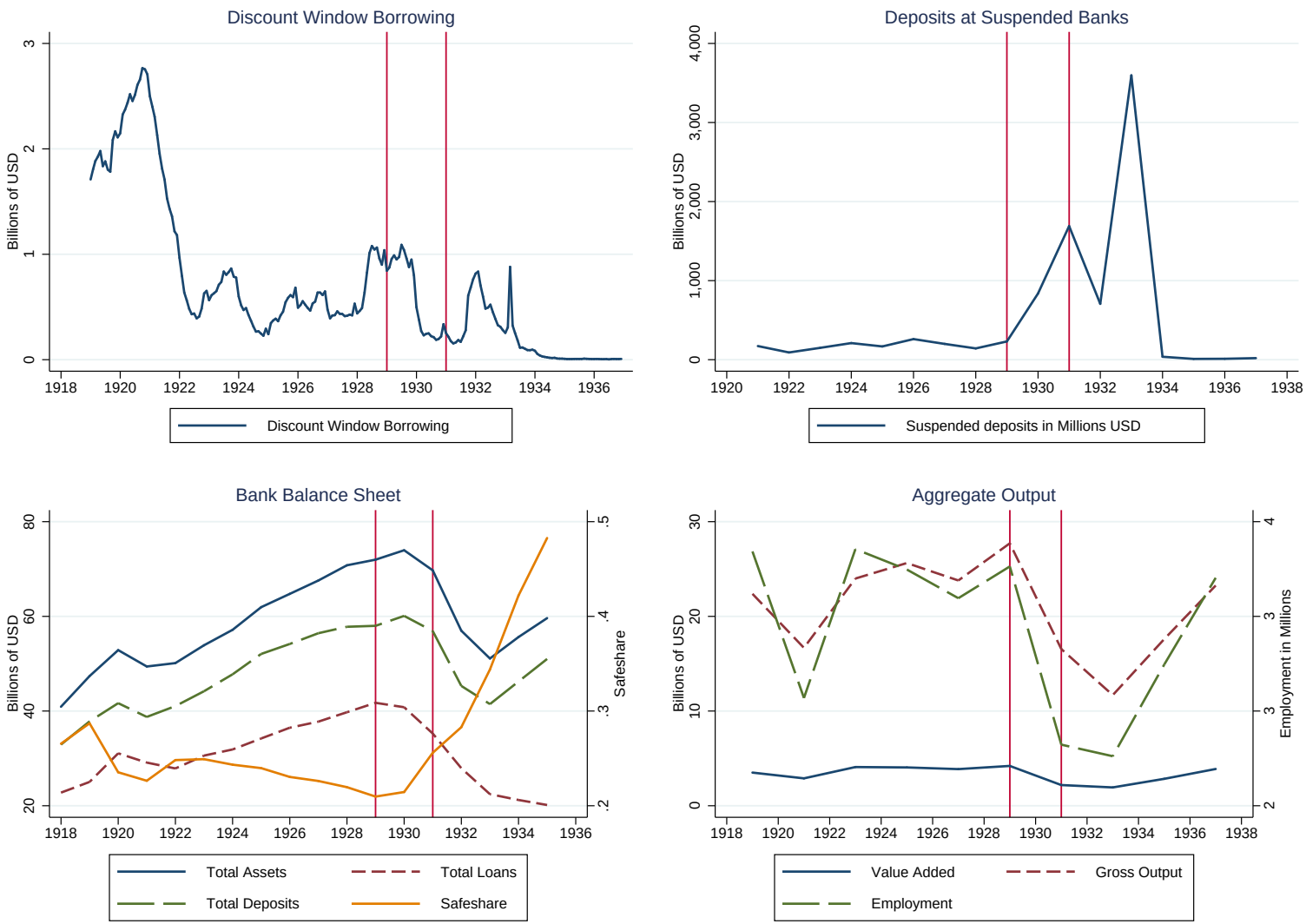

Figure 2: Total Borrowings of Depository Institutions from the Federal Reserve. Bank Balance Sheet Variables. State Output Measures. Data sources described in Section 2.2.

