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BANK FAILURES AND ECONOMIC ACTIVITY: EVIDENCE FROM THE PROGRESSIVE ERA

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ABSTRACT

During the Progressive Era (1900-29), economic growth was rapid but volatile. Boom and busts witnessed the formation and failure of tens of thousands of firms and thousands of banks. This essay uses new data and methods to identify causal links between failures of banks and bankruptcies of firms. Our analysis indicates that bank failures triggered bankruptcies of firms that depended upon banks for ongoing access to commercial credit. Firms that did not depend upon banks for credit did not fail in appreciably larger numbers after banks failed or during financial panics.

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1. Introduction

Commercial banks' contribution to the economy has long been and remains the subject of debate. According to some observers, banks facilitated economic activity by processing payments, facilitating savings, serving as financial intermediaries, transforming liquid low-yield deposits into longer-term higher-yielding assets, screening and monitoring the recipients of this credit, and financing economic activities that would not occur in the absence of banks' actions. Failures of banks interrupted these services and disrupted commerce and manufacturing (Bernanke 1983). According to other observers, banks were one among many financial intermediaries. In their absence, other financial intermediaries would readily process payments, facilitate savings, and intermediate finance. Economic activity would remain much the same. Bank failures, therefore, should have had little impact on the aggregate economy.

The empirical debate on this issue focusses on the impact of bank failures since banks' contributions to the economy may be easier to observe at times when banks suddenly exit the economy. Conclusive answers to the question "how do bank failures impact the economy?" remain elusive for several reasons. One is deficiencies in data. Academic analysts lack data about exactly which firms borrowed from banks, particularly in past eras, like the early twentieth century, when banks played a larger role in the commercial credit system than they do today. Analysts also lack data on outcomes that clearly link bank failures and changes in business activity. Two is identification. Banks' and firms' actions and outcomes are endogenous and often simultaneous. Banks' decisions influence firms. Firms' decisions influence banks. Events that impact one often also directly influence the other, and some impactful events may not be observed by researchers. Firms and banks engage in repeated, reciprocal relationships, forecast future decisions and events, and act accordingly. These interrelationships mean that causality could run in many directions: from banks to firms, from firms to banks, from the past to future, from anticipation of future to present, or in all these directions at once. In situations like this, with complex causal chains and complicated issues of inferences, researchers require innovative research designs to discern cause from effect.

Our essay advances research on both fronts. We examine the relationship between bank failures and business activity during the Progressive Era (1900-1929). From primary sources, we gather novel data that illuminates relationships between banks and businesses. Information from the Internal Revenue Service (IRS) and Bureau of the Census indicates characteristics of firms

whose operations either required or did not utilize financing from banks. The bank-dependent firms included almost all trading firms (retailers and wholesalers) and small manufacturing firms. Their debts substantially exceeded deposits in banks. The bank-independent firms included large manufacturers, almost all of whom had substantially more deposits in than loans from banks. To this data, we add information from R.G. Dun and Company that reveals failures of small and large manufacturing and trading firms. We join the two data sets to determine quarterly bankruptcies of firms that borrowed from banks and firms that did not. Our analysis focusses on national aggregates because this information is only available for the nation as a whole.

We use this data to discern links between bank failures and business bankruptcies and illuminate the mechanism underlying those links. Our initial identification strategy uses local projections to compare the impact of bank failures on the failure of bank dependent and independent firms. We find that failures of bank-dependent firms increased substantially after increases in bank failures, but that failures of bank-independent firms did not. Conversely, bank failures increased substantially after increases in failures of large manufacturing firms that borrowed little from banks but held large cash balances in depositories, while bank failures changed little (or not at all) after increases in failures of trading and small manufacturing firms.

To confirm the direction of causality, we employ two instruments popular in the literature: the banking panic series of Jalil (2015) and the bank-equity approach of Baron, Verner, and Xiong, (2022). In the first stage of a two-stage linear projection, these instruments identify exogenous shocks to bank failures, which in the second stage, recover results similar to those in our original estimates. We check the robustness of these results using traditional time-series identification strategies, particularly timing restrictions in a vector autoregression analysis. We base these restrictions upon historical information about bank lending and bankruptcy procedures that we introduce in this and a related essay (Del Angel and Richardson, 2024b).

Our analysis focusses on the United States from 1901 to 1929, a three-decade span characterized by rapid economic growth and deep downturns amidst financial distress. Examining this era can yield lessons for the present, since commercial banks' role in the U.S. then resembled their role in many OECD and in most developing nations now. That era also presents unique analytic opportunities since the federal government seldom intervened in financial markets or the macroeconomy and did little to stem bank distress prior to the Great Depression. In addition, the federal Bankruptcy Act of 1898 induced the generation of a unique data set of filings in federal

bankruptcy courts. After this act, creditors seeking to force firms (except for railroads and banks) to repay debts had to file suits in federal bankruptcy courts. Only creditors could file these suits. Debtors could not (using procedures established in the 1930s and ubiquitously used today) preemptively file suit to seek protection from creditors. The principal (and in many cases the only) creditors of trading and manufacturing firms were commercial banks. Bankruptcy filings, therefore, largely originated with banks' efforts to force businesses that borrowed from them to repay past-due debts.

Our paper contributes to four literatures. The first examines the effect of credit supply shocks on economic activity in the early twentieth century. Bernanke (1983) used aggregate time series to show that the 1930-33 crisis disrupted the credit allocation process by increasing the real cost of intermediation which led to a contraction of bank-credit and industrial production. Calomiris and Mason (2003) used state and county data to show that the contraction of bank lending correlated with reduced income and building permit growth from 1930 to 1932. Richardson and Troost (2009) used microdata on banks and businesses to show that bank suspensions during panics reduced lending to commerce and industry. Ramirez and Shively (2012) used aggregate data to reveal the strong correlation between bank and commercial failures from 1900 to 1929. We introduce new evidence that illuminates bank failures' impact on firms that borrowed from banks and firms that did not. The new data demonstrates that the impulse underlying the correlation bank-and-business-failure was the failure of creditors. Failures of banks triggered failures of firms that borrowed from banks but did not lead to failures of firms that did not depend upon banks for credit. Failures of firms that lent large sums to banks (i.e. net creditors whose deposits in banks substantially exceeded borrowing from banks) preceded failures of banks.

