Monetary Intervention Mitigated Banking Panics During the Great Depression

Quasi-Experimental Evidence from the Federal Reserve District Border in Mississippi, 1929 to 1933

Abstract

The Federal Reserve Act of 1913 divided Mississippi between the 6th (Atlanta) and 8th (St. Louis) Federal Reserve Districts. Before and during the Great Depression, these districts' policies differed. The Atlanta Fed championed monetary activism and the extension of credit to troubled banks. The St. Louis Fed adhered to the doctrine of real bills and eschewed expansionary initiatives. Outcomes differed across districts. In the 6th District, banks failed at lower rates than in the 8th District, particularly during the banking crisis in the fall of 1930. The pattern suggests that discount lending reduced failure rates during periods of panic. Historical evidence and statistical analysis corroborates this conclusion.

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Banks failed throughout the Great Depression. Their demise contributed to the disruption

of financial intermediation, contraction of monetary aggregates, and decline in aggregate demand

that spawned the deepest downturn in American history (Benjamin Bernanke, 1983; Milton

Friedman and Anna Schwartz, 1963; Christina Romer, 1993; Peter Temin, 1989). The Federal

Reserve did little to stem the falling tide. It failed for many reasons. Its leaders adhered to

outdated doctrines and monitored misleading indicators of monetary conditions (Allan Meltzer,

2003). The gold standard fettered mechanisms of monetary policy (Barry Eichengreen, 1992).

The Board of Governors lacked leadership and could not coordinate policies amongst its

disputatious districts (David Wheelock, 1991).

Even if the Federal Reserve had tried to alleviate the banking crisis, no clear evidence exists

that it could have helped depository institutions. Two schools of thought exist on this issue. One

school believes the principal causes of banking crises were withdrawals of deposits, illiquidity of

assets, and the Federal Reserve's reluctance to act. The Fed could have alleviated banking problems

by acting as a lender of last resort (Friedman and Schwartz, 1963; Elmus Wicker, 1996). The

second school concludes that banks failed because the economy contracted. Asset prices fell. Loan

default rates rose. Banks became insolvent, continuing a process of liquidation and consolidation in

the banking industry that began during the 1920s. In such circumstances, the Fed could not aid

banks by injecting liquidity into the banking system (Temin, 1976; Charles Calomiris and Joseph

Mason, 2003).

These opposing views coexist for several reasons. One is methodological. None of the

studies directly measures the effects of monetary policy. All infer the Fed's ability to influence the

banking system indirectly, by analyzing correlations between bank failures and economic activity

which in theory should shed light on the issue. Another reason the debate continues is differences in

data sources. Friedman and Schwartz (1963) analyze data on bank suspensions aggregated at the

national level. Their successors scrutinize similar series at lower levels of aggregation, or disaggregated data consisting of samples of national banks, or panels of banks from within individual cities, states, or Federal Reserve districts. The most recent and comprehensive work (Calomiris and Mason, 2003) analyzes a panel of data for all Federal Reserve member banks. Future research, Calomiris and Mason (2003, p. 1639) indicate, should analyze data on all banks, multiple measures of financial distress (such as suspensions and liquidations), and multiple channels of contagion (such as bank runs and correspondent linkages).

Even with such data, analyzing the impact of Federal Reserve policies would be difficult. At the national level, Fed policies were endogenous reactions to ongoing economic events. Changes in Fed policies often coincided with changes in fiscal, tariff, and regulatory policies and with shocks to the economy for which data is insufficient or nonexistent. At the district level, the boundaries of Federal Reserve Districts coincided in most cases with state borders. States changed policies throughout the depression, often at the same time and occasionally in reaction to actions of the Federal Reserve. Economic shocks also differed across states. The endogeneity of policies, simultaneous changes in multiple policy dimensions, and the spectrum of unobserved impede efforts to attribute differences in outcomes to differences in policies. When observed, correlations between outcomes and policies might have been caused by phenomena for which investigators cannot control.

In such circumstances, quasi-experimental econometric strategies have become increasingly popular. The task is to find a group of banks that operated in a single regulatory and economic environment but which were exposed to different Federal Reserve policy regimes. Comparing outcomes across regimes yields insights free from problems of inference inherent in traditional analysis. The obvious place to seek such a group is along the Federal Reserve district borders. Borders occasionally divided states. Mississippi is an example. Its northern half lay within the 8th

Federal Reserve District (St. Louis). Its southern half lay within the 6th Federal Reserve District (Atlanta). The two districts' policies differed dramatically early in the depression. St. Louis was a staunch advocate of non-intervention. Atlanta was a leading advocate of assisting banks in need. The St. Louis and Atlanta Feds applied their different policies to the portions of Mississippi lying within their jurisdictions. The adoption of these policies preceded the onset of the depression, and had little to do with circumstances in Mississippi, which was a small and peripheral portion of each Federal Reserve district, and much to do with the philosophies and experiences of the leadership of the two banks. Thus, the application of Federal Reserve policies to Mississippi possessed the characteristics of an exogenous policy experiment.[1]

This essay analyzes the impact of Federal Reserve policies in the Mississippi case. Section 1 describes the data that we analyze. Section 2 examines the historical and economic justification for employing quasi-experimental methods. Section 3 describes our methods and results. Our analysis progresses through three stages. The first is a non-parametric examination of the building blocks of duration analysis: survival and hazard functions. The second is a parametric analysis of our panel of data. The third is a series of robustness checks. These methods directly address key questions concerning the collapse of the banking system during the early 1930s. Did Federal Reserve policies

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[1] Mississippi possesses advantages over all other candidates for quasi-experimental analysis. The principal proponents of monetary activism were the 2nd (New York) and 6th (Atlanta) districts. They shared within-state borders with the 8th (St. Louis), 3rd (Philadephia), and 1st (Boston) districts, which at the onset of the depression adhered to the doctrine of real bills. The 6th/8th district border divided Mississippi along a line of latitude into regions of equal size with similar industrial, agricultural, and demographic environments. In contrast, the 6th/8th district border in Tennessee separated regions with distinct industries and agricultures and which experienced different shocks during the downturn. The collapse of Caldwell and Company, which initiated the first banking panic of the depression, occurred in the 6th District's section of the state. Similar concerns complicate analysis along the borders of the 2nd district. The 1st/2nd district border in Connecticut and the 2nd/3rd district border in New Jersey separated the commercial and industrial suburbs of New York City from the rest of each state. It may be difficult to determine whether differences in outcomes along those borders were due to Federal Reserve policies or New York City effects. In addition, the unit-banking system in Mississippi was widely representative of the type of banks which failed in large numbers during the early 1930s, and as the last section of this essay discusses, the small-to-medium sized banks which predominated in Mississippi were the type which throughout the nation played the largest role in transmitting financial panics, depositors' behavior, and monetary policy to the real economy. The experience of banks in New York (state, city, and metropolitan area), where failure rates were low and uncorrelated across time and institutions, was not representative of banks in the rest of the nation.

influence bank failure rates? Did monetary intervention mitigate banking panics? Did providing liquidity to the banking system (or credibly committing to provide liquidity) reduce rates of suspension and liquidation? To each question, the answer is yes.

Section 4 discusses the implications of our analysis. By injecting liquidity into the banking system, particularly during the banking panic in the fall of 1930, the Federal Reserve Bank of Atlanta reduced bank failure rates. If other Federal Reserve Banks had pursued similar strategies, fewer banks would have failed, and the course of the depression may have been different.

1. Data Sources

The extant evidence is insufficient for the investigation of events in Mississippi. The *Biennial Report of the Banking Department of the State of Mississippi* lacks information on individual institutions. No published data distinguishes banks lacking liquidity from banks suffering insolvency or banks that suspended payments temporarily from those which closed permanently. No scholarly study elucidates the policies pursued by the Federal Reserve Bank of Atlanta. No scholarly study describes the banking panics which struck Mississippi.

An array of sources, however, provides the essential information. The *Rand McNally Bankers' Directory* describes individual banks. Details include balance sheet data, correspondents, Federal Reserve membership, and dozens of other bank characteristics. Rand McNally published biennially in July and January. Information for Mississippi state banks appears to have been updated in June annually. Observations drawn from the July issue, therefore, provide a panel of annual observations on state and national banks at their spring calls. Table 1 and 2 recapitulate this information. The former indicates the number of banks in operation during the depression. The latter presents summary statistics for individual bank characteristics.

Data on economic conditions comes from several sources. The United States Censuses of Agriculture, Manufacturing, and Population provide data on the characteristics of counties. Summary statistics appear in Table 3. *Bradstreet's Weekly*, *Dun's Review*, *The Commercial and Financial Chronicle*, the *Federal Reserve Bulletin*, and the *Annual Reports* of the Federal Reserve Board and the Federal Reserve Banks provide information on building permits, business failures, commodity prices, interests rates, and price and production indices.

The archives of the Federal Reserve Board of Governors provide additional information. Form St. 6386b reports individual bank suspensions and their causes. Form St. 6386c reports changes in bank status such as reopenings of suspended banks and voluntary liquidations, a category of closures in which banks ceased operations and arranged to repay depositors the full value of their deposits without the intervention of courts or receivers.[2] This evidence distinguishes between temporary and permanent closures of banks. In the banking lexicon of the 1930s, a *suspension* occurred when a bank closed its doors to the public for the opening of at least one business day, whether or not the bank reopened for business at some time in the future. *Liquidations* were the subset of suspensions where insolvent banks permanently ceased operations, surrendered charters, sold assets, and repaid creditors to the greatest extent possibly usually under the auspices of a court appointed officer called a receiver.

From these sources, we construct a data panel consisting of all banks that operated in Mississippi between July 1929 and July 1933. Our panel contains standard information about bank characteristics and economic conditions and novel information such as multiple measures of financial distress (such as suspensions and liquidations), multiple paths of contagion (including correspondent linkages and runs on banks), factors fundamental to the performance of the national

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[2]   These records reside in Record Group 82, Central Subject File of the Federal Reserve Board of Governors, 1913-1954, National Archives and Records Administration, College Park, Maryland. For detailed descriptions of this archival evidence, see Richardson (2004 and 2006).

economy and particularly pertinent to Mississippi (such as levels of farm indebtedness and the condition of the cotton crop), and measures of Federal Reserve policy regimes.

To determine the policy regimes of the Atlanta and St. Louis Federal Reserve Banks, we examine a wide variety of historical sources. The archives of the Board of Governors contain correspondence between the Board, the Atlanta Fed, and the St. Louis Fed which describes the actions and illuminates the intentions the two districts. So does Richard Gamble's in-house history of the Atlanta Fed (1989) and articles in depression-era newspapers and periodicals.

Two independent sources enable us to determine the dates and the nature of Mississippi's banking crises. The first source is data collected by the Board of Governors' Division of Bank Operations on Form St. 6386b, which indicates when runs struck banks. The second is articles published in seven newspapers during three periods (i) September 1, 1930 through March 31, 1931, (ii) September 1, 1931 through December 31, 1931, and (iii) November 1, 1932 through March 31, 1933. The newspapers include three of the most prominent in Mississippi, the Meridian Star, Vicksburg Herald, and Vicksburg Sunday Post-Herald; the leadings papers from the headquarters' cities of the 6th and 8th Federal Reserve Districts, the Atlanta Journal, St. Louis Globe-Democrat, and St. Louis Post-Dispatch; and the New York Times.