7 Tables

Table 1: Aggregate Balance Sheet 1929-1933. Millions of USD. Levels, changes in levels, and percentage change in selected balance sheet items. Data from *All-Bank Statistics: United States, 1896-1955.*

	Level			Level Change			Percentage Change		
Description	1929	1931	1933	1931-29	1933-31	1933-29	1931-29	1933-31	1933-29
Total Loans	41,934	35,415	22,537	-6,518	-12,878	-19,397	-15.5	-36.4	-46.3
Loans For Securities	13,844	10,998	5,655	-2,846	-5,343	-8,189	-20.6	-48.6	-59.2
Loans For Real Estate	11,796	11,626	9,954	-170	-1,672	-1,842	-1.4	-14.4	-15.6
All Other Loans	16,294	12,791	6,928	-3,503	-5,863	-9,366	-21.5	-45.8	-57.5
Total Investments	17,305	19,973	18,125	2,669	-1,849	820	15.4	-9.3	4.7
Treasuries	5,477	6,602	8,229	1,125	1,627	2,752	20.5	24.7	50.3
Munis	2,860	3,472	3,178	612	-294	318	21.4	-8.5	11.1
Other Investment Securities	8,968	9,900	6,717	932	-3,182	-2,251	10.4	-32.1	-25.1
Total Cash	9,223	10,405	7,793	1,182	-2,612	-1,429	12.8	-25.1	-15.5
Cash In Collection	2,397	2,531	1,510	134	-1,021	-886	5.6	-40.3	-37.0
Currency Coin	770	851	641	81	-210	-129	10.5	-24.6	-16.7
Bankers Balances	6,056	7,023	5,642	967	-1,381	-414	16.0	-19.7	-6.8
Safe	15,162	17,947	17,690	2,785	-257	2,528	18.4	-1.4	16.7
Other Assets	3,844	4,270	3,104	426	-1,166	-740	11.1	-27.3	-19.2
Total Assets	72,315	70,070	51,359	-2,245	-18,711	-20,956	-3.1	-26.7	-29.0
Total Deposits	58,269	57,187	41,684	-1,082	-15,503	-16,585	-1.9	-27.1	-28.5
Capital	3,883	3,748	2,943	-135	-806	-941	-3.5	-21.5	-24.2
Surplus And Other Capital Acc.	5,867	6,123	4,445	256	-1,678	-1,422	4.4	-27.4	-24.2
Safeshare Times 100	21	26	34	5	9	13	22.2	34.5	64.3
Suspended Deposits	231	1,690	3,553	1,460	1,863	3,322	632.8	110.2	1440.4

Table 2: Bank Loan Spreads. Yearly averages. Data sources described in Section 2.2.

	Loan Spreads			
Year	Loan Rate	T-Bill	Spread	Δ Spread
1926	5.082	3.233	1.850	-0.101
1927	4.963	3.095	1.867	0.018
1928	5.376	3.968	1.407	-0.460
1929	6.016	4.420	1.596	0.188
1930	5.124	2.229	2.895	1.299
1931	4.697	1.402	3.295	0.400
1932	5.020	0.879	4.141	0.845
1933	4.763	0.515	4.248	0.107
1934	4.215	0.256	3.959	-0.289

Table 3: Firm-level Industry Finance Dependence Measure. Fifteen Census of Manufactures industries that are matched to firms in Moody's Manuals. CX VW refers to the main measure of industry external finance dependence, defined in Equation 2.

Industry Description	# States 1931	# Company-years	# Companies	CX VW
Boots	20	38	8	4.69
Bread	48	47	12	5.84
Canning	34	29	8	4.75
Chemicals	20	76	16	5.66
Cigars, Cigarettes	21	52	13	5.84
Confectionary	38	50	10	6.36
Cotton Goods	22	57	16	6.35
Furniture	37	6	2	4.56
Glass	10	8	2	6.52
Lumber	41	5	1	7.01
Meat Packing	35	10	2	6.31
Motor Vehicles	8	125	31	4.32
Petroleum refining	15	156	41	4.75
Printing, Newspapers	36	10	3	3.47
Rubber Tires, Tubes	2	42	10	5.92
Total 15 industries	387	711	175	

Table 4: WLS Regressions. 1929-1931. Sample consists of 387 state-industry observations. Left hand side variable measured as a log change from 1929 to 1931.