Second, we advance the literature on the impact of banks and finance companies on small business credit. Chen, Hanson, and Stein (2017) document a large credit supply shock for small businesses in counties that were most exposed to the four largest banks in the U.S. from 2008-2014. Cortés et al. (2020) show that banks more affected by stress tests conducted by the Federal Reserve decreased small business lending and increased interest rates from 2012-16 after the 2008 financial crisis. Gopal and Schnabl (2022) show that nonbank lenders decreased lending to small businesses in the U.S. during the 2008 financial crisis. We are the first scholars to distinguish lending to small firms in historical data. A related paper demonstrates that small firms depended upon banks for commercial credit during the Progressive Era. This essay demonstrates that in the

Progressive Era, bank distress impacted small businesses more rapidly and severely than in recent decades, which suggests that the range of federal programs designed to insulate small firms from credit supply shocks – which were created primarily in response to the financial crises of the Progressive Era and Great Depression – help to insulate the modern economy from the consequences of credit disruptions.

Third, we add new evidence to the literature on the macroeconomic effects of financial crises. Jalil (2015) derives a new series of banking panics for years 1825-1929 and finds that banking panics had a large negative effect on output. Baron, Verner and Xiong (2022) construct a new series of bank equity returns and banking panics for 46 countries from 1870 to 2016 and find that large declines in bank equity predict credit contractions and output gaps. Xu (2022) examines how the 1866 banking crisis that originated in London affected global trade. Countries exposed to bank failures experienced a large and persistent decline in exporting activity. Our essay corroborates the arguments of these authors, reinforces their claims about causality, and illuminates the mechanism by which bank distress impacted business activity, particularly during the financial crises of the Progressive Era.

Finally, our paper adds to the literature on bank failures in emerging markets (Brown and Dinc, 2005; Dinc, 2005; Carvalho, 2014) by examining the short-run effect of bank failures on business bankruptcies in a time period when the U.S. was an emerging market economy. Our work also builds on information that we introduced in earlier essays. Del Angel and Richardson (2024a) introduced data on bankruptcies from Dun's aggregated at the state level. Gou and Richardson (2011) introduced that data aggregated by branches of business. This essay introduces data aggregated by size of firm (large and small), economic sector (manufacturing and trading), and bank dependence (i.e. clear net borrowers and clear net creditors of commercial banks). The crosswalk between bankruptcy and net-credit position requires analysis of data on firm balance sheets that we introduced in our previous work but conduct in this essay.

The remainder of this essay lays out our argument. Section 2 describes the structure of the commercial credit system and the types of firms dependent on banks for credit. Section 3 discusses data sources and illustrates patterns apparent in the data. Section 4 describes our statistical methods and results. Section 5 discusses the implications of our estimates.

2. Historical Background on Banks and Bankruptcies

The historical foundation for our analysis is information about the nature of banking, bankruptcies, manufacturing, and commerce during the Progressive Era. A series of papers – Del Angel and Richardson (2024a, 2024b) and Richardson and Gou (2011) – detail these facts and cite primary sources. This section summarizes that material and elaborates on issues that frame the statistical analysis in this essay.

In the Progressive Era, a system of manufacturing and distribution spanned the nation. Raw materials were extracted or grown in some locations, shipped to places to be converted into intermediate products, shipped onward to be assembled into final goods, then shipped to wholesalers, retailers, and eventually consumers. An example would be trees that were harvested in forests in the West, cut into lumber at sawmills at a city near the forest, shipped by rail across the United States to factories in furnishing manufacturing centers in places like North Carolina, and eventually sold to households throughout the nation. Most firms that engaged in manufacturing and trading activity were small. They operated in a single city or county. Their downstream links (i.e., input purchases) and upstream links (to purchasers of their output), however, spanned several states and often the entire nation.

Banking was also local. Prohibitions on branching limited most banks to operate within a single city (and often a single building). Local banks and local firms interacted repeatedly, with banks financing stages of the production process undertaken by nearby firms. Bank credit was short term. Banks financed specific transactions. A bank in North Carolina, for example, might loan a local manufacturer the funds to produce 10,000 chairs to be shipped to a retail store in New York City. The loan would be collateralized by the merchandise (as well as the full faith and credit of the borrower) and last for only the length of time needed to purchase the raw materials, ship them to the factory, make the chairs, and ship them to their destination. The merchant in New York who purchased the chairs would take out a loan from their local bank to finance the chairs while they held them in inventory.

The financial instrument that initiated this transaction would be a means of payment issued by a firm and guaranteed by a bank. The most common arrangement was for the purchaser to write a draft that promised payment on a particular date. The draft would be accompanied by an agreement that made payment contingent upon goods arriving at their destination. The firm that

issued the draft would take the paperwork to its bank which (for a fee) would guarantee payment as promised. The supplier would take the draft and accompanying paperwork to their bank and use it as collateral for a loan. This enabled the supplier to receive payment up front (i.e. before they delivered the goods) and the purchaser to pay after delivery.

Credit was crucial to the system because production preceded purchasing and because producers seldom directly contacted consumers. Ultimate consumers paid the bill for the chain of production and distribution, but they made their payments when they purchased the goods, or if they paid on credit, months or years later. Consumers' payments flowed through retailers to wholesalers and then to manufacturers of final goods, intermediate inputs, and basic resources. While the latter received payment last, they needed the funds first, so that they could initiate production. Commercial banks bridged this gap, financing the costs of production and distribution which consumers' final payments would eventually cover.

Which firms borrowed the most from banks? Del Angel and Richardson (2024b) answer this question in detail using data from the Internal Revenue Service and Bureau of the Census. A summary is that almost all trading firms borrowed substantially from banks. Wholesalers and retailers typically had few assets other than inventory and little cash on hand. These trading firms typically owed banks two to three dollars for each dollar that they had on deposit in banks. Balance sheets of small manufacturing firms were similar. They borrowed two to three dollars from banks for each dollar that they had on deposit. Trading firms and small manufacturing firms, in other words, were net borrowers from banks. They lacked sufficient cash and deposits to repay their loans in the short term, a span of a few weeks or months; they also lacked assets that could be sold to repay their debts in the medium term, a span of several months to half a year. Banks were their principal source of funds. Most borrowed funds only from banks, and they lacked access to alternative sources of credit.

The balance sheets of large manufacturing firms looked different. They typically deposited more money in banks than they borrowed from them. Their balance sheets often had between one and three dollars in cash or deposits for each dollar that they owed to banks. They were net creditors to banks, not net borrowers from them. While they found banks useful for facilitating payments and smoothing short-term imbalances in cash flows, they financed most of their operations with equity (i.e., stocks), debt (i.e., bonds), and retained earnings (i.e., cash which they accumulated in banks). They could typically repay their debts to banks rapidly, possibly within a

few hours and certainly within a few days. They had access to several sources of funds, and typically possessed valuable capital, such as land, buildings, plants, and machinery, which they could use as collateral for loans or sell to raise cash.