2. Historical Background

Our quasi-experimental approach relies upon three facts. First, when the depression began, the policy regimes of Atlanta and St. Louis Federal Reserve Banks differed, and those differences were exogenous to the state of Mississippi and events occurring at the time. In the summer of 1931, the St. Louis Fed reformulated its policy regime, and thereafter, its actions resembled those of the Atlanta Fed. Second, bank suspensions in Mississippi surged on three occasions, and the nature of those surges differed. During the panic which began in December 1930, depositors withdrew funds

from all banks *en masse*. During the crises in the fall of 1931 and winter of 1933, depositors

withdrew funds from some, but not all, banks after shocks to fundamentals temporarily confused

depositors about the solvency of depository institutions. Third, Mississippi was economically

homogenous, particularly in counties adjacent to the Federal Reserve district boundary.

2.1   Policy Regimes of 6th and 8th Districts

Friedman and Schwartz (1963) pioneered efforts to identify Federal Reserve policy regimes

by analyzing historical documents. Scholars who have followed in their footsteps have named their

method the *narrative historical approach*. Principal proponents of the method, Christina and David

Romer, emphasize the importance of establishing clear criteria for identifying policy regimes,

particularly during the interwar era, when there was wide "variation in monetary institutions, in the

theoretical framework adhered to by central bankers, and in the particulars of important monetary

episodes (C. Romer and D. Romer, 1989)." Since our essay focuses on bank failures, we define

policy regimes in terms of a Federal Reserve district's philosophies, plans, and rules regarding the

extension of aid to troubled banks and concerning whether and how to intervene during banking

panics. In our case, the identification of these regimes is simplified by the stability of the leadership

of the 6th Federal Reserve District from the founding of the Federal Reserve until the reorganization

of the system during the Roosevelt Administration.

In the spring of 1913, the organizing committee of the Federal Reserve System split the state

of Mississippi into nearly equal portions. Counties lying north of 35 degrees latitude became a part

of the 8th District. Counties lying south of that line became a part of the 6th District. Banks located

in one district could petition to be placed under the jurisdiction of different districts. A few banks in

central Louisiana took this opportunity to shift from the 8th to the 6th District, after it established a

branch in New Orleans. However, no banks in Mississippi requested a transfer in either direction (Gamble, 1989, p. 5).

Since its inception, the Federal Reserve Bank of Atlanta adhered to a doctrine known as Bagehot's Law. This rule required that during financial panics, central banks should act as lenders of last resort and extend credit to all financial institutions, and if necessary, to merchants and firms. Such lending should be substantial enough to enable solvent but illiquid institutions to survive deposit losses, and thus, to prevents runs from driving healthy banks into insolvency.[3] Prior to the stock market crash in October 1929, the Atlanta Fed faced four situations when it could employ such policies. In 1920, a cotton price bubble burst, triggering financial panics throughout the South. In 1926, rumors triggered runs on banks in Cuba, where the Atlanta Fed operated a branch office. In the spring of 1929, an infestation of Mediterranean fruit flies crippled crops in central Florida, triggering runs on banks in Tampa which threatened to spread throughout the state. In September 1929, bank runs once again swept Cuba. In each instance, the Atlanta Fed rushed large quantities of cash to the afflicted region, extended emergency loans to member banks, helped member banks extend credit to their country clients, and returned the situation to *status-quo ex-ante*.

During the twelve months following the stock market crash in October 1929, rates of bank failure resembled those that had prevailed throughout the previous decade. In November 1930, however, Caldwell and Company failed in Nashville, Tennessee. The firm controlled one of the largest banking chains in the South, and its principal affiliates, the Bank of Tennessee, held deposits from hundreds of institutions. When reports of the incident reached Atlanta, the Governor of the Federal Reserve Bank of Atlanta, Eugene Black, and two cashiers rushed to the scene to help the

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[3]   Bagehot's Law is named after Walter Bagohot, one of its earliest and most influential advocates. His classic explication of the doctrine appears in *Lombard Street* (Bagehot 1873).

Federal Reserve branch in Nashville supply currency and credit to banks in the city and surrounding region. Two days later, runs began on banks in Knoxville. Deposits in each of the three largest institutions, the Holston-Union Bank, City National Bank, and the East Tennessee National Bank, fell by $500,000 in an afternoon, forcing the banks to invoke the thirty day clause on certificate holders and savings depositors. One of Atlanta's cashiers rushed to Knoxville, while Eugene Black endeavored "to aid the Knoxville situation in any way that [he] could" and "keep the Nashville situation in check." In a report to the board on November 14, Black wrote that

> We are shipping sums to these two banks [City National and East Tennessee
> National] in Knoxville which will be adequate for any demand made upon them and
> I am hopeful that the situation there has been relieved (Gamble, 1989, p. 20).

Caldwell's collapse had repercussions throughout the surrounding region. Suspension rates rose rapidly in states, such as Arkansas, with banking chains linked to the Caldwell conglomerate.

As the 6th District endured the onslaught following Caldwell's collapse, it acted everywhere as it had in the past. It rushed cash in large quantities to banks undergoing runs. It extended credit to member banks as quickly and substantially as possible and helped them extend loans to their correspondents and clients. During the first three weeks of the Caldwell crisis, discounts to member banks increased by $2,800,000. Total Federal Reserve credit to member banks increased by more than $8,100,000 (Wicker, 1996, p. 54).

From December 1932 to March 1933, as the national banking system careened towards collapse, the Atlanta Fed repeated this performance, and advanced funds to "member banks on any asset having value (Gamble, 1989, pp. 22-23)." At that time, as they had throughout the contraction, the leaders of the Federal Reserve Bank of Atlanta advocated Bagehotian doctrines. The Governors of the Atlanta and New York Federal Reserve Banks, Eugene Black and George Harrison, "were the only Reserve Bank governors who advocated significant open-market purchases during the depression (Wheelock, 1991, p. 97; see also Meltzer 2003 p. 293)." Black's insistent advocacy of

expansionary initiatives eventually won the ear of Congress and the President, who appointed Black chairman of the Federal Reserve Board of Governors in 1933.

The policies and philosophies of the Federal Reserve Bank of St. Louis were far different. During the panic following the collapse of Caldwell, the St. Louis Fed did not rush to extend loans and may have slowed their disbursement by more stringently monitoring the quality of paper submitted for rediscounting. During the first three weeks of the crisis, discounts to member banks in the 8th District declined by $2,100,000. Total Federal Reserve credit to member banks in the 8th District declined by more than $11,800,000 (Wicker, 1996, p. 54). The St. Louis bank was one of only three Reserve banks – including Chicago and Cleveland – which "thought that discount rates should be held above market rates (Caroline Whitney, 1934, p. 68)."

The St. Louis Fed's reluctance to extend credit to banks or increase the monetary base, either through open-market purchases or the discount window, "stemmed from a fundamental Real Bills view that the supply of credit should contract during recessions" since a lower level of economic activity required less credit to sustain it (Wheelock, 1991, pp. 53, 111). According to this doctrine, occasional depressions weeded out inefficient firms, moderated wages, and cleansed the capitalist system. Excessive credit expansion generated fears of inflation and uncertainty about interest rates which deterred business investment and retarded economic activity. For this reason, the directors "opposed reductions in discount rates and other actions [which would] retard the necessary process of liquidation (Lester Chandler, 1971, p. 142)." The St. Louis Fed retained this hard line position throughout the first 18 months of the depression.

Attitudes changed, however, during the summer of 1931. In July, the St. Louis Fed ceased to oppose intervention and eased restrictions on discount lending. The 8th District's chairman wrote that open-market purchases of government securities "may have been of some benefit. Therefore, it seems to me worthwhile to continue the experiment (Chander 1971 p. 142)." In the spring of 1932,

the St. Louis Fed participated in the open-market purchase program pursued by the Federal Reserve System as a whole.

The operation of the discount window appears to have been a principal difference between the 6th and 8th Districts. The Federal Reserve Act of 1913 narrowly defined assets that banks could use as collateral when borrowing from the Federal Reserve. Legal changes expanded this authority. The Glass-Steagall Act (February 27, 1932) permitted Federal Reserve Banks to discount hitherto ineligible assets for member banks. The Emergency Relief and Construction Act (July 21, 1932) allowed Federal Reserve banks to lend money to "individuals, partnerships, and corporations" having no other sources of funds (Whitney, 1934, p. 64). The Emergency Banking Act (March 9, 1933) empowered Federal Reserve banks "under exceptional and exigent circumstances … to make advances to member banks which have no eligible assets on their own promissory notes secured to the satisfaction of the Reserve Bank (Whitney, 1934, p. 65)."

The Federal Reserve Act permitted, but did not require, Reserve Banks to discount eligible paper. Reserve Banks possessed broad discretion about when, to whom, and under what condition to extend loans. During the 1930s, Reserve Banks exercised this discretion and regulated borrowing by individual member banks directly, rather than relying on the discount rate to ration loans (Anderson, 1965, p. 47). Reserve Banks closely monitored member bank borrowing. Most Reserve Banks used a basic line, sometimes seasonally adjusted, to determine which member banks borrowed excessively. Reserve Banks discouraged the use of discounts either to supplement a member bank's own resources or to take advantage of rate differentials. Member banks that persisted in such activities found the discount window closed to them (Anderson, 1965, pp. 46-47). The Board of Governors encouraged such practices. In 1929, the Board of Governors "directed the Reserve Banks to pursue a policy of 'direct pressure,' in which discount loans simply were refused to any bank carrying stock market loans (Wheelock, 1991, p. 73)." In 1931, when applications at

discount windows mounted at a record rate, the Federal Reserve sent member banks a letter admonishing them for such behavior and stressing the inappropriateness of increased bank borrowing (Lloyd Thomas, 2005, p. 389).

The operative aspect of discount window operations were, therefore, the willingness of Federal Reserve Banks to extend loans based on various forms of collateral. Throughout the depression, the Federal Reserve Bank of Atlanta operated an open window. It extended loans to member banks that wanted to borrow at the prevailing rate and, up until February 1932, possessed sufficient eligible paper, and after February 1932, possessed assets of any type judged to be of any value. During panics, the Federal Reserve Bank of Atlanta rushed funds to afflicted areas, sent personnel to expedite the lending process, and publicly proclaimed its willingness to extend credit sufficient to alleviate the situation. This behavior constituted Atlanta's policy regime, which remained constant throughout the depression.

St. Louis Fed's policy regime changed in midstream. Until the summer of 1931, the Federal Reserve Bank of St. Louis adhered to the doctrine of real bills and its prescription of pro-cyclical policies. It ran a tight discount window. It took little or no action to expedite the lending process during periods of panic. It limited lending and frequently refused requests to rediscount eligible paper. When it did extend loans, the St. Louis Fed usually required what was then known as *marginal* or *double* collateral – that is, collateral consisting of the eligible paper required by law plus an equal amount of United States government securities, which remained as collateral on deposit at the Fed until the loan was repaid. This practice discouraged banks from using the discount window as a source of liquidity, since they had to pledge $2 of their most liquid assets to get $1 of cash (Westerfield 1932). In the summer of 1931, the St. Louis Fed changed policies, eased collateral requirements, and expanded lending through the discount window. Thereafter, its philosophies and policies moved towards those of the Federal Reserve Bank of Atlanta.

Data on discounting in Table 4 illuminates differences between the districts. At the end of 1929, Atlanta extended credit to member banks principally by rediscounting commercial paper. St. Louis extended credit principally upon the security of United States government obligations. At the end of 1933, after the Glass-Steagall Act of 1932 expanded the discretionary lending powers of the Federal Reserve district banks, commercial paper remained over 60% of Atlanta's discounts. Hitherto ineligible assets amounted to more than one-quarter of Atlanta's total lending. In St. Louis, the majority of lending to member banks continued to be secured by United States government obligations. About one-tenth of all lending was on hitherto ineligible assets.