A. Value Added—measured by wages.

CX VW × Δ Bank Ta	0.615***			
	(5.95)			
CX VW × Δ Bank Loans		0.568***		
		(5.57)		
CX VW × Δ Bank Safeshare			-1.565**	
			(-3.02)	
CX VW × Δ Bank Deposits				0.618***
				(6.21)
Constant	0.376	0.649*	0.00553	0.249
	(1.74)	(2.50)	(0.02)	(1.25)
Observations	387	387	387	387
R^2	0.712	0.708	0.689	0.714

B. Gross Output—measured by value of production.

CX VW × Δ Bank Ta	0.508***			
	(4.07)			
CX VW × Δ Bank Loans		0.349**		
		(2.82)		
CX VW × Δ Bank Safeshare			-0.302	
			(-0.49)	
CX VW × Δ Bank Deposits				0.507***
				(4.22)
Constant	0.184	0.170	-0.431	0.0743
	(0.70)	(0.54)	(-1.56)	(0.31)
Observations	387	387	387	387
R^2	0.509	0.496	0.484	0.511

C. Employment.

CX VW × Δ Bank Ta	0.502***			
	(5.37)			
CX VW × Δ Bank Loans		0.438***		
		(4.74)		
CX VW × Δ Bank Safeshare			-1.128*	
			(-2.42)	
CX VW × Δ Bank Deposits				0.502***
				(5.58)
Constant	0.501*	0.673**	0.153	0.395*
	(2.56)	(2.86)	(0.73)	(2.19)
Observations	387	387	387	387
R^2	0.665	0.659	0.641	0.667

Table 5: Interpretation of Coefficients. SD is the sample standard deviation of output measure, or the bank balance sheet measure. BS Drop refers to the change in the total balance sheet item, as reported in Table 1. Implied Aggregate measures the implied drop in output assuming an industry with median dependence on bank finance (CX=5) facing a banking sector that mirrors the change on the national level.

	Coefficient	SD	BS Drop	Implied Aggregate
Wages		0.30		
Total Assets	0.615	0.11	-3.10%	-9.5%
Loans	0.568	0.15	-15.50%	-44.0%
Safeshare	-1.565	0.03	4.65%	-36.4%
Deposits	0.618	0.11	-1.90%	-5.9%
Output		0.34		
Total Assets	0.508	0.11	-3.10%	-7.9%
Loans	0.349	0.15	-15.50%	-27.0%
Safeshare	-0.302	0.03	4.65%	-7.0%
Deposits	0.507	0.11	-1.90%	-4.8%
Employment		0.30		
Total Assets	0.502	0.11	-3.10%	-7.8%
Loans	0.438	0.15	-15.50%	-33.9%
Safeshare	-1.128	0.03	4.65%	-26.2%
Deposits	0.502	0.11	-1.90%	-4.8%

Table 6: WLS Regressions 1929-1930. Right hand side variables measured from 1929-1930.

A. Value Added—measured by wages.

CX VW × Δ Bank Ta	0.790***			
	(5.37)			
CX VW × Δ Bank Loans		0.741***		
		(3.94)		
CX VW × Δ Bank Safeshare			-0.781	
			(-0.77)	
CX VW × Δ Bank Deposits				0.799***
				(5.60)
Constant	0.0924	0.205	-0.404*	-0.00188
	(0.47)	(0.85)	(-2.04)	(-0.01)
Observations	387	387	387	387
R^2	0.706	0.695	0.681	0.709

B. Gross Output—measured by value of production.

CX VW × Δ Bank Ta	0.665***			
	(3.77)			
CX VW × Δ Bank Loans		0.530*		
		(2.37)		
CX VW × Δ Bank Safeshare			-0.986	
			(-0.82)	
CX VW × Δ Bank Deposits				0.673***
				(3.93)
Constant	-0.0414	-0.0335	-0.426	-0.121
	(-0.18)	(-0.12)	(-1.83)	(-0.55)
Observations	387	387	387	387
R^2	0.506	0.493	0.485	0.507

C. Employment.

CX VW × Δ Bank Ta	0.684***			
	(5.18)			
CX VW × Δ Bank Loans		0.630***		
		(3.74)		
CX VW × Δ Bank Safeshare			-1.233	
			(-1.35)	
CX VW × Δ Bank Deposits				0.688***
				(5.37)
Constant	0.299	0.386	-0.0753	0.215
	(1.71)	(1.79)	(-0.42)	(1.30)
Observations	387	387	387	387
R^2	0.663	0.650	0.637	0.665

Table 7: WLS Regressions 1929-1931. Controlling for change in deposits at suspended banks, normalized by total assets in 1929.

