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 aid to ailing institutions. The St. Louis Fed adhered to the doctrine of real bills and eschewed expansionary initiatives. During the banking panic in the fall of 1930, the Atlanta Fed expanded credit available to the financial system and expedited lending to banks in need. The St. Louis Fed did not. Outcomes differed across districts. Banks in the 6th District survived the panic at a rate substantially higher than banks in the 8th District. The pattern suggests that monetary intervention reduced failure rates during panics. 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 Its leaders adhered to outdated doctrines and monitored misleading indicators of monetary conditions. The Board of Governors lacked leadership and could not coordinate policies amongst its disputatious districts. The gold standard fettered mechanisms of monetary policy (Barry Eichengreen, 1992).

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 crisis was 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. 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. 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 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 shocks 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

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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.

progresses through two 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. These methods directly address key questions concerning the collapse of the banking system during the early 1930s. Did Federal Reserve policies influence bank failure rates? Did monetary intervention mitigate banking panics? Did providing liquidity (or credibly committing to do so) reduce rates of bank suspension and liquidation? To each question, the answer is yes.

Our statistical methods indicate that discount lending helped banks survive banking panics. Section 4 examines the robustness of this result. It examines shocks, selection, and policies that might have influenced bank failure rates. Evidence indicates, however, that the plausible alternatives could not generate the patterns that appear in the data.

Section 5 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. Much of the scholarship on the Great Depression, including Friedman and Schwartz's monetarist hypothesis (1963) and Bernanke's credit crunch conjecture (1983), sees banking panics as an important cause of the contraction and a key to understanding the downturn's depth and length. If those scholars are correct, then the evidence presented in this essay indicates that the Federal Reserve may have missed an opportunity to alter the course of the contraction.

1. Data Sources

The extant evidence is insufficient for the investigation of events in Mississippi. No published data distinguishes banks lacking liquidity from banks suffering insolvency or banks that suspended payments temporarily from those that 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. The *Biennial Report of the Banking Department of the State of Mississippi* lacks information on individual operating banks.

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. The Division of Bank Operations form St. 6386b reports individual bank suspensions and their causes. Form St. 6386c reports changes in bank status such as reopenings of suspended institutions 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 data distinguishes between temporary and permanent closures of banks. A temporary *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. Permanent *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 (including suspensions and liquidations), all other possible changes in bank status (including mergers, consolidations forced by financial difficulties, and voluntary liquidations), multiple paths of contagion (including correspondent linkages and runs on banks), factors fundamental to the performance of the national 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

[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).

intentions of the two districts. So does Richard Gamble's in-house history of the Atlanta Fed (1989) and articles in depression-era newspapers and periodicals. The monthly bulletins and annual reports of the Reserve Banks also describe their policies and provide data demonstrating the implementation of their plans. Additional evidence of implementation comes from the weekly balance sheets of each Reserve Bank and *Banking and Monetary Statistics* (Board of Governors, 1943).

Three 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 the causes of bank suspensions. The second source is the narrative description of events contained within the biennial reports of Mississippi's state banking department. The third is articles in seven newspapers including 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 builds 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, in the fall of 1930, Mississippi experienced a panic of the type modeled by Diamond-Dybvig (1983), in which a sudden shift in depositors' perceptions about the safety of financial institutions triggered runs on banks, and depositors withdrew funds *en masse*. Third, Mississippi was economically homogenous, particularly in counties adjacent to the Federal Reserve district boundary.

2.1 Policy Regimes of the 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 and 8th Federal Reserve Districts 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 roughly in half. Counties lying north of 33 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 pursued a policy similar to Bagehot's Rule, a doctrine 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 banks 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 Federal Reserve branch in

[3] Bagehot's Law is named after Walter Bagehot