2.2   Banking Crises

Bank failures occurred most often in Mississippi during three periods when bank failure rates rose in other states. Scholars identify three events as triggers (not necessarily exclusive) of these three surges in bank suspensions.

First, on 7 November 1930, Caldwell and Company collapsed. Failures initially spread through correspondent networks to banks in Tennessee, Arkansas, Illinois, and North Carolina. Caldwell's correspondent network did not extend into Mississippi, where the banking situation remained calm for six weeks following Caldwell's collapse. Newspapers in Mississippi, however, reported the financial scandal underlying Caldwell's demise (e.g. Vicksburg Herald, Saturday, 8 November 1930, p. 1). The scandal remained a prominent news item for the next two months. Newspapers also covered defalcations of greater magnitude which caused the closure of the Guaranty Building and Loan Association and affiliated investment institutions in Hollywood, California (Atlanta Journal, 12 December 1930, pp. 1, 10) and the closure of the Bank of the United States in New York City (Atlanta Journal, 11 December 1930, p. 33; 12 December 1930, p. 36; 16 December 1930, p. 29). Mississippi's newspapers also emphasized a state Supreme Court decision

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that invalidated a law which exempted state banks from taxation (Meridian Star, 1 December 1930, p. 1). The decision threatened to increase banks' operating expenses and weaken their financial position. The decision also cast doubt upon the states recently revised banking codes and threatened to saddle operating banks with large liabilities from the deposit insurance program which the state discontinued in the spring.

The incessant discussion of financial corruption, banking panics, industrial recession, and court cases appears to have taken a toll on depositors' confidence. The Vicksburg Herald's weekly tabulation of Vicksburg bank balance sheets shows deposits falling at a rapid and increasing rate during November and December. The process remained orderly until Friday, 19 December 1930, when panic struck.

On that day, the state banking department closed three banks; one due to embezzlement, and two due to frozen assets and poor collections. The next day, one of the larger banks in the state "placed itself in the hands of the State Banking Department for liquidation because of an unusual situation caused by the death of G. A. Wilson (Atlanta Journal, 21 December 1930, p. 11)." Rumors triggered runs on nearby banks, which soon spread to neighboring towns, and within a week, throughout the state. Heavy withdrawals caused the closure of 49 institutions. Other institutions suspended operations to forestall runs which management believed to be imminent. State law allowed banks to close their doors to depositors for up to five days and for a longer period if they could demonstrate both compelling necessity and the ability to reopen after the crisis passed. Banks also took measures short of suspension to slow the decline in deposits such as restricting withdrawals from savings accounts for periods of up to 30 days (a provision in most deposit contracts) and refusing to terminate time deposits ahead of the maturity date. The number of bank runs fell during January. Runs occurred sporadically in February. The last bank to suspend

operations due to deposit losses did so on 2 March 1931. Aggregate deposits in Mississippi's banks rose mildly thereafter, but did not return to the pre-panic level.

Mississippi's second surge in bank suspensions began after England abandoned the gold standard on 11 September 1931. Britain's action did not directly affect banks in Mississippi, which lacked links to financial centers abroad. Fear that the United States might also abandon the gold standard, however, reduced deposits at banks in American money centers. To combat the external drain and defend the gold standard, the Federal Reserve System raised discount rates from 1.5% to 3.5% in two steps in October 1931 and employed open-market operations to reduce the money supply and raise interest rates.

These actions weakened the financial position of banks throughout the nation. Suspension rates rose in most states. In Mississippi, according to newspaper reports and data from the Federal Reserve archives, unease among depositors led to heavy withdrawals at some banks. The afflicted banks tended to be in poor financial condition. Their assets were frozen and had fallen in value. Rising interest rates pushed them towards insolvency. Withdrawals pushed them over the edge. A few of the banks which closed their doors due to deposit losses managed to reopen, but most of them did so only after recapitalizing, either through assessments on stockholders, contributions by depositors, or both. The first failure due to deposit losses occurred on 13 November 1931. The last occurred on 11 January 1932.

The third surge in bank suspensions occurred after 8 November 1932, when Franklin Roosevelt won the presidential election. Expectations that the new Democratic administration would abandon the gold standard induced foreigners to ship funds abroad and Americans to convert deposits to precious metals. Golden fetters prevented the Federal Reserve from expanding the monetary base and forced several districts to restrict lending and raise interest rates. In December, these pressures forced a few banks in Mississippi out of business. Between January 12 and February

18, runs once again targeted banks in poor financial condition, and forced six banks to close their doors. A state-wide banking panic, however, did not occur.

In sum, the historical record reveals three banking crises in Mississippi. The first, in December 1930, was a panic of the type modeled by Diamond-Dybvig (1983), in which a sudden shift in depositors' perceptions about the safety and solvency of the financial system triggered runs on banks. Withdrawals *en masse* forced banks to liquidate assets, or to suspend operations temporarily, or to seek assistance from lenders of last resort. Solvent institutions which could not bear the costs of such actions went out of business. The second, in the fall 1931, was a crisis of the type modeled by Jacklin and Battacharya (1988), where adverse shocks pushed some banks into insolvency. Depositors did not know which banks would fail and withdrew funds from banks whose health they questioned. The third, in the winter of 1933, seems to have been caused by the decline in the value of banks' assets, steady drains in deposits during the preceding years, and deteriorating fundaments rather than panic among depositors.

2.3   Economic Conditions

Mississippi was homogenous in regulatory, economic, and demographic dimensions. Mississippi's banking department applied standard procedures throughout the state. So did departments of federal government, since Mississippi lay within a single district for the Office of the Comptroller of Currency, Reconstruction Finance Corporation, Department of Agriculture, Works Progress Administration, and all other organizations which we have checked. Mississippi's economic and demographic structures were similar throughout the state. Table 3 demonstrates this by displaying county-level data drawn from the censuses of population, manufacturing, and agriculture for 1930. The columns segregate the information by Federal Reserve district. In both the 6th and 8th Districts, the fraction of the population in the labor force was substantial. Unemployment

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rates were low. Levels of farm debt hovered around one-third to one-fifth of farm value. Rural

counties concentrated on cultivating cotton, with cotton farms comprising nearly 80% of the acres

in the northern half of the state and 60% of the acres in the southern section. Disposable incomes

differed little across counties. Prevailing prices for labor (average annual manufacturing wage in

row (5)) and capital (ratio of interest charges to mortgage debt in row (13)) also differed little across

counties. The largest differences arose in the extremities of the state. The southernmost counties

abutting the Gulf of Mexico retained large swaths of undeveloped bayou and substantial maritime

industries. The counties adjoining the Federal Reserve district border had few discernible

differences.

2.4   The Historical Experiment

The homogeneity of banking systems and business conditions and the exogeneity of policies

makes Mississippi's experience a valid policy experiment. The homogeneity of treatment groups

and exogeneity of treatments implies that differences in outcomes resulted from differences in

treatments.

What differences should be expected? During the post-Caldwell panic, when the Atlanta Fed

followed Bagehot's Law and the St. Louis Fed followed the doctrine of real bills, economic theory

predicts that bank failure rates in the 6th District should have been lower than bank failure rates in

the 8th District. In the Diamond-Dybvig framework, which characterizes this panic, a lender of last

resort can mitigate a financial panic by extending credit to illiquid institutions (and perhaps forestall

a panic by credibly committing to do so). Since the Atlanta Fed implemented such a policy in a

prompt, ample, and public manner, the difference in outcomes between the 6th and 8th Districts

should reveal the effectiveness (or ineffectiveness) of Atlanta's policies.

In contrast, during the crisis in the fall of 1931, when the Atlanta and St. Louis Fed pursued similar policies, the 6th and 8th Districts should have experienced similar suspension and liquidation rates.[4] Economic theory strengthens this prediction. In the Jacklin-Battacharaya framework, which characterizes that event, real shocks and imperfect information are the fatal factors. Withdrawals, which reallocate funds from questionable to healthy banks, threaten a few banks on the margin. A lender of last resort may be able to aid those marginal institutions, but it cannot change the fate of insolvent banks. Since illiquidity is not the root of the problem, creating liquidity – via the implementation of Bagehot's Law – cannot solve the problem.

During the crisis in the winter of 1933, no clear prediction can be made. Government policies, economic conditions, and bankers' behavior interacted endogenously. The Reconstruction Finance Corporation was authorized, willing, and able to extend loans to banks which either did not approach or were turned away from their Federal Reserve Districts' discount window. Higher failure rates in the 8th District during the depressions' initial years changed the composition and character of banks in the 8th District relative to the 6th District. So, treatment groups may not have been homogenous, and treatments are difficult to determine. Given these facts and the small sample size, the strongest supposition that can be supported is that the patterns in the data from the winter of 1933 are consistent with the claims of this essay, but have little or no power against alternative hypotheses, since the patterns in the data are probably consistent with any reasonable conjecture.

Non-panic periods serve as a control cases. Bagehot's Law is a policy implemented during panics, when withdrawals, contagion, and illiquidity bedevil banks. The policy does not operate, and therefore, should have no direct effect on bank failure rates outside of panic periods.[5]

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[4]   In the lexicon of experimental analysis, the fall of 1931 serves as a placebo treatment. The experimental and control groups receive similar therapies, and therefore, should experience similar outcomes. If outcomes differ, some unnoted difference between the groups must be influencing the results, and the experimental design may be invalid.
[5]   In this sentence, the caveat 'direct' indicates that Bagehotian policies might influence outcomes in non-panic periods indirectly, either by (a) influencing bankers' expectations of the probabilities and consequences of future panics, and

The control case helps to test the homogeneity assumption underlying our analysis. As we noted earlier, differences between districts in economic conditions and/or shocks is one potential violation of this assumption. The design of our study, which limits analysis to a single state, and the statistical tests which we perform in the next section, allay this concern. Another potential violation of the homogeneity assumption is selection on unobserved characteristics. Selection could have operated through several channels including the opening of new banks, closing of old banks, and migration of banks between districts. In each case, banks likely to benefit from Bagehot's Law because they possessed less liquid portfolios would grow as a proportion of the banks in the 6th District, while banks which did not perceive the need for assistance during panics because they possessed more liquid portfolios, would grow as a percentage of the banks in the 8th District. This process of selection would concentrate banks susceptible to panics in the 6th District. The concentration could cause the efficacy of monetary intervention to be understated, since the treatment group consisted disproportionately of vulnerable institutions.

Several factors, however, allay such concerns. First, statistical tests cannot reject null hypotheses that bank survival, failure, and establishment rates in the 6th District equaled those in the 8th District between 1925 and 1929 (the pre-depression years for which we have data). Second, when given the option to change districts, none of Mississippi's banks chose to do so. What explains the absence of selection? Two explanations appear plausible. One, bankers did not anticipate need for a lender of last resort, since during the Roaring '20s, bankers did not expect the onset of a depression. Two, until the spring of 1930, Mississippi operated a statewide deposit insurance system. The system guaranteed liquidity to banks beset by withdrawals and repaid

thereby, influencing bankers' behavior, or (b) altering the composition of banks that survive panics. The former might alter behavior and outcomes in pre-panic periods. The latter might alter outcomes in post panic periods.

depositors who lost funds in failed banks. Its existence reduced the probability of panics and rendered the Atlanta Fed's assistance superfluous.