A. Value Added—measured by wages.

CX VW × Δ Bank Ta	0.584***			
	(5.06)			
CX VW × Δ Bank Loans		0.529***		
		(5.15)		
CX VW × Δ Bank Safeshare			-2.169***	
			(-4.12)	
CX VW × Δ Bank Deposits				0.588***
				(5.37)
CX VW × Δ Bank Suspended	-0.457	-1.541*	-2.920***	-0.485
	(-0.61)	(-2.28)	(-4.16)	(-0.66)
Observations	387	387	387	387
R^2	0.712	0.713	0.705	0.715

B. Gross Output—measured by value of production.

CX VW × Δ Bank Ta	0.471***			
	(3.39)			
CX VW × Δ Bank Loans		0.310*		
		(2.48)		
CX VW × Δ Bank Safeshare			-0.746	
			(-1.17)	
CX VW × Δ Bank Deposits				0.472***
				(3.56)
CX VW × Δ Bank Suspended	-0.531	-1.534	-2.148*	-0.561
	(-0.59)	(-1.87)	(-2.53)	(-0.64)
Observations	387	387	387	387
R^2	0.510	0.502	0.494	0.511

C. Employment.

CX VW × Δ Bank Ta	0.482***			
	(4.62)			
CX VW × Δ Bank Loans		0.407***		
		(4.37)		
CX VW × Δ Bank Safeshare			-1.593***	
			(-3.34)	
CX VW × Δ Bank Deposits				0.482***
				(4.87)
CX VW × Δ Bank Suspended	-0.291	-1.217*	-2.250***	-0.321
	(-0.43)	(-1.99)	(-3.54)	(-0.49)
Observations	387	387	387	387
R^2	0.665	0.663	0.655	0.667

Table 8: IV Regressions. 1929-1931. State-level instruments for fragility of the banking sector constructed by Mladjan (2016).

A. Value Added—measured by wages.

CX VW × Δ Bank Ta	0.543**			
	(2.88)			
CX VW × Δ Bank Loans		0.572**		
		(2.95)		
CX VW × Δ Bank Safeshare			-10.55	
			(-1.69)	
CX VW × Δ Bank Deposits				0.620**
				(3.21)
Constant	0.206	0.608	2.854	0.178
	(0.76)	(1.54)	(1.42)	(0.75)
Observations	387	387	387	387
R^2	0.619	0.592	-0.170	0.618

B. Gross Output—measured by value of production.

CX VW × Δ Bank Ta	0.637**			
	(3.03)			
CX VW × Δ Bank Loans		0.687**		
		(3.11)		
CX VW × Δ Bank Safeshare			-12.53	
			(-1.67)	
CX VW × Δ Bank Deposits				0.763***
				(3.51)
Constant	0.289	0.793	3.444	0.296
	(0.96)	(1.76)	(1.43)	(1.11)
Observations	387	387	387	387
R^2	0.484	0.426	-0.838	0.473

C. Employment.

CX VW × Δ Bank Ta	0.388*			
	(2.18)			
CX VW × Δ Bank Loans		0.421*		
		(2.32)		
CX VW × Δ Bank Safeshare			-7.654	
			(-1.55)	
CX VW × Δ Bank Deposits				0.470**
				(2.58)
Constant	0.248	0.560	2.177	0.259
	(0.98)	(1.52)	(1.37)	(1.16)
Observations	387	387	387	387
R^2	0.535	0.512	-0.014	0.531

Table 9: OLS Regressions 1929-1931. Sample consists of 387 state-industry observations.