A key feature of the Progressive Era commercial banking system was the length of bank loans. Most loans matured in three to six months. No loans matured in more than a year. Many loans could be called. Banks could ask firms to repay callable loans on short notice, often by the end of the next business day.

The short term of commercial lending meant that bank distress could quickly impact operations at bank dependent firms. Banks that needed cash typically called outstanding loans and refused to roll over maturing credit. Banks might sue firms that could not come up with the cash. Banks that failed would continue to act to collect debts. The affairs of failed banks were wound up by court or regulator appointed officers known as receivers. Receivers as a matter of course called outstanding lines of credit and could not renew term loans. These actions ensured that bank distress triggered a contraction of commercial credit, as banks forced firms to repay loans, and a rush of bankruptcy suits, as bankers and receivers sought to compel firms to repay debts and get in the queue of creditors hoping to be reimbursed by the liquidation of firms that could not come up with the cash.

The Progressive Era system of commercial credit had strengths. It provided firms with short-term credit within long-term bank-firm relationships. It linked payment to performance and provided funds to those who needed them at each stage of the process of production and distribution. It shifted the source of funds along with the collateral from one financial institution to the next along the chain of production and distribution. It mobilized local information, monitoring, and savings in support of a nationwide network of production and distribution. It ensured that financiers who knew the borrowers decided which firms should get loans and at what interest rates. It allowed funds to flow through interbank networks to localities where it would earn the highest return. It facilitated specialization, particularly by providing information to producers and shifting risk from producers to intermediaries who specialized in taking and managing risks and leveraging local information to reduce risks borne at each locality and stage in the production process (note that we discuss and provide examples of each of these advantages in Del Angel and Richardson 2024a).

This system also had weaknesses. While economic growth under this system was rapid, it was also volatile, and the volatility was often associated with financial panics. Widespread bank distress occurred during (and may have exacerbated or triggered) nationwide downturns that began in 1893, 1907, 1913, and 1920. Regional banking crises coincided with regional business downturns on numerous additional occasions (Jalil, 2015; Davison and Ramirez, 2014; Carlson, Mitchener, and Richardson, 2011). The panics of this period are well documented. Many began with events in the financial system, like the panic of 1907, which was triggered by a failed attempt to corner the copper market, or the panic in 1914, which was triggered by the financial fallout in New York from the onset of the First World War in Europe. This fragility of the financial system, where liquidity shortages in some parts of the network triggered bank runs in a broader area, provides one of the instruments that we employ later in our analysis.

3. Data Sources and Patterns

The data used in this essay comes from several sources. This section describes those sources and facts of the data underlying our analysis. It begins by discussing business bankruptcies.

Data on business bankruptcies comes from *Dun's Review*, published by R.G. Dun and Company, a predecessor of today's Dun and Bradstreet Corporation. The papers Richardson and Gou (2011) and Del Angel and Richardson (2024a) introduced this data, describe it in detail, and tabulate it by quarter, state, and branch of business. A companion paper (Del Angel and Richardson 2024b) constructs a data series tabulated by size of firm and net credit position. This essay collates that data with additional information to generate data on bankruptcies for bank-dependent and bank-independent firms. The former were all trading and small manufacturing firms. The latter were large manufacturers.

Dun's collected data on bankruptcies by establishing a reporting network which collected information on court filings in every county in the United States during each month of the year. Dun's defined a business failure as the involvement of a firm in court proceedings which were likely to end in loss to creditors and in most cases involved the liquidation of the organization. Personal bankruptcies of professional individuals such as doctors, dentists, and lawyers were excluded. Failures of railroads and banks were also excluded. The suits that initiated most bankruptcies were filed under the Bankruptcy Act of 1898. A consistent series can be constructed

from the early 1900s to the end of the 1920s. Before and after those dates, the law and the nature of events classified as business bankruptcies differed.

Dun's tabulated data about bankruptcies in several ways. One consistent classification was the division of the data into the sectors of manufacturing and trading. This classification followed rules established by the Census Bureau for conducting the census of business in 1890 and remained consistent through the 1920s. Another consistent classification was the division of the data by the size of the firm. Dun's classified firms by size using liabilities at the date of failure. Large firms had liabilities over $100,000. Small firms had liabilities below $100,000. Dun's provided cross-tabulations indicating bankruptcies of large and small manufacturing firms as well as large and small trading firms. These cross-tabulations form the basis of our analysis since they allow us to identify bankruptcies of bank dependent and independent firms.[1]

The crosswalk between data on business bankruptcy and bank dependence is imperfect, but sufficient for our purposes. Business bankruptcy was reported by Dun's. Dun's differentiated large and small firms using liabilities. The IRS reported information about firms' net credit positions, from which we infer bank dependence. The IRS differentiated large and small firms using net income. Liabilities and net income were correlated, since larger firms had more liabilities as well as higher net incomes. To determine the net credit position of manufacturing and trading firms that Dun's considered large and small, we map Dun's definition into the IRS data. An accounting identity – a firms' liabilities equal its assets – helps us to do this, since the IRS tables that we use report for groups of firms' average net income, bank borrowing, bank deposits, and assets, while tables from *Dun's Review* report for groups of firms' average assets and number of bankruptcies.

Results of this exercise appear in Table 1. Small bankrupt trading firms had a deposit-to-loan ratio of 0.34. All the firms in these categories depended upon banks for credit; they had little ready cash, borrowed heavily from banks, and lacked access to alternative sources of funds. Large bankrupt trading firms also depended on banks for credit. Their average deposit-to-loan ratio was 0.67. Only the dozen largest retailers in the nation clearly operated independent of banks. These

[1] While Dun's Review also tabulated data on bankruptcies by state, region, and branches of business (which were subdivisions of the manufacturing and trading sectors), its definition of branches of business changed over time to reflect changes in Census Bureau definitions. Moreover, it did not report bankruptcies by size cross-tabulated with branches of business, region, or state. So, we cannot determine failures of bank dependent and independent firms by state, region, or branch of business.

firms included mail-order stores including Sears Roebuck and Montgomery Ward and five-and-dime chants like FW Woolworths. These organizations raised funds by issuing common stock, borrowing in bond markets, and retaining earnings. They deposited large sums within but borrowed little from banks. None entered bankruptcy during the era that we study. We confirmed this by checking each corporations' history in Moody's manuals. So, bankruptcy statistics do not reflect their experience.