<u>2.5   Basic Patterns in the Data</u>

Table 5 and Figure 1 illuminate the patterns of bank failures at the heart of this essay. Table 5 reports suspension and liquidation rates for each year from July 1929 to July 1934. The rates peaked in the second year of the depression and remained above pre-depression levels until the national banking holiday in March, 1933. Table 5 shows that when the Atlanta and St. Louis Feds pursued opposite policies during the fall and winter of 1930, fewer banks failed in the 6th District, which made every effort to inject liquidity into the banking system. More banks failed in the 8th District, which preached non-intervention and where Federal Reserve credit outstanding fell substantially. Afterward, as the policies of the districts converged and the nature of the banking difficulties changed, rates of suspension and liquidations did likewise. For the entire contractionary phase of the Great Depression, July 1929 through March 1933, the rate of suspension in the 8th District (59.2%) exceeded the rate in the 6th District (38.7%) by a wide margin. The rate of liquidation in the 8th District (34.4%) exceeded the rate in the 6th District (26.8%) by a smaller amount.

Figure 1 illustrates these patterns by plotting the percentage of banks in business and operation each day over the entire span of our data panel from 1 July 1929 to 30 June 1933. Figure 1 also indicates the date when the St. Louis Fed's policies began to converge toward those of the Atlanta Fed and the dates of the events which the historical literature identifies as triggers of the surges in suspensions apparent in the evidence. Figure 1 shows that during the post-Caldwell panic, when policy regimes differed across districts, banks suspended operations (temporarily and permanently) at much higher rates in the 8th District. During later banking crises, when policies

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differed little and the rise in failures stemmed largely from fundamental factors, banks in the 6th and 8th Districts failed at similar rates.

3. Methods and Results

Statistical analysis substantiates this supposition by controlling for characteristics of individual banks, the economic environment, and other phenomena which might have generated the observed differences across districts. Section 3.1 controls for potentially confounding factors non-parametrically. Section 3.2 presents parametric estimates. Section 3.3 discusses the robustness of our results.

3.1 Non-Parametric Estimates

The analysis of time-to-failure rests on survivor and hazard functions. This section presents non-parametric estimates of survivor functions constructed via the Kaplan-Meier method and of hazard functions constructed by smoothing raw hazard rates (i.e. the number of bank failures divided by the number of banks at risk on each date). Kernels are Epanechnikov. Bandwidths of 28 days on graphs spanning four years and 7 days on graphs spanning four months are wide enough to smooth daily volatility without obscuring weekly shifts in the probability of failure.

Figure 2 presents survival and hazard functions for all banks in Mississippi during the three banking crises. In Figure 2(a) and (b), the time under analysis is restricted to the four months following the collapse of Caldwell and Company. In Figure 2(c) and (d), the time under analysis is the four months after Britain abandoned the gold standard. In Figure 2(e) and (f), the time under analysis is the four months following Roosevelt's election. In each figure, the population at risk is all banks in operation. A bank that surrendered its charter voluntarily or merged with another institution departs from the population at risk (but is not counted as a failure) on the date when it

ceased operations. A bank that suspended operations is counted as a failure on the date that it closed its doors to the public.

In Figure 2, the gray lines depict the 6th District. The black lines depict the 8th District. Figures 2(a) and (b) show that following Caldwell's collapse, patterns of hazard and survival differed dramatically between the 6th and 8th Districts. Failure rates in the 8th District rose rapidly and exceeded those in the 6th District for most of the crisis. The array of standard non-parametric tests for the equality of survival functions – including the log rank, Breslow, Peto-Peto, and Tarone-Ware tests – reject at the 1% significance level the null hypothesis of that the survival function for the 6th District equaled that for the 8th District. All of the tests produce χ^2 statistics (with 1 degree of freedom) of over 20.

Figures 2(c) and (d) show that after Britain abandoned the gold standard, suspension rates in the 6th District resembled those in the 8th District. For a brief period in November, suspensions occurred more frequently in the southern half of the state, but hazard rates soon rose north of the border. Tests of equality of the survivor functions cannot reject the null hypothesis of equality. The standard tests all produce χ^2 statistics of less than 1.

Figures 2(e) and (f) show that following Roosevelt's election, the banking situation in Mississippi remained calm. Suspension rates rose slightly around Christmas. More suspensions occurred in the 8th than the 6th District. But, the standard tests cannot reject the null hypothesis that the functions do not differ. All produce χ^2 statistics of less than 1½.

Figure 3 demonstrates that differences in suspension rates across districts during the post-Caldwell panic cannot be attributed to fundamentals or selection. Figures 3(a) and (b) limit the analysis to banks that operated within one degree latitude of the Federal Reserve district border.[6]

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[6]   Throughout this essay, whenever we state 'within 1° latitude of the border,' we are referring to this county-based distance definition. The set includes all banks operating within a county for which at least 50% of the surface area of

Figures 3(c) and (d) limit the analysis to banks operating within 50 miles of the border. These

figures demonstrate that even in a narrow band along the border, banks failed at a higher rate in the

8th District and a lower rate in the 6th District. Economic fundamentals varied little over such short

distances, particularly in economically and politically homogenous central Mississippi. Thus,

differences in fundamentals were not the reason that failure rates differed between districts.

Figures 3(e) and (f) limit the analysis to banks in operation before the founding of the

Federal Reserve in 1913. Figures 3(g) and (h) limit the analysis to banks founded after the Federal

Reserve System. These figures demonstrate that banks in both groups failed at a higher rate in the

8th District. Therefore, selective pressures, which would have altered the pattern for one of these

groups, were not the reason that failure rates differed between districts.

Table 6 extends the comparative exercise of the Figure 3 to later periods of panic. The table

indicates the results of log-rank tests for the equality of survival functions from the 6th and 8th

Districts. The test statistics are χ^2 with 1 degree of freedom. For the post-Caldwell panic, the null

hypothesis of equality can be rejected in every instance. For the post-Britain-abandoned-gold and

post-Roosevelt-election surges in suspensions, the null hypothesis of equality cannot be rejected.

Figure 4 illustrates patterns of suspensions over the entire sample period. The event under

analysis is suspension of operations. The definition of the population at risk remains as above except

for temporarily suspended banks, which depart the population at risk when suspended and reenter

the population at risk after resuming operations. All of the graphs depict a similar pattern. In the 8th

District, more banks failed, and failures were clustered during periods of panic. In the 6th District,

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the county lay within one degree latitude of the border. This geographic restriction defines a band running through
the center of the state straddling the Federal Reserve district border. The outer edges of the band vary from 70 to 95
miles distance from the boundary. This county-based measure of distance from the border proves useful in
regressions whose explanatory variables include county-level characteristics, county fixed effects, or county
contagion effects as well as error terms clustered by county.

fewer banks failed, particularly during the banking panic of 1930, and failures were spaced more

evenly through time.

Figures 4(a) and (b) illuminate important issues. During non-panic periods, the suspension

rate in the 6th District exceeded that of the 8th District, particularly in the period preceding the

collapse of Caldwell, when principal employers in two towns in the southern half of the state closed,

forcing nearby banks out of business. This pattern suggests that economic fundamentals favored

banks in the 8th District over those in the 6th District. During periods of panic, however, banks in the

8th District failed at higher rates. This pattern is consistent with the effective application of

Bagehot's law, which should reduce liquidation rates during panics, when the lender of last resort

loans freely, but not during normal times, when the lender of last resort husbands its reserves and

allows insolvent banks to liquidate.

The remaining figures demonstrate the robustness of the result. Figures 4(c) and (d) limit the

analysis to all banks that operated within one degree latitude of the border. Figure 4(e) and (f) limit

the analysis to all banks that operated within 50 miles of the border.[7] Figures (g) and (h) limit the

analysis to banks established before 1913. The pattern remains the same. Thus, neither differences

in economic fundamentals nor selection across jurisdictions drives our results.

The tripartite pattern apparent in Figure 4 – (1) hazard rates for the 6th and 8th Districts

similar at all times except during panic following Caldwell's collapse, when the hazard for the 8th

District exceeded that in the 6th by a wide margin, (2) cumulative hazard for the entire period higher

in the 8th District, (3) failures clustered during three periods of heightened risk – appears robust to

reasonable alterations in our non-parametric framework.[8] A non-parametric test for this pattern,

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[7]   Note: The pattern persists even for extremely small bands. For example, in a 25 mile radius around the border, 8
      banks failed in the 8th district, while only one bank failed in the 6th district.
[8]   A companion essay available from the authors shows that when the measure of distress is changed to liquidation,
      patterns of survival and hazard do not change. For both suspensions and liquidations, our results also hold for all
      subpopulations which we have examined. These subpopulations include banks in the western and eastern halves of

however, does not exist. Generating such tests requires additional assumptions. For this task, we turn to parametric methods.

3.2   Parametric Estimates

A plethora of potential parameterizations exist for our analysis. We present results for the current gold standard in this literature, the log-logistic survival model of Calomiris and Mason (2003b). In this model, the unit of observation is the individual bank. The dependent variable is log days until liquidation. Time under observation begins on July 1, 1929 and ends at the national banking holiday in March 1933. The explanatory variables include the characteristics of banks, the characteristics of counties in which banks operate, measures of business conditions at the state and national level, indicators of periods of panic, and in our version of this model, indicators of Federal Reserve policy regimes. Bank characteristics update annually each July 1st. County characteristics (from Census of 1930) remain constant over time. National and state economic conditions update monthly. This framework allows us to determine the relative importance of fundamentals and contagion as sources of bank distress and to test whether Federal Reserve intervention mitigated (or accentuated) banking panics.

Table 7 presents the results of this exercise. Column (1) reports the basic model. It contains indicator variables for the three banking crises, for whether a bank operated within the 6th District, and for whether during each of three banking crises a bank operated within the 6th District. The crisis indicators reveal to what extent liquidation rates rose above the baseline during each period of panic. These crisis/district interaction terms reveal for each crisis whether liquidation rates differed between the 6th and 8th Districts. The coefficient for the fall 1930 crisis indicator is statistically

the state, banks in operation for more or less years than the median age of all banks, state banks, non-member banks, member banks, national banks, banks in counties with more and less than the median percentage of agricultural acreage dedicated to cotton cultivation, and banks in counties with above and below the median number of manufacturing establishments.

significant, indicating that during the crisis, the liquidation rate rose above the baseline. The coefficient for fall '30 crisis/Atlanta Fed interaction term is also statistically significant, indicating that during the crisis, banks in the 6th District liquidated at lower rates than banks in the 8th District. We cannot reject the null hypothesis that the other coefficients equal zero, suggesting that during the later crises, outcomes differed little from the baseline or between Federal Reserve districts.

Table 8 reveals the magnitudes of the coefficients. Column (1) indicates the crisis in the fall of 1930 raised bank liquidation rates substantially. The marginal effects can be stated as changes in cumulative hazard rates (a metric readily comparable to that of the graphs in the previous section). The regression coefficients, the parametric assumptions concerning the survival function, and the data can be combined to estimate the probability of liquidation for each bank for each day during the crisis period. The mean estimate is 1.593 per thousand. A counterfactual – what would the hazard rate have been in the absence of the panic – can be estimated by setting the panic indicator variable equal to zero and redoing the calculation. The mean estimate for the counterfactual is 0.089 per thousand. The average difference in estimates is 1.504 per thousand. Compounding over the 73 days of the fall '30 crisis reveals that the panic increased the cumulative hazard for each bank by 11.0%. The fall '30 crisis, in other words, accounts for approximately one third of the total cumulative hazard experienced by banks in Mississippi between July 1929 and March 1933. Similar calculations reveal the effect of the Atlanta Fed's expansionary policy during the fall '30 crisis. Cumulative hazard in the 6th District was 10.2% lower than cumulative hazard in the 8th District. In other words, in the 8th District, where the St. Louis Fed followed the real bills doctrine, the crisis in the fall of 1930 raised cumulative hazard by 11.0%, while in the 6th District, where the Atlanta Fed followed Bagehot's Law, the crisis increased cumulative hazard by only 0.8%.