A. Value Added—measured by wages.

CX VW × Δ Bank Ta	0.224*			
	(2.09)			
CX VW × Δ Bank Loans		0.141		
		(1.83)		
CX VW × Δ Bank Safeshare			-0.560	
			(-1.47)	
CX VW × Δ Bank Deposits				0.259*
				(2.51)
Constant	-0.223	-0.245	-0.345*	-0.231
	(-1.27)	(-1.35)	(-2.19)	(-1.51)
Observations	387	387	387	387
R^2	0.629	0.628	0.627	0.632

B. Gross Output—measured by value of production.

CX VW × Δ Bank Ta	0.152			
	(1.29)			
CX VW × Δ Bank Loans		0.0623		
		(0.73)		
CX VW × Δ Bank Safeshare			-0.0830	
			(-0.20)	
CX VW × Δ Bank Deposits				0.187
				(1.64)
Constant	-0.363	-0.444*	-0.541**	-0.355*
	(-1.88)	(-2.21)	(-3.12)	(-2.10)
Observations	387	387	387	387
R^2	0.510	0.508	0.507	0.511

C. Employment.

CX VW × Δ Bank Ta	0.0967			
	(0.96)			
CX VW × Δ Bank Loans		0.0626		
		(0.86)		
CX VW × Δ Bank Safeshare			-0.501	
			(-1.41)	
CX VW × Δ Bank Deposits				0.132
				(1.36)
Constant	-0.143	-0.149	-0.112	-0.123
	(-0.87)	(-0.87)	(-0.76)	(-0.85)
Observations	387	387	387	387
R^2	0.547	0.546	0.548	0.548

Table 10: WLS Regressions. 1919-1921. Sample consists of 387 state-industry observations. Left hand side variable measured as a log change from 1929 to 1931.

A. Value Added—measured by wages.

CX VW × Δ Bank Ta	0.143			
	(0.94)			
CX VW × Δ Bank Loans		0.0338		
		(0.31)		
CX VW × Δ Bank Safeshare			0.292	
			(0.95)	
CX VW × Δ Bank Deposits				0.138
				(1.05)
Constant	-0.222	-0.220	-0.0274	-0.151
	(-1.27)	(-1.03)	(-0.12)	(-0.88)
Observations	395	395	395	395
R^2	0.588	0.587	0.588	0.589

B. Gross Output—measured by value of production.

CX VW × Δ Bank Ta	-0.0751			
	(-0.52)			
CX VW × Δ Bank Loans		-0.157		
		(-1.55)		
CX VW × Δ Bank Safeshare			0.597*	
			(2.05)	
CX VW × Δ Bank Deposits				-0.0135
				(-0.11)
Constant	-0.430*	-0.263	-0.142	-0.456**
	(-2.59)	(-1.31)	(-0.65)	(-2.80)
Observations	394	394	394	394
R^2	0.597	0.599	0.601	0.596

C. Employment.

CX VW × Δ Bank Ta	0.0174			
	(0.13)			
CX VW × Δ Bank Loans		0.0253		
		(0.27)		
CX VW × Δ Bank Safeshare			-0.126	
			(-0.47)	
CX VW × Δ Bank Deposits				-0.0750
				(-0.66)
Constant	-0.273	-0.298	-0.333	-0.284
	(-1.80)	(-1.62)	(-1.65)	(-1.91)
Observations	395	395	395	395
R^2	0.458	0.458	0.458	0.459

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A Appendix

Table 11: Aggregate Balance Sheet 1919-1923.

	Level			Level Change			Percentage Change		
Description	1919	1921	1923	1921-19	1923-21	1923-19	1921-19	1923-21	1933-29
Total Loans	25,132	29,236	30,734	4,104	1,498	5,602	16.3	5.1	22.3
Loans For Securities	9,330	9,203	9,658	-126	455	328	-1.4	4.9	3.5
Loans For Real Estate	4,709	5,857	7,329	1,148	1,472	2,620	24.4	25.1	55.6
All Other Loans	11,094	14,176	13,748	3,083	-429	2,654	27.8	-3.0	23.9
Total Investments	12,024	11,169	13,474	-854	2,305	1,451	-7.1	20.6	12.1
Treasuries	5,425	4,201	5,716	-1,224	1,515	291	-22.6	36.1	5.4
Munis	1,695	1,723	1,852	28	129	157	1.7	7.5	9.3
Other Investment Securities	4,904	5,245	5,907	342	661	1,003	7.0	12.6	20.5
Total Cash	8,286	6,980	7,595	-1,307	615	-691	-15.8	8.8	-8.3
Cash In Collection	1,740	1,669	1,680	-71	11	-60	-4.1	0.7	-3.5
Currency Coin	965	879	770	-86	-109	-195	-8.9	-12.4	-20.2
Bankers Balances	5,581	4,432	5,145	-1,149	713	-436	-20.6	16.1	-7.8
Safe	13,666	11,235	13,483	-2,431	2,247	-184	-17.8	20.0	-1.3
Other Assets	2,161	2,247	2,340	86	93	179	4.0	4.1	8.3
Total Assets	47,603	49,633	54,144	2,030	4,511	6,541	4.3	9.1	13.7
Total Deposits	37,982	38,934	44,376	952	5,442	6,394	2.5	14.0	16.8
Capital	2,504	2,946	3,080	442	134	576	17.7	4.6	23.0
Surplus And Other Capital Acc.	2,905	3,439	3,738	534	299	832	18.4	8.7	28.7
Safeshare Times 100	29	23	25	-6	2	-4	-21.2	10.0	-13.3