Statistics for small manufacturing firms resembled those of small trading firms. They had little ready cash, borrowed substantial sums from banks, and lacked alternative sources of funds. Their average deposit-to-loan ratio was 0.34. They clearly relied on banks to finance their operations and could not repay their loans in a short span of time.

Statistics for large bankrupt manufacturing firms reflected the experience of both bank dependent and independent firms. Manufacturers just above Dun's threshold for large firms (i.e. firms with over $100,000 in assets but with net incomes from $5,000 to $50,000) borrowed substantial sums from banks. On average, however, they also issued substantially more bonds and equity than small manufacturing and trading firms. These firms, in other words, frequently borrowed from banks and might have trouble repaying bank loans immediately, but had access to alternative sources of funds. Larger manufacturing firms with higher net profits, however, borrowed much less from banks; firms with net incomes over $100,000 were generally creditors to banks, since on average their deposits in exceeded their borrowing from banks. Overall, we find that one-fifth of the manufacturing firms that Dun's classified as large operated completely independent from banks, while about four-fifths utilized substantial amounts of bank credit, although many of these had access to alternative sources of funds and fixed assets with substantial value.

The data that we examine on bank failures originated with two sources: bank regulators and the financial press. Regulators of state and national banks reported changes in bank status – such as suspensions, mergers, and terminations – to their supervisors, who published these materials periodically. Frequency varied across jurisdictions (e.g. national or a particular state), departments (e.g. Federal Reserve or Comptroller of Currency), and time. The materials most commonly found in modern libraries are regulators' annual reports. The financial press reported many of these events within days of their occurrence in daily publications like the *Wall Street Journal* and *New York Times*. The financial press also compiled information about these events

which was published periodically in volumes such as *Rand McNally Bankers Directory* or *R.G. Dun's Bank and Quotation Record*. During the 1920s and 1930s, the Federal Reserve Board's Division of Bank Operations compiled information from all of these sources to create data on the number of bank suspensions. The Federal Reserve published aggregate tabulations from this endeavor in its monthly bulletin in February 1937. The original information gathered by the Division of Bank Operations resides in the National Archives of the United States. Richardson (2006, 2007, 2008) and Chung and Richardson (2007) recovered this microdata and used it to construct the data series analyzed in this essay. These series consist of counts of failures of banks from regulators original reports that have been checked repeatedly by experts over the intervening decades.

The empirical analysis focuses on the period from 1901 through 1929, because during that period, the procedures for firm bankruptcies and bank liquidations remained stable and to avoid the economic downturn of the Great Depression. In our empirical models we control for inflation and real GNP growth. Monthly inflation was calculated from the Index of the General Price Level for the United States from the National Bureau of Economic Research Macrohistory database. Quarterly real GNP data come from Blake and Gordon (1986).

Table 2 presents summary statistics on quarterly business bankruptcies, bank failures, real GNP growth and inflation for 1901 to 1929. The mean number of bank failures was 66 with a standard deviation of 75. The average number of business bankruptcies was 3,945 with a standard deviation of 1,395. The large standard deviation of both variables reflects the substantial increases in business and bank failures in times of economic and financial distress. Consistent with the facts discussed in Section 2, the average number of bankruptcies of bank independent firms (i.e., large manufacturing firms) was smaller than the average number of bankruptcies of bank dependent businesses (i.e., trading and small firms). Lastly, Real GNP growth had a mean of 0.007 and a standard deviation of 0.026. Inflation had a mean value of 0.002 and a standard deviation of 0.008.

We summarize the chronological relationships between bank failures and business bankruptcies with a simple vector auto regression. This system regresses business failures on bank failures and lags of both bank and business failures, and it also regresses bank failures on business failures and lags of bank and business failures. A Granger causality test on this system indicates that shocks (i.e. sudden increases unexplained by the variables in the system) to business bankruptcies were typically followed by increases in bank failures, while shocks to business

failures were followed less often by increases in bank failures. Figure 1 plots the impulse-response function derived from our estimates on this simple system. This plot demonstrate that sudden surges in bank failures were typically followed by increases in business failures. The next section seeks to more clearly identify the causal relationships underlying this preliminary evidence and stylized facts.

4: Methods and Results

Measuring the relationship between bank resolutions and business bankruptcies is difficult because the phenomena are endogenous and interrelated. The data that we collected, however, provides an empirical lens on this issue. The previous section showed that shocks (i.e. sudden and unexplained increases in bank failures) preceded increases in business failures. This section demonstrates that this correlation was causal by introducing three types of statistical evidence. The first is that bank-failure shocks preceded substantial increases in failures of bank-dependent but not bank independent business. The second is two-stage regressions that identify exogenous bank failures using instruments that leading scholars have recently used to identify exogenous shifts in bank distress in this period. These instruments include banking panics (as in Jalil 2015) and declines in bank equity prices (as in Baron, Verner, and Xiong, 2022). These instruments demonstrate that failures of bank dependent but not bank independent firms increased substantially after exogenous increases in bank failures. The third is standard time-series identification techniques that identify causal pathways using ordering assumptions implied by the structure of Progressive-Era banking system. All these techniques yield the same qualitative and similar quantitative conclusions.

To estimate bank failures' impact on bankruptcies of bank-dependent firms (BD) and bankruptcies of bank-independent firms (BI), we employ the local projection approach of Jordà (2005). To obtain stationary data and remove seasonality, we difference non-stationary variables by subtracting the value of the variable 12 months prior from the value of the variable at time t.

We implement this approach by estimating a standard set of linear projections which are summarized by equation 1:

$$\Delta y^{d}_{t+h} = \alpha_h + \beta_h \Delta Bank\ Failures_t + \gamma_h \Delta y^{j \neq d}{}_{t-l} + \Gamma_h X_{t-l} + \epsilon_{t+h} \qquad (1)$$

where t indicates the time. h = 0,…,6 indexes the current and six future quarters. $d = \{\text{BD}, \text{BI}\}$ indicates the type of business. BD denotes businesses that depend upon banks for credit. BI indicates business that do not. Δy_t^d is the 12-month difference of business bankruptcies of type d firm in quarter t. $\Delta Bank\ Failures_t$ is the 12-month difference of bank failures in quarter t. $\Delta y_{t-l}^{j \neq d}$ is a vector of lags of the 12-month difference of business bankruptcies of firm type j, where l denotes lag length. X_{t-l} is a vector of explanatory variables that includes lags of $\Delta y^d, \Delta Bank\ Failures$, real GNP growth, and inflation.

We include lags of real GNP growth and inflation to control for measures of aggregate economic activity. We estimate equation (1) using OLS and Newey-West standard errors that correct for heteroscedasticity and serial correlation. The number of lags l is chosen based on Akaike Information Criterion (AIC). The coefficients of interest are β_h that denote the response of business bankruptcies to bank failures.