Columns (2) through (6) in Tables 7 and 8 strengthen this supposition. Column (2) adds to the explanatory variables a vector of bank characteristics. The characteristics include the percentage

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of total assets comprised of cash, exchanges with banks, and marketable securities [Assets % Cash];

net worth as a share of total assets [Net Worth / Total Assets]; deposits as a percentage of total

liabilities [Liabilities % Deposits]; the number of years that the bank had been in operation; whether

the bank possessed a state charter; the natural log of total assets; and the percentage of non-cash

assets invested in real estate. We do not report coefficients for the latter two variables, which are

statistically insignificant in most specifications.[9] We correct standard errors for heterogeneity using

the Huber-White sandwich method with error terms clustered on individual banks. We account for

the possibility of selective survival based on unobserved characteristics using the standard frailty

method of assuming a gamma distribution for the unobserved parameters and estimating the

parameter (theta) of that distribution. While these corrections improve the efficiency of our

estimates, in no case do they change the signs or significance levels of the key coefficients.

Columns (3) and (4) add to the regression the characteristics of the counties within which

each bank operated. Column (3) adds measures of population density, the ratio of aggregate farm

debt to farm value, the percentage of land under cultivation planted with cotton, the percentage of

farm acres in pasture or fallow, and the percentage of farms under 100 acres. This set of five county

characteristics is the most powerful, parsimonious specification which we have identified among the

hundreds of available county-level characteristics. Rather than accounting for county characteristics

by choosing a subset of the numerous, available variables, Column (4) adds to the regression the 12

principal components (as identified by the Kaiser Criterion) of the vast array of county-level data.

Employing the principal components improves the fit of our regression, but changes neither the

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[9]   Note: Our database contains over 30 bank characteristics. We chose to include these seven because they have clear
      interpretations. For example, *Assets % Cash* indicates liquidity. *Net Worth* indicates solvency. *Liabilities % Deposits*
      indicates the cost of capital and vulnerability to changes in depositors' preferences for cash. In addition, these seven
      provide the most powerful, parsimonious set of explanatory variables. Results obtained with them correspond
      closely to results obtained from running regressions on the principal components of the array of all bank
      characteristics.

signs nor the significance levels of variables concerning the banking crises and Federal Reserve policy regimes, and changes their magnitudes only marginally.

Column (5) adds variables measuring temporal variation in state and national economic conditions. The variables are the dollar values of building permits in Mississippi as well as the value of building permits and business bankruptcies for the United States as a whole. The variables enter the regression in the form which maximizes the value of their coefficients and minimizes the value of the coefficients for the banking panics and policy regimes. Building permits (for both Mississippi and the United States) enter the regressions in an annual log difference transformation at lags of 3 and 5 months. Business failures enter the regression in contemporaneous levels. Incorporating this information improves the fit of our regression, increases the estimated magnitude of the impact of the banking crisis and monetary intervention in the fall of 1930 (see Table 8, column (5)), but reduces the precision of the estimate (see Table 7, column (5)).

Column (6) estimates the canonical Calomiris and Mason version of the model. We format our data as in their seminal (2003b) essay, employing identical county, state, and national data and nearly identical bank characteristics, and replicate their result. The regression does an excellent job of predicting the longevity of individual institutions. Fundamentals are highly correlated with bank distress. However, our version of the model includes indicators for Federal Reserve policy regimes. The coefficients on these indicators demonstrate that the Federal Reserve could lower bank failure rates by acting as a lender of last resort during banking panics.

3.3   Robustness

Our conclusion remains robust to a wide variety of alterations in our econometric framework. Models employing different parametric assumptions, explanatory variables, and corrections for

heterogeneity and serial correlation yield identical qualitative and similar quantitative results. We discuss such statistical concerns in an extended essay available upon request from the authors.

One crucial issue, however, cannot be addressed statistically. Could some unmeasured fundamental shock explain differences between the 6th and 8th Districts during the post-Caldwell crisis? To be consistent with the evidence, the shock would have to one which raised failure rates in the 8th District relative to the 6th District during the period beginning December 20, 1930 and ending March 2, 1931, but neither before nor after, and the shock would have to be one which affected the districts uniformly and which retained its punch right up to the border, but which did not spill over into the adjoining district. Neither climatic, agricultural, industrial, nor cultural shocks seem likely to have had such characteristics.

Could the confounding factor be financial links to the Caldwell conglomerate or geographic proximity to the locus of the post-Caldwell panic? The evidence indicates otherwise. Consider the case of financial linkages. One of our sources, Rand McNally, lists the correspondents for all banks in Mississippi. Another source, the St 6386 forms in archives of the Board of Governors, indicates whether a correspondent's closure caused the suspension of a client. These sources show that no links existed between banks in Mississippi and the Caldwell organization or its subsidiaries. This evidence of absence confirms statements made by Mississippi's Superintendent of Banks, J. S. Love, during a press conference on November 22, 1930. "Our [Mississippi's] banks are free from outside allied connections. There does not exist in this state any group or chain banking system. … [We] see no cause for alarm (Vicksburg Sunday Post-Herald, 23 November 1930, p.11; Meridian Star, 23 November 1930, pp. 1-2)." Finally, including the matrix of correspondent linkages on the right-hand side of our regressions alters neither the signs nor the significance levels of our coefficients.

Now, consider the case of geographic proximity. In Mississippi, bank runs began 6 weeks after Caldwell's demise and 3½ weeks after the last bank in another state failed due to

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correspondent links to the Caldwell conglomerate. Runs began in the center of Mississippi, not in close proximity to borders of states engulfed by Caldwell's collapse. In addition, although the eastern half of Mississippi lay closer to Nashville, which contained Caldwell's headquarters, the bulk of Caldwell's financial operations, and its largest banking affiliate, the pattern of failures did not differ in the eastern and western halves of Mississippi or based upon distance from Nashville.

Could the confounding factor be some other unmeasured shock? To answer that question, we scrutinized seven newspapers (named in Section 2) for the months of September 1930 through March 1931, (ii) read the annual reports of Mississippi's banking commissioner for the years 1928 through 1937, and (iii) compiled records of bank failures collected by the Board of Governors. All of these sources described the epidemic of bank runs which occurred in Mississippi at that time. None of the newspapers described shocks to the economy which might have caused more banks to fail in the northern half of the state. It seems unlikely that such a large number of observers, with the knowledge needed to detect such an unusual and sizeable shock and with the ability and incentive to report it, would have failed to report such an event, if it had occurred.

4. Discussion

The multiple methods employed in the previous section tell a consistent tale. During the banking panic that began in December 1930, banks failed at lower rates in the 6th Federal Reserve District, where the Atlanta Fed injected liquidity into the banking system, than in the 8th Federal Reserve District, where the St. Louis Fed followed the doctrine of real bills. The St. Louis Fed could have followed the same policy as the Atlanta Fed, and if it had, rates of bank suspension and liquidation would have been lower.

The quasi-experimental structure of our study, which frees our estimates from difficulties of inference which typically trouble studies of firms in complex, changing, and endogenous economic

environments, strengthens our conclusion. The limitations of our analysis are the same as those for any study of this type. While our methods generate a precise and powerful result, they do so for a particular point in time and space: Mississippi during the early 1930s. The generalizability of our result depends on the representativeness of the place and period under study. On this dimension, our study stands on strong ground.

The depository institutions in Mississippi were broadly representative of the portion of the banking system that bore the brunt of the Great Depression. Mississippi was an agricultural state suffering from droughts, falling commodity prices, and the broad economic downturn that followed the stock market crash. Unit banks predominated. Most banks possessed state charters. Similar conditions existed in the regions of the nation and segments of financial industry that suffered the bulk of all bank failures.

The depository institutions in Mississippi were also broadly representative of the segments of the banking industry crucial for understanding links between financial markets, monetary policies, and the real economy. Most of the banks in the cotton state were medium-to-small-sized state-chartered institutions. Their customers tended to be individuals, farmers, and businesses that lacked access to equity markets and other non-bank sources of credit. Their management possessed information about local borrowers and local economic conditions which was lost when they ceased operations. Bernanke (1983) identifies the destruction of this information and the resulting disintermediation as one of the channels by which financial crises exacerbated the Great Depression. Moreover, the medium-to-small-sized banks in Mississippi were typical of the institutions which bore the brunt of the deposit losses during the early years of the depression, as depositors shifted funds towards larger, member banks which were less likely to fail or removed funds entirely from the depository system. Medium-to-small-sized banks state banks were also the institutions that accumulated the largest excess reserves. Monetarists identify declines of the deposit-currency and

deposit-reserve ratios as principal factors behind the collapse of the money supply and aggregate economy between 1931 and 1933 (Friedman and Schwartz, 1963). Moreover, the collapse of state-banking systems which began in the fall of 1930 received prominent media coverage. This widespread reporting of the banking situation – including seemingly obsessive coverage of defalcations, indictments, and suicides of bankers – must have generated fear and uncertainty among consumers and businessmen. Romer (1993) among others identifies uncertainty and expectations as mechanisms by which financial crises deepened the depression. Thus, the banking situation in Mississippi during the 1930s reflects the three primary channels – money, intermediation, and expectations – by which bank failures influenced real economic activity.

The majority of Mississippi bank suspensions occurred during the 18 months following the stock market crash, particularly during the fall of 1930 and following winter, when banks in large numbers failed throughout the South and Midwest. Mississippi's experience provides an accurate representation of broader events during this pandemic, but may not provide an accurate representation of events which occurred in northern industrial cities at later times, such as the surges in bank liquidations in Chicago, Pittsburg, or Philadelphia in 1931 and 1932, or the increase in bank failures when the Federal Reserve raised discount rates to defend the gold standard in the fall of 1931. For those periods, our findings – that the preponderance of banks failed for fundamental reasons and failure rates did not differ across Federal Reserve districts – are consistent with the conclusions of Temin, White, Calomiris, and Mason.

Our methods are also most reliable for the first 18 months of the depression. Before the summer of 1931, policies differed starkly between the 6th and 8th Districts. The differences were long standing and exogenous both to circumstances in Mississippi and the recession underway at the time. The recession's influence on Mississippi's economy was limited. Failures of banks and firms had not yet become a loop of reinforcing feedback. Fears of depositors had not yet drained the

financial system of funds, forcing banks to shed assets and driving down prices of securities. Until Caldwell collapsed, bank failures were uncommon and localized. The banking panic which struck Mississippi in December 1930, in other words, struck virgin territory. In such circumstances, our estimates should have clear causal interpretations. After the spring of 1931, however, the 8th District changed policies. Banks and firms failed in large numbers. The money multiplier declined. Interactions among economic actors and aggregates dragged the economy deeper into depression. In such circumstances, causation is unclear. Conclusions must be cautious. Policies of the 6th and 8th Districts converged as did outcomes for banks. This is consistent with our claim that monetary policies influenced rates of suspension and liquidation (policies were similar and outcomes were similar), but probably also consistent with the range of reasonable alternatives.

The issues of representativeness and robustness focus attention on the post-Caldwell panic. Friedman and Schwartz (1963) emphasize this event's influence on the course of the contraction. This panic marks the month when the money multiplier, the deposit-currency ratio, the deposit-reserve ratio, and most measures of money supply plunged toward their nadir in the trough of the depression. Their decline during the next three years remains the most rapid and prolonged descent in American monetary history. The banking panic in the fall of 1930 also appears to be a turning point of many macroeconomic models of the Great Depression. For example, Cecchetti and Karras find "there is an aggregate supply collapse that coincides with the onset of severe bank panics" … "suggesting an association between [the supply shocks] and the credit channels emphasized by Bernanke (Stephen Cecchetti and Georgios Karras, 1994, pp. 80-81, 99-100)." Lawrence J. Christiano, Roberto Motto, and Massimo Rostagno find that the flight from deposits to currency during the year following Caldwell's collapse (and the consequent accelerator effects, debt deflation, and credit crunch) explains the severity of the contraction during the years 1931 through 1933 (Christiano, Motto, and Rostagno, 2004).