Table 12: Interaction with historical district Discount Window usage. 1929-1931. Low DW is an indicator variable for states that are in Fed Districts that saw below-mean amount of Discount Window borrowing in 1919-1928.

A. Value Added—measured by wages.

CX VW × Δ Bank TA	0.383**			
	(2.86)			
Low DW	-0.179	0.00126	0.493*	-0.159
	(-0.68)	(0.00)	(2.29)	(-0.66)
CX VW × Δ Bank TA × Low DW	0.571**			
	(2.69)			
CX VW × Δ Bank LOANS		0.354**		
		(3.10)		
CX VW × Δ Bank LOANS × Low DW		0.371***		
		(3.82)		
CX VW × Δ Bank SAFESHARE			-0.782	
			(-1.45)	
CX VW × Δ Bank SAFESHARE × Low DW			-1.469***	
			(-4.13)	
CX VW × Δ Bank DEPOSITS				0.407**
				(3.04)
CX VW × Δ Bank DEPOSITS × Low DW				0.490*
				(2.33)
Constant	0.0377	0.194	-0.272	-0.0109
	(0.15)	(0.69)	(-1.15)	(-0.05)
Observations	387	387	387	387
R^2	0.718	0.721	0.705	0.719

B. Gross Output—measured by value of production.

CX VW × Δ Bank TA	0.424**			
	(2.60)			
Low DW	-0.339	0.0234	0.400	-0.270
	(-1.06)	(0.07)	(1.54)	(-0.92)
CX VW × Δ Bank TA × Low DW	0.206			
	(0.80)			
CX VW × Δ Bank LOANS		0.219		
		(1.55)		
CX VW × Δ Bank LOANS × Low DW		0.226		
		(1.89)		
CX VW × Δ Bank SAFESHARE			0.243	
			(0.37)	
CX VW × Δ Bank SAFESHARE × Low DW			-1.022*	
			(-2.37)	
CX VW × Δ Bank DEPOSITS				0.429**
				(2.63)
CX VW × Δ Bank DEPOSITS × Low DW				0.181
				(0.71)
Constant	0.0617	-0.107	-0.624*	-0.0218
	(0.20)	(-0.31)	(-2.18)	(-0.08)
Observations	387	387	387	387
R^2	0.510	0.502	0.493	0.512

C. Employment.

CX VW × Δ Bank TA	0.289*			
	(2.38)			
Low DW	-0.0902	0.0747	0.417*	-0.0714
	(-0.38)	(0.31)	(2.15)	(-0.33)
CX VW × Δ Bank TA × Low DW	0.525**			
	(2.74)			
CX VW × Δ Bank LOANS		0.252*		
		(2.43)		
CX VW × Δ Bank LOANS × Low DW		0.322***		
		(3.66)		
CX VW × Δ Bank SAFESHARE			-0.496	
			(-1.02)	
CX VW × Δ Bank SAFESHARE × Low DW			-1.186***	
			(-3.69)	
CX VW × Δ Bank DEPOSITS				0.301*
				(2.48)
CX VW × Δ Bank DEPOSITS × Low DW				0.468*
				(2.46)
Constant	0.190	0.278	-0.0712	0.147
	(0.85)	(1.09)	(-0.33)	(0.72)
Observations	387	387	387	387
R^2	0.672	0.672	0.656	0.673