Figure 2 shows the time paths of responses of the different types of business bankruptcies to bank failures, the coefficients $\hat{\beta}_h$ from estimating equation 1. Table 3 reports the corresponding coefficients and standard errors for h=0,.3. Panel A of Figure 2 and Table 3 show that bank failures have a positive and significant effect on all types of business bankruptcies three quarters after the shock. The peak effect of bank failures occurs at h=2. A one unit increase in the 12-month difference of bank failures increases the 12-month difference of business bankruptcies by 5.86. Panel B of Figure 2 plots the impulse response functions for trading and manufacturing firms. There is a significant and positive impact of bank failures on both types of firms. The effect of bank failures on trading business bankruptcies, however, is considerably larger than the effect on manufacturing firms. For instance, at h=2, the effect on trading firms is 3.45 (5.35/1.55) times larger than the corresponding effect on manufacturers.

The description of Progressive-Era commercial credit cycle in Section 2 suggests a reasonable interpretation of these results. Bank failures led to the failure of bank-dependent firms because banks struggling to come up with cash to satisfy depositors' withdrawal requests did so at least in part by compelling business borrowers to repay, either by calling loans that could be called or refusing to roll over loans that came up for renewal. These demands for repayment rapidly impacted most of bank-dependent customers since most business lending was callable or up for renewal within six months.

Once a bank failed, the receivers in charge with winding up the banks' affairs would swiftly step in to compel repayment of outstanding loans. Their legal duty was to depositors; they had no legal authority or incentive to help the businesses that had borrowed from the bank they were liquidating, and they could not renew loans that came due. Receivers requested repayment of funds on the date due and sued borrowers that did not repay promptly. If the value of these suits exceeded $5,000, they had to be filed in bankruptcy court. Since most loans came due within six months or less, the suits triggered by the failure of a bank should appear on court dockets (and in our statistics) within six months, which is the pattern we observe in the data.

The impact of banks failures was larger for trading firms because trading firms on average borrowed more from banks than manufacturing firms. Trading firms also kept less cash on their balance sheets. Trading firms paid out most of their profits, accumulated little equity, and other than inventory, had few assets with substantial value. So, they had few financial reserves and less ability to withstand banks (and receivers) sudden demands for cash. The effect on manufacturers was smaller because manufacturers on average kept more cash on hand. They also typically possessed valuable assets (like manufacturing equipment) and substantial equity which they could use as collateral to borrow from new banks when their old lender ran into trouble.

Panel C of Figure 2 plots the impulse response functions for small and large firms. The response of small firms to bank failures are approximately twelve to twenty-seven times bigger than the responses of large firms. Small firms, typically turned to banks for access to credit, so when banks failed, they lost access to funding, so they also failed. Large firms did not depend upon bank credit, because they had access to equity, debt, and retained earnings. Also, larger firms tended to be creditors of banks, holding deposits in excess of outstanding debts. Therefore, the effect of bank failures on large firms was relatively small in contrast to the large effect on the small bank-dependent firms.

Panel D of Figure 2 shows the results for creditors composed only by large manufacturing firms and debtors that include trading firms and small manufacturers. Bank failures had a very small and weak effect on creditors. The responses of creditors to bank failures are not significantly different from zero at the 5% level after one quarter after the shock. On the other hand, the impulse response function of debtors indicates that bank failures had a large and significant effect on bankruptcies of bank-dependent firms. At horizon h=2, the effect on debtors is approximately 55 times larger (7.71/0.14) than the corresponding effect on creditors. Overall, this evidence shows

that increases in the number of bank failures increased bankruptcies of bank-dependent firms and had a small and weaker effect on bankruptcies of firms that did not depend upon banks for access to credit.

Given the structure of the economy, it is possible that business bankruptcies, especially of creditors, may have led to bank failures, giving rise to a problem of reverse causality. To correct for potential reverse causality from bankruptcies of creditors and debtors to bank failures, we use the Local Projections Instrumental Variable (LP-IV) approach proposed by Jordà (2005). To estimate the dynamic causal effect of bank failures on business bankruptcies, we estimate equation 2:

$$\Delta y^{i}_{t+h} = \omega_h + \varphi_h \Delta \widehat{Bank\ Failures}_t + \vartheta_h \Delta y^{j\neq i}{}_{t-l} + \Upsilon_h X_{t-l} + \xi_{t+h} \quad (2)$$

where $\Delta \widehat{Bank\ Failures}_t$ denotes the fitted values of *Bank Failures* from the first-stage regression:

$$\Delta Bank\ Failures_t = \delta + \vartheta Z_t + \Pi_h X_{t-l} + \varepsilon_t \quad (3)$$

Z_t is a vector of instruments and X_{t-l} is a vector that includes lags of real GNP growth, inflation, and the 12-month difference of Bank Failures and Business Bankruptcies. The instrument Z_t needs to satisfy the following conditions:

1. $Relevance$: $\mathbb{E}[Z_t \Delta Bank\ Failures_t] \neq 0$ (4)
2. $Contemporaneous\ exogeneity$: $\mathbb{E}[Z_t \varepsilon_t] = 0$ (5)
3. $Lead - lag\ exogeneity$: $\mathbb{E}[Z_t \varepsilon_{t+h}] = 0 \quad for\ all\ \ h = \pm 1, \pm 2 \ldots$ (6)

We employ two instruments introduced by other scholars. The first is banking panics identified by Jalil (2015). Jalil (2015) dates national and regional banking panics using data drawn from newspapers. His narrative analysis identifies exogenous panics and determines their impact on economic activity. From Jalil's data, we construct one binary instrument indicating the timing of exogenous banking panics that occurred during the period of our study.

The second is a nonfinancial equity returns index based on Baron, Verner, and Xiong, (2022). The basis of this instrument is the finding that prior to World War II swings in bank equity preceded and precipitated banking crises. A portion of the variation in equity was driven by exogenous booms and busts in the aggregate stock market. The booms and busts in the United States were driven in part by unanticipated international events, like declarations of war and discoveries of resources particularly gold, copper, and oil, and in part by animal spirits, such as the great equity boom of the Roaring 20s. We use lagged values on non-financial equity returns

that predicted changes in the value of bank capital which often preceded and occasionally precipitated banking crises.