Our results suggest the banking panic in the fall of 1930 need not have been such a turning point. The Federal Reserve Bank of Atlanta's aggressive intervention reduced rates of bank suspension substantially. The benefits of Atlanta's actions spread beyond the banking system. Data from the Census of Manufactures demonstrates that between 1929 and 1931, industrial output contracted more in the 6th District than in the 8th and all other Federal Reserve districts. After 1931, the depression deepened in the 8th District and the United States as a whole, but in the 6th District, industrial production increased, and recovery began (Rosenbloom and Sundstrom, 1999).

Atlanta's success suggests that concerted action by the Federal Reserve System as a whole should have reduced rates of bank failure at least as much and perhaps more, since substantial reductions in the number of failures should have increased depositors' confidence and assets' values, which would improve the health of the banking system as a whole. At the time, the economic justification for such action was well known. Bagehot's Law predated the doctrine of real bills and was standard operating procedures at the Bank of England and other European central banks. The Federal Reserve had the resources to implement Bagehot's Law. Gold stocks were large. Credit could have been extended without endangering the exchange-rate regime. Golden fetters did not yet restrain the Federal Reserve's behavior. In sum, during the fall of 1930, monetary authorities missed an opportunity to avert the onset of banking panics, and this sin of omission lengthened and deepened the Great Depression.

Table 1
Number of Banks in Operation in Mississippi
by Year, Source of Charter, and Federal Reserve District

Begin 1 July		End 30 June	State Banks			National Banks		
			All (1)	6th FR (2)	8th FR (3)	All (4)	6th FR (5)	8th FR (6)
1929	to	1930	274	120	155	35	21	14
1930	to	1931	259	105	154	35	22	13
1931	to	1932	222	96	126	28	18	10
1932	to	1933	206	89	108	27	18	9
1933	to	1934	189	82	106	24	15	9

Sources: See Section 3.

Table 2: Characteristics and Summary Statistics of Banks in Mississippi, 1 July 1929

	All Banks			6th Federal Reserve District						8th Federal Reserve Distrct					
				All 6th			1° Border			All 8th			1° Border		
# of Banks	310			141			76			169			112		
	Median	Mean	SD	Median	Mean	SD	Median	Mean	SD	Median	Mean	SD	Median	Mean	SD
Financial Characteristics ($1,000)															
Total Assets	501	939	77	559	1,166	141	514	1,211	225	448	748	76	451	790	106
Loans and Discounts	334	546	881	334	676	1,070	278	713	1,288	256	437	668	270	464	755
Bonds and Securities	81	178	259	110	239	323	104	233	344	67	126	173	47	124	186
Cash and Exchanges	91	178	273	92	204	310	84	228	373	91	157	237	92	174	276
Miscellaneous	12	37	67	13	47	86	11	37	78	11	28	45	12	28	45
Paid-Up Capital	30	53	66	30	59	75	30	63	86	30	49	57	30	52	65
Deposits	436	799	1,180	506	1,003	1,445	465	1,040	1,699	369	629	869	379	662	993
Surplus and Profits	20	46	86	23	58	109	21	65	134	18	36	57	20	42	66
Financial Ratios															
Net Worth / Assets	0.11	0.12	0.05	0.10	0.11	0.04	0.10	0.11	0.04	0.11	0.13	0.05	0.13	0.14	0.06
Assets % Cash	0.38	0.38	0.15	0.37	0.38	0.14	0.36	0.39	0.14	0.38	0.38	0.15	0.38	0.37	0.15
Liabilities % Deposits	0.86	0.84	0.09	0.87	0.85	0.07	0.88	0.85	0.08	0.86	0.83	0.10	0.85	0.82	0.11
Services															
Safe Deposit Boxes	0	0.36	0.48	0	0.41	0.49	0	0.34	0.48	0	0.32	0.47	0	0.33	0.47
Savings Department	1	0.68	0.47	1	0.77	0.42	1	0.74	0.44	1	0.60	0.49	1	0.55	0.50
Trust Department	0	0.24	0.43	0	0.26	0.44	0	0.24	0.43	0	0.22	0.42	0	0.24	0.43
Bond Department	0	0.11	0.31	0	0.16	0.37	0	0.16	0.37	0	0.06	0.24	0	0.07	0.26
Number of Branches	0	0.07	0.77	0	0.01	0.12	0	0.00	0.00	0	0.13	1.03	0	0.13	1.24
Affiliations															
State Bank	1	0.89	0.32	1	0.85	0.36	1	0.88	0.33	1	0.92	0.28	1	0.90	0.30
Federal Reserve Member	0	0.12	0.33	0	0.15	0.36	0	0.12	0.33	0	0.10	0.30	0	0.12	0.32
Member ABA	1	0.82	0.38	1	0.91	0.29	1	0.87	0.34	1	0.75	0.43	1	0.72	0.45
Member SBA	1	0.96	0.19	1	0.97	0.17	1	0.96	0.20	1	0.96	0.20	1	0.95	0.21
Age															
Years in Operation	23	22.42	13.37	24	23.21	12.33	24.5	24.00	12.74	20.5	21.75	14.20	21	21.98	14.87
% Operating Before Fed	1	0.64	0.48	1	0.69	0.46	1	0.72	0.45	1	0.60	0.49	1	0.59	0.49
Correspondents															
Total Correspondents	3	3.02	0.93	3	3.10	0.90	3	3.08	0.95	3	2.96	0.96	3	3.04	0.89
6th Bank With 8th Correspondent	0	0.15	0.41	0	0.33	0.55	0	0.37	0.61						
8th Bank With 6th Correspondent		0.41	0.61							1	0.76	0.65	1	0.91	0.64

Source: See Section 2

Table 3

Characteristics of Counties, 1930, by Federal Reserve District

		All Counties		Counties Within 6th Fed District				Counties Within 8th Fed District			
				All 6th		1^0 Border		All 8th		1^0 Border	
		Avg	Sd	Avg	Sd	Avg	Sd	Avg	Sd	Avg	Sd
(1)	Population	24,510	14,411	22,394	14,431	28,243	17,744	26,843	14,206	30,396	17,150
(2)	Persons per square mile	43.1	20.0	37.4	19.7	41.5	20.3	49.3	18.6	51.4	21.5
(3)	Urban population share (%)	11.9	17.8	14.2	22.3	12.2	22.8	9.3	10.8	12.5	11.1
(4)	Negro population share (%)	46.4	20.9	43.4	18.2	49.5	18.2	49.6	23.3	56.1	18.1
(5)	Number of manufacturing establishments	22.5	18.2	20.1	20.0	25.6	24.6	25.2	15.9	27.1	14.1
(6)	Annual manufacturing wage ($)	732.7	165.8	754.8	150.6	779.2	129.3	711.2	178.7	753.7	182.9
(7)	Net sales, retail stores, annual per capital ($)	182.9	67.0	190.0	76.8	188.2	91.7	175.1	54.0	185.0	51.5
(8)	Fraction of population in labor force (%)	40.5	7.3	38.8	6.2	41.3	6.3	42.4	8.0	42.9	7.6
(9)	Unemployment rate (%)	1.2	1.6	1.8	2.0	1.0	1.1	0.5	0.4	0.6	0.4
(10)	Fraction of farm acres in cotton (%)	68.1	23.5	57.5	26.4	68.0	18.2	79.7	11.9	77.7	14.1
(11)	Fraction of farm acres with crop failures (%)	2.3	4.8	3.3	6.4	3.8	7.3	1.1	0.8	1.1	0.5
(12)	Ratio of farm mortgage debt to farm value (%)	37.2	7.1	33.2	5.3	35.3	4.2	41.6	6.1	41.2	7.2
(13)	Ratio of interest charges to mortgage debt (%)	6.9	0.4	7.0	0.5	6.9	0.4	6.9	0.4	6.9	0.5

Sources: Censuses of Population, Agriculture, and Manufacturing, 1930.

Notes: Columns headed "Avg" indicate the average county values. Columns headed "Sd" indicate the standard deviation of the county values.

Table 4
Bills Discounted by Class of Paper, December 1929 and December 1933
End of Month Figures in Thousands of Dollars

Year	Federal Reserve District	Total	Bills Rediscounted secured by		Member Bank Collateral Notes secured by			I.P.C
			US Govt	Other and unsecured	US Govt	Eligible	Ineligible	
			(a)	(b)	(a)	(c)	(d)	(e)
1929	All Districts	632,421	755	173,286	352,733	105,067	--	--
	Atlanta (6th)	29,347	107	21,357	2,573	5,310	--	--
	St. Louis (8th)	17,938	109	2,908	12,446	2,475	--	--
1933	All Districts	97,590	338	19,887	26,891	31,246	18,824	404
	Atlanta (6th)	4,184	11	1,029	216	1,677	1,248	3
	St. Louis (8th)	1,415	0	< ½	788	485	133	0

Definitions of columns: (a) discounts or notes secured by United States government obligations, (b) discounts secured by any means other than United States government obligations or unsecured, (c) notes secured by collateral eligible for rediscount according to the Federal Reserve Act other than United States Government obligations, (d) discounts secured by collateral ineligible for discount or purchase according to the Federal Reserve Act but permitted by the Glass-Steagall Act of 1932, (e) loans to individuals, partnerships, and corporations as permitted by the Glass-Steagall Act of 1932. Note that (d) and (e) were not permitted during 1929, hence the "--" marks.

Source: Banking and Monetary Statistics, p. 340, Table 88

Table 5
Bank Suspensions and Liquidations
Mississippi, July 1929 through June 1934, by Federal Reserve District

Begin 1 July		End 30 June	Percentage of Banks Suspending			Percentage of Banks Liquidating		
			All (1)	6th FRd (2)	8th FRd (3)	All (4)	6th FRd (5)	8th FRd (6)
1929	to	1930	4.8	7.1	3.0	4.5	7.1	2.4
1930	to	1931	28.9	14.2	39.5	13.6	7.1	18.6
1931	to	1932	13.2	14.9	11.8	8.0	7.9	8.1
1932	to	1933	7.7	7.5	7.9	7.3	6.5	7.9
1933	to	1934	0.9	0.0	1.7	0.9	0.0	1.7
Total			49.8	38.7	59.2	30.9	26.8	34.4

Sources: Rand McNally Bankers Directory and National Archives, Record Group 82, see Section 3 and Richardson (2004) for details.

Notes: Total indicates the percentage of banks operating on 1 July 1929 that either suspended or liquidated by 30 June 1933.

Table 6
Log-Rank Tests for Equality of Survival Functions in 6th and 8th Districts
During Three Banking Panics

Banking Panic	All Banks	Banks Within Distance From Border		Bands With Date of Foundation	
		1° Latitude	50 Miles	Before 1913	After 1913
	(1)	(2)	(3)	(4)	(5)
χ^2 with 1 degree of freedom					
Fall '30	25.20	13.15	5.69	13.58	8.82
Fall '31	0.05	0.50	0.03	0.00	0.30
Winter '32/3	0.21	0.01	0.50	0.02	1.36
Sample Size, # of banks at t=0					
Fall '30	286	170	89	184	98
Fall '31	209	128	61	141	68
Winter '32/3	180	112	51	120	60

Table 7
Log-Logistic Survival Regressions for Individual Banks
Dependent Variable: Log Days Until Liquidation

|	(1)	(2)	(3)	(4)	(5)	(6)
Fed Atlanta During Crisis '30	**10.441**	**1.785**	**1.646**	**1.670**	*0.662*	**1.156**
	(1.427)	(0.872)	(0.825)	(0.831)	(0.350)	(0.501)
Fed Atlanta During Crisis '31	−0.062	0.270	0.250	0.112	0.071	0.038
	(0.786)	(0.718)	(0.701)	(0.690)	(0.322)	(0.602)
Fed Atlanta During Crisis '33	1.441	1.145	0.953	1.192	0.573	0.656
	(3.168)	(0.860)	(0.859)	(0.874)	(0.434)	(0.692)
Federal Reserve Atlanta	0.181	−0.070	−0.326	−0.602	−0.285	−0.046
	(0.277)	(0.288)	(0.378)	(0.454)	(0.217)	(0.287)
Banking Crisis – Fall 1930	**−12.089**	**−3.239**	**-3.068**	**-2.972**	**−1.099**	**−2.150**
	(1.319)	(0.875)	(0.839)	(0.901)	(0.394)	(0.826)
Banking Crisis – Fall 1931	−0.647	−0.794	−0.793	−0.658	−0.058	−0.782
	(0.5449)	(0.516)	(0.547)	(0.536)	(0.249)	(0.536)
Banking Crisis – Winter 1933	−2.738	−1.852	−1.592	−1.748	−0.524	**−1.492**
	(3.099)	(0.713)	(0.681)	(0.731)	(0.355)	(0.704)
Assets % Cash		**5.251**	**4.599**	**4.655**	**2.102**	**4.465**
		(1.158)	(1.182)	(1.299)	(0.654)	(1.484)
Net Worth / Total Assets		**9.775**	**9.571**	**7.247**	**3.652**	**9.106**
		(3.187)	(3.771)	(3.080)	(1.702)	(3.267)
Liabilities % Deposits		4.107	3.459	2.967	1.867	**3.612**
		(1.268)	(1.402)	(1.296)	(0.689)	(1.418)
State Bank		*0.609*	0.488	*0.679*	**0.358**	*0.465*
		(0.317)	(0.326)	(0.350)	(0.177)	(0.281)
Years in Operation		**0.033**	**0.028**	**0.029**	**0.012**	0.022
		(0.012)	(0.013)	(0.012)	(0.006)	(0.011)
Constant		1.535	-4.131	0.46	1.958	61.119
		(2.274)	(2.987)	(2.431)	(1.485)	(48.202)
ln (Gamma)	**−0.282**	**−0.515**	**−0.557**	**−0.593**	**−1.120**	**−0.978**
	(0.094)	(0.094)	(0.106)	(0.117)	(0.170)	(0.209)
ln (Theta)		**−16.808**	**−16.083**	**−17.186**	**−15.956**	
		(0.766)	(0.562)	(0.476)	(0.792)	
Bank Characteristics Vector		MS	MS	MS	MS	CM
County Characteristics Vector			MS	PC	PC	CM
Economic Conditions Vector					MS	CM
Number of Subjects	312	312	312	312	312	304
Number of Failures	80	80	80	80	80	74
Days at Risk	325959	325959	325959	325959	325959	298916
Log Likelihood	−187.0	−147.2	−143.0	−136.2	−122.3	−109.1
Wald Chi 2	144.7	51.2	64.2	99.2	336.24	150.6
Wald Chi 2 Degrees Freedom	7	14	19	25	28	26

The dependent variable in columns (1) to (5) is log days until liquidation after July 1, 1929. The dependent variable for column (6), which replicates the canonic Calomiris-Mason regression, is log days until liquidation after December 29, 1929. For coefficients, boldface indicates significance at 5% level. Italic indicates significance at 10%. Standard errors (in parenthesis) estimated with Huber-White sandwich method clustered on individual banks. "CM" indicates the vectors of control variables conform to the specifications of Calomiris and Mason (2003). "MS" indicates the vectors of control variables fitted to Mississippi fundamentals as described in text. "PC" indicates that characteristic vector comprised of principal components of county variables as described in text.

Table 8
Magnitudes of Effects of Policy Regimes and Panics
Change in Cumulative Hazard Rates in Log-Logistic Regressions

	(1)	(2)	(3)	(4)	(5)	(6)
Fed Atlanta During Panic '30	− 10.2	− 10.1	− 10.0	− 10.1	− 11.6	− 11.0
Fed Atlanta During Panic '31	+ 0.2	− 0.7	− 0.7	− 0.3	− 0.5	− 0.2
Fed Atlanta During Panic '33	− 2.0	− 2.1	− 1.9	− 2.3	− 3.1	− 1.6
Banking Panic – Fall 1930	+ 11.0	+ 10.7	+ 10.7	+ 10.7	+ 11.4	+ 11.4
Banking Panic – Fall 1931	+ 1.6	+ 1.6	+ 1.7	+ 1.4	+ 1.3	+ 2.5
Banking Panic – Winter 1933	+ 3.5	+ 2.5	+ 2.2	+ 2.4	+ 2.2	+ 2.3

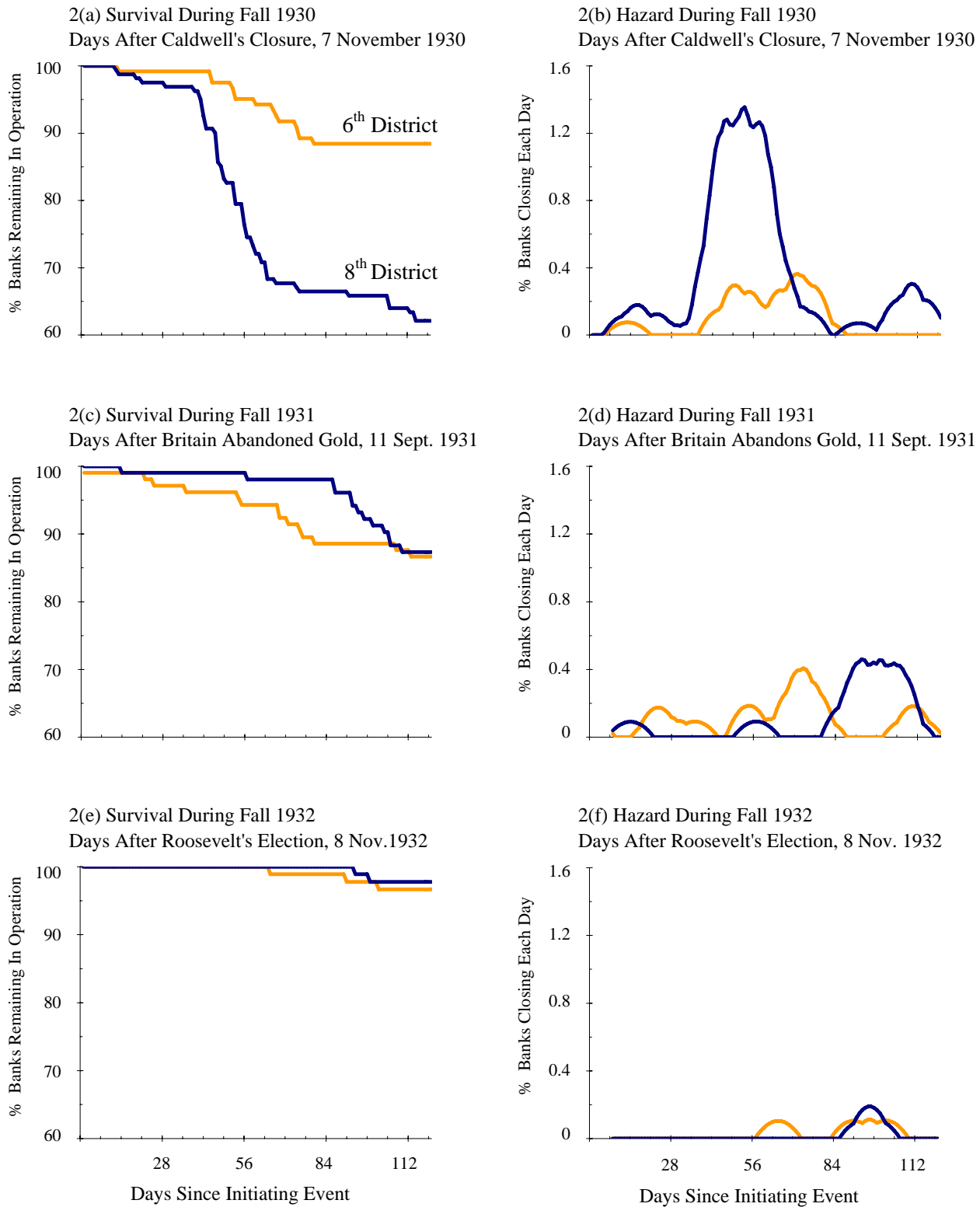Sources: See Section 2, Section 4.2, and Table 7