As an initial empirical test, Figure 3 and Table 4 show the time paths of responses of bank failures to bankruptcies of creditors and debtors using local projections. The responses of bank failures to bankruptcies of debtors are close to zero, and only significant up to the one-quarter horizon. The responses of banks failures to bankruptcies of creditors are large and significant. At horizon h=1, the effect of creditors is approximately 46 times larger (0.93/0.02) than the corresponding effect of debtors. This evidence suggests there was a feedback effect between creditors and bank failures.

The results based on estimating equation 2 with LP-IV are shown in Figure 4. Consistent with the previous evidence, the effect of bank failures on creditors is small and close to zero, while the effect on debtors is large. The second stage coefficients are larger than the corresponding OLS estimates, and the relative magnitude of the responses of debtors and creditors remains large. Tables 5 and 6 report the first stage HAC F-statistics which are above the conventional critical value of 10, illustrating that our instruments are not weak.

A series of statistical exercises confirm the robustness of our results. The first robustness check is to use vector autoregressions (VAR) instead of local projections. VARs recover results similar results to our estimates. The second robustness check is to include data on other factors that may have influenced commercial bank. This includes reserve bank policy rates, open-market commercial lending rates, international trade flows, and international gold flows. Our results are robust to the inclusion of these variables (results are available upon request and documented in our replication files).

5. Discussion

A clear chronological correlation existed between failures of banks and bankruptcies of firms in the Progressive Era. After bank failures increased, business failures also increased. That pattern was recognized by observers at the time and scholars afterwards. Our research design illuminates the mechanism underlying that correlation and corroborates claims about the direction of causality. We show that failures of banks triggered failures of firms that borrowed funds from banks. These statistical findings substantiate the suppositions that intermediation in the face of adverse selection is one of the principal services that banks provide to the economy and that one of the principal ways that financial crises and lenders-of-last resort influence economic activity is through a bank-lending channel.

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Table 1. Bank Dependency and Business Bankruptcies

Sector	Size	#	Assets		Deposits		Loans		Deposits/ Loans	Percent Bank Dependent
			Total $ mil.	Avg. $,000	Total $ mil.	Avg. $,000	Total $ mil.	Avg. $,000		
Trading	Small	42,881	2,731	63.7	145	3.4	428	10.0	0.34	100%
	Large	22,867	12,317	538.6	846	37.0	1,258	55.0	0.67	100%
Manufacturing	Small	26,042	2,115	81.2	98	3.8	287	11.0	0.34	100%
	Large	25,808	50,802	1,968.5	3,108	120.4	2,195	85.1	1.42	82%
Large & income < $100k		21,063	8,449	401.1	445	21.1	752	35.7	0.59	
Large & income > $100k		4,745	42,353	8925.8	2,663	561.2	1,443	304.1	1.85	

Notes: $ mil. Indicates millions of dollars. Bank dependence defined in text. Dependent 100% indicates all firms in group were dependent upon banks for credit. Less than 100% indicates that some banks in the group depended upon banks while others operated independent of banks. Large & income < $100k indicates large manufacturing firms with annual income under $100,000. Large & income > $100k indicates large manufacturing firms with annual income over $100,000.

Source: IRS (1926), Dun's Review (various issues), Del Angel and Richardson (2024a).

Table 2. Summary Statistics for Principal Variables, 1901-1929

Variable	Obs.	Mean	Std. Dev.	Min	Max
Bank Failures	116	66	75	1	364
Business Bankruptcies	116	3,945	1395	551	7517
Large Business Bankruptcies	116	100.5	62	12	306
Small Business Bankruptcies	116	3,845	1346	539	7211
Manufacturing Business Bankruptcies	116	981	333	150	1604
Trading Business Bankruptcies	116	2,774	1005	354	5508
Large Manufacturing Business Bankruptcies	116	52	29	8	122
Trading and Small Manufacturing Business Bankruptcies	116	3,703	1299	495	6971
Real GNP Growth	116	0.007	0.026	-0.06	0.08
Inflation	116	0.002	0.008	-0.03	0.03

Table 3. Effect of Bank Failures on Business Bankruptcies, 1901-1929

	(1) Quarter 0	(2) Quarter 1	(3) Quarter 2	(4) Quarter 3
A. Business Bankruptcies				
Bank Failures	3.29**	5.51***	5.86***	4.85**
	(1.43)	(2.05)	(1.90)	(2.43)
N	110	109	108	107
B. Small Business Bankruptcies				
Bank Failures	2.77**	4.31**	4.63***	4.43***
	(1.14)	(1.69)	(1.39)	(1.51)
N	110	109	108	107
C. Large Business Bankruptcies				
Bank Failures	0.23***	0.19**	0.17**	0.06
	(0.07)	(0.09)	(0.08)	(0.08)
N	110	109	108	107
D. Trading Business Bankruptcies				
Bank Failures	3.25***	4.84***	5.35***	3.55*
	(0.96)	(1.71)	(1.59)	(1.95)
N	110	109	108	107
E. Manufacturing Business Bankruptcies				
Bank Failures	1.22***	1.55***	1.55***	1.03*
	(0.43)	(0.49)	(0.51)	(0.58)
N	110	109	108	107
F. Debtors Bankruptcies				

Bank Failures	4.75***	7.71***	7.54***	4.45
	(1.33)	(2.35)	(2.26)	(2.85)
N	108	107	106	105
G. Creditors Bankruptcies				
Bank Failures	0.15**	0.14*	0.11	0.07
	(0.06)	(0.07)	(0.07)	(0.07)
N	108	107	106	105

Notes: Newey West standard errors clustered by date in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4. Effect of Business Bankruptcies on Bank Failures, 1901-1929

	(1) Quarter 0	(2) Quarter 1	(3) Quarter 2	(4) Quarter 3
A. Bank Failures				
Creditors Bankruptcies	0.65***	0.93***	0.81***	0.64**
	(0.19)	(0.23)	(0.27)	(0.26)
B. Bank Failures				
Debtors Bankruptcies	0.03***	0.02***	0.02	0.01
	(0.01)	(0.01)	(0.01)	(0.01)
N	108	107	106	105

Notes: Newey West standard errors clustered by date in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 5. Local Projection IV Using Baron's Instrument

	(1)	(2)	(3)	(4)
	Quarter 0	Quarter 1	Quarter 2	Quarter 3
A. Debtors Bankruptcies		Second Stage		
Bank Failures	22.7***	55.8***	55.6***	28.8**
	(4.0)	(13.6)	(10.9)	(14.0)
B. Creditors Bankruptcies				
Bank Failures	1.3***	1.2***	1.2***	0.4**
	(0.3)	(0.2)	(0.2)	(0.2)
Ratio Debtor/Creditor	17.46	46.5	46.3	72
		First Stage		
Lagged Non-Financial Equity Return	-163.4***	-163.0***	-163.9***	-158.0***
	(26.4)	(26.4)	(25.9)	(27.4)
Lagged Bank Equity Return	-52.0	-44.6	-43.1	-192.6
	(76.8)	(79.5)	(81.5)	(171.2)
F-stat HAC	24.3	24.6	25.0	19.8
N	111	110	109	108

Notes: Newey West standard errors clustered by date in parentheses. *** p<0.01, ** p<0.05, * p<0.1

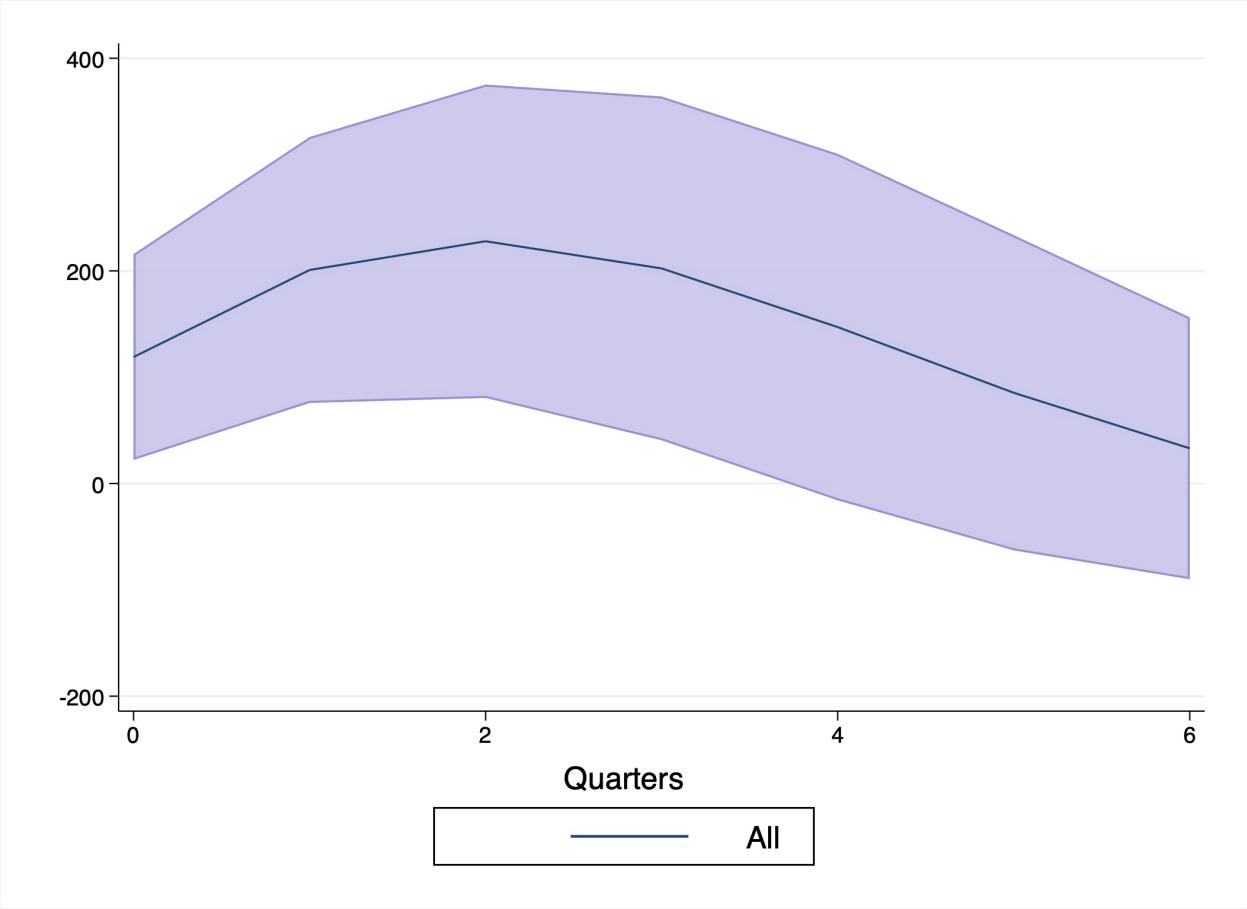
Table 6. Local Projections IV Using Jalil's Instrument

	(1) Quarter 0	(2) Quarter 1	(3) Quarter 2	(4) Quarter 3
A. Debtors Bankruptcies		Second Stage		
Bank Failures	13.5***	20.5***	18.1***	9.1*
	(2.3)	(5.5)	(5.1)	(5.2)
B. Creditors Bankruptcies				
Bank Failures	0.6***	0.6***	0.4***	0.3**
	(0.2)	(0.2)	(0.1)	(0.2)
Ratio Debtors/Creditors	22.5	34.2	45.3	30.3
		First Stage		
Panics	47.5***	47.6***	57.6***	56.6***
	(5.8)	(5.8)	(5.1)	(4.8)
F-stat HAC	66.8	66.1	127.3	141.2
N	108	107	106	105

Notes: Newey West standard errors clustered by date in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Figure 1. Effect of Bank Failures on Business Bankruptcies, 1901-1929

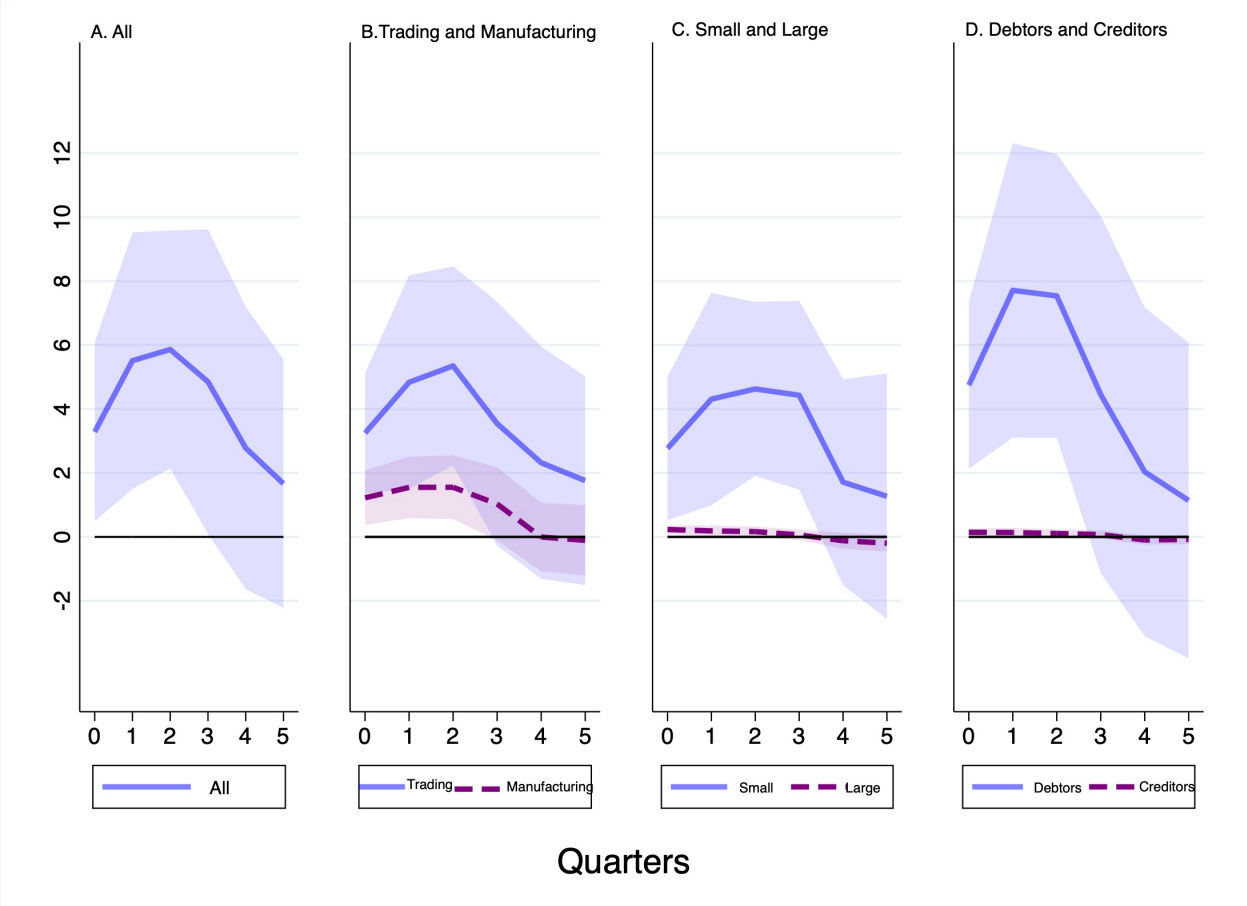
VAR



Source: See text. Note: Shaded regions indicate 95% confidence intervals.

Figure 2. Effect of Bank Failures on Business Bankruptcies, 1901-1929

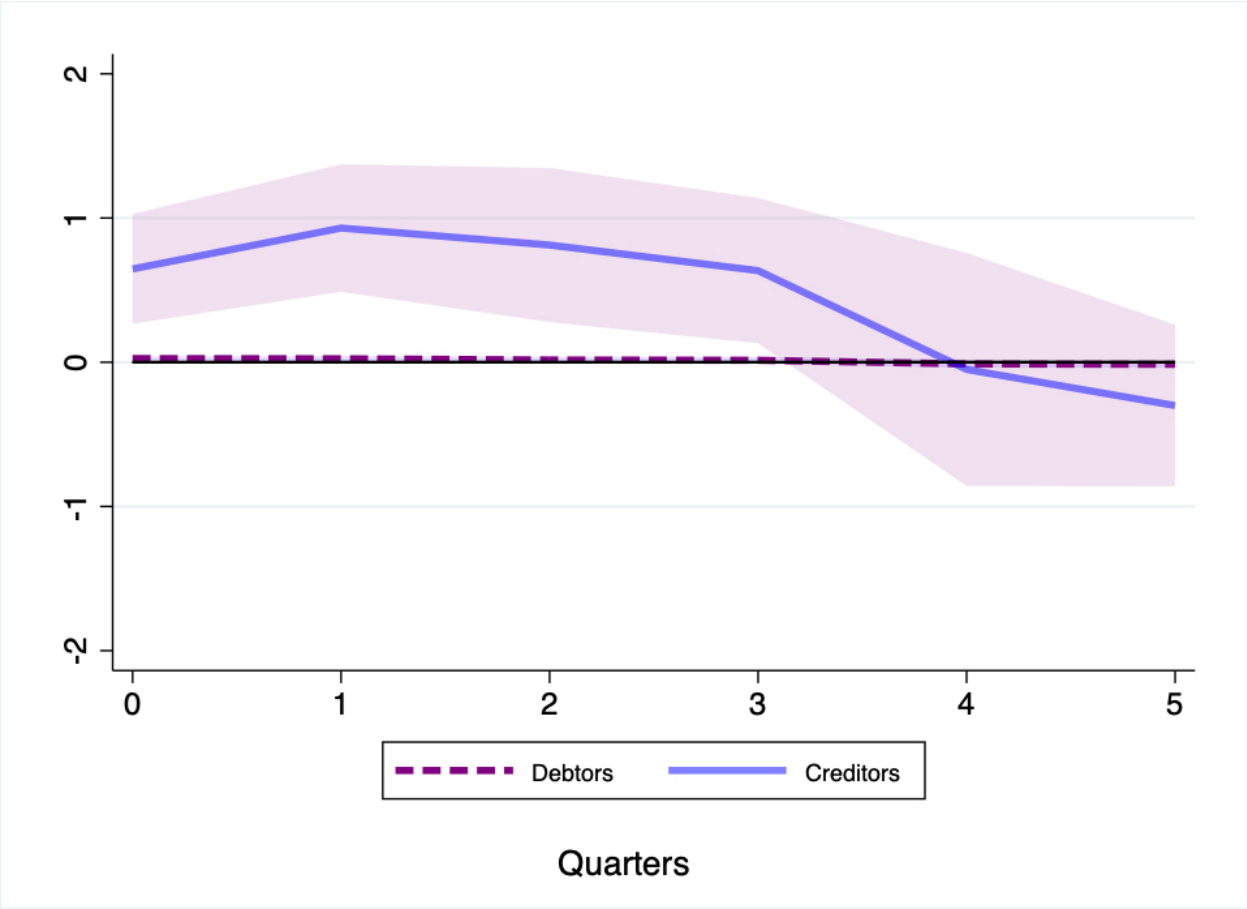
Local Projections



Source: See text. Note: Shaded regions indicate 95% confidence intervals.

Figure 3. Effect of Business Bankruptcies on Bank Failures, 1901-1929

Local Projections



Source: See text. Note: Shaded regions indicate 95% confidence intervals.

Figure 4. Effect of Bank Failures on Business Bankruptcies, 1901-1929

Local Projections IV

Source: See text. Note: Shaded regions indicate 95% confidence intervals.