Figure 1
Percentage of Banks in Business and in Operations in the 6th and 8th Federal Reserve Districts
Mississippi, July 1929 to June 1933
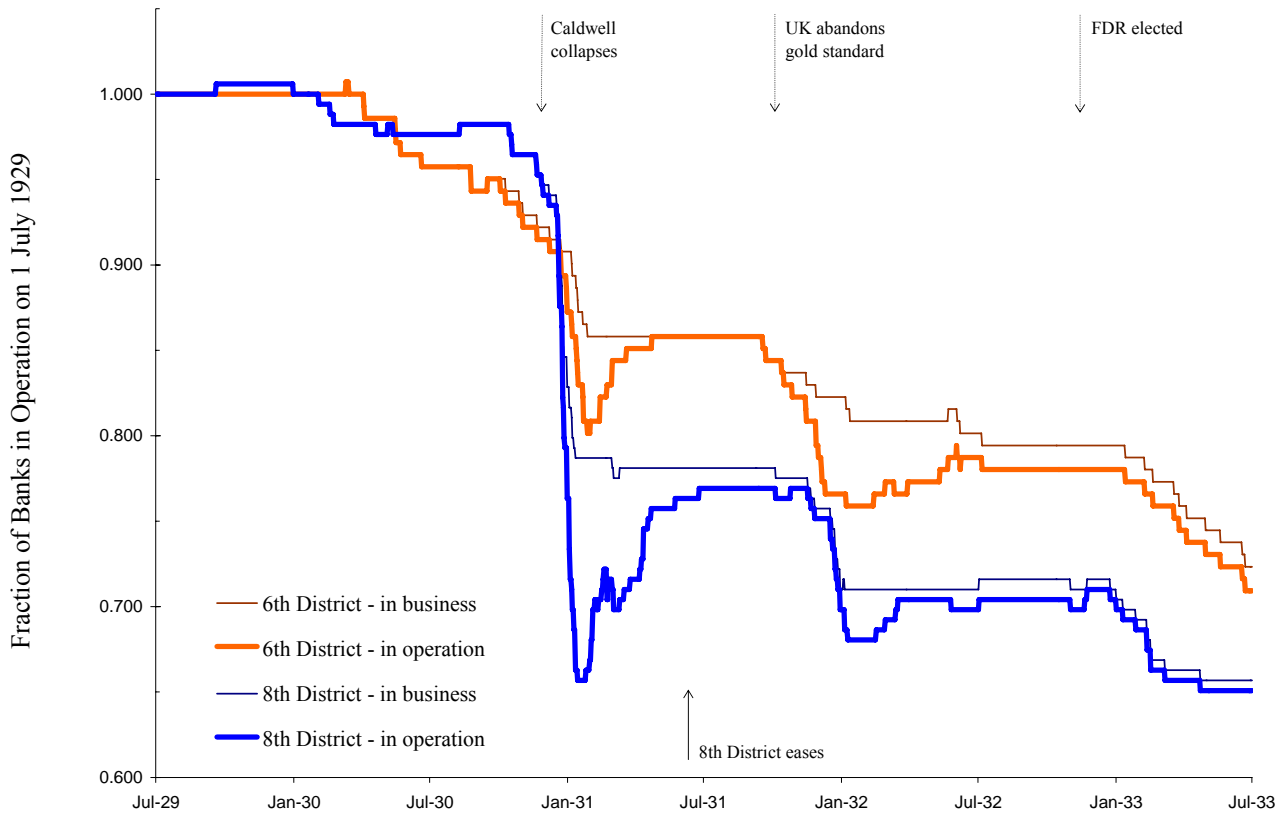
Notes: The difference between 'banks in operation' and 'banks in business' is the percentage of temporarily suspended banks. The numerator of the series 'banks in operation' is the number of banks in operations on 1 July 1929 minus the number of banks which since that date suspended operations (either temporarily or permanently), consolidated due to financial distress, liquidated voluntarily, or surrendered their charter after merging with another institution and plus the number of banks which since 1 July 1929 newly opened for business or reopened after temporarily suspending operations. The numerator of the series 'banks in business' equals 'banks in operation' plus the number of suspended banks yet to reopen. The denominator of both series is the number of banks in operation (which equals the number of banks in business) on 1 July 1929. For the 6th District, that number is 141. For the 8th District, that number is 169.
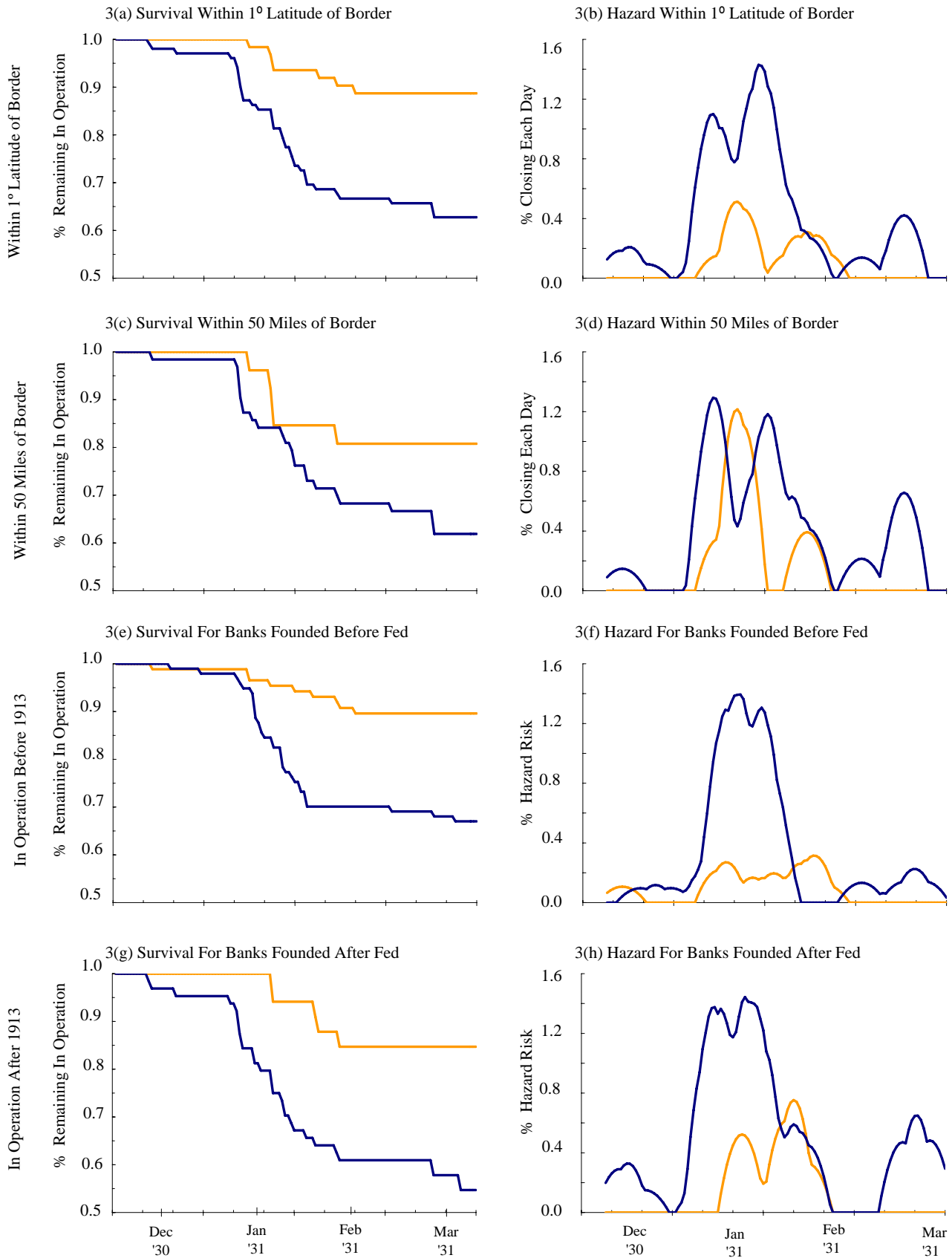
Source: See Section 3.

Figure 2

Survival and Hazard During the Banking Crises

Comparisons of 6th and 8th Districts

2(a) Survival During Fall 1930
Days After Caldwell's Closure, 7 November 1930

2(b) Hazard During Fall 1930
Days After Caldwell's Closure, 7 November 1930

6th District

8th District

2(c) Survival During Fall 1931
Days After Britain Abandoned Gold, 11 Sept. 1931

2(d) Hazard During Fall 1931
Days After Britain Abandons Gold, 11 Sept. 1931

2(e) Survival During Fall 1932
Days After Roosevelt's Election, 8 Nov.1932

2(f) Hazard During Fall 1932
Days After Roosevelt's Election, 8 Nov. 1932

Days Since Initiating Event

Days Since Initiating Event

Sources: See Section 2

Notes: Gray line indicates 6th District. Survival functions estimated using Kaplan-Meyer method. Hazard functions estimated by smoothing actual daily hazard rates (i.e. failures on day t/banks in operation on day t) with an Epinechov kernel filter with bandwith of 7 days
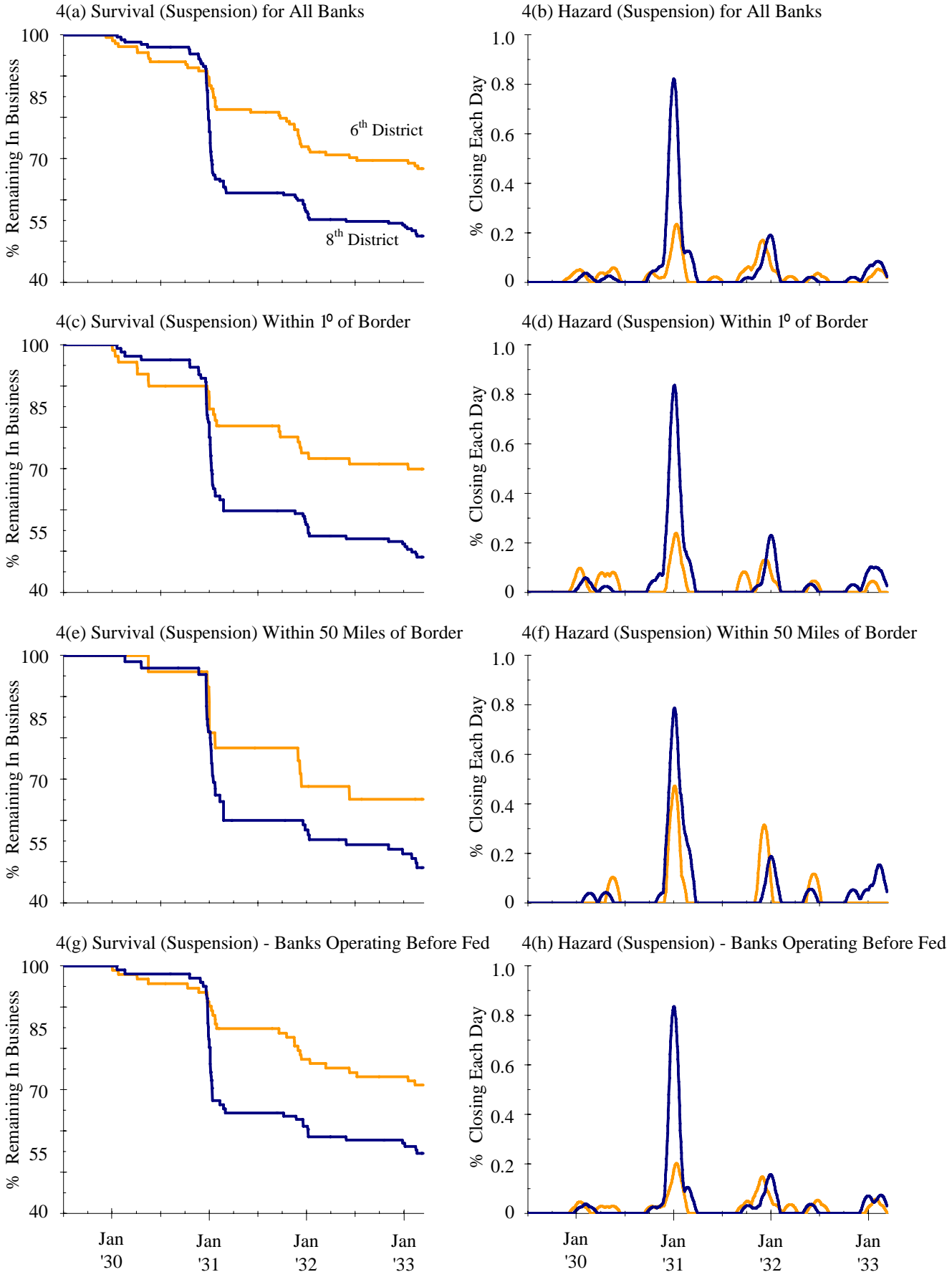
Figure 3
Survival and Hazard During the First Banking Panic, Principal Non-Parametric Controls
Days After Caldwell's Closure, 7 November 1930

3(a) Survival Within 1° Latitude of Border

3(b) Hazard Within 1° Latitude of Border

3(c) Survival Within 50 Miles of Border

3(d) Hazard Within 50 Miles of Border

3(e) Survival For Banks Founded Before Fed

3(f) Hazard For Banks Founded Before Fed

3(g) Survival For Banks Founded After Fed

3(h) Hazard For Banks Founded After Fed

Sources: See Section 2

Notes: Gray line depicts 6th District. Survival and hazard functions estimated as in Figure 2.

Figure 4
Bank Suspension in the 6th and 8th Federal Reserve Districts
Survival and Hazard Functions for Principal Comparison Groups

4(a) Survival (Suspension) for All Banks

4(b) Hazard (Suspension) for All Banks

4(c) Survival (Suspension) Within 1⁰ of Border

4(d) Hazard (Suspension) Within 1⁰ of Border

4(e) Survival (Suspension) Within 50 Miles of Border

4(f) Hazard (Suspension) Within 50 Miles of Border

4(g) Survival (Suspension) - Banks Operating Before Fed

4(h) Hazard (Suspension) - Banks Operating Before Fed

Notes: Gray line indicates 6th District. Hazard functions estimated using Epinechov kernel with bandwith of 28 days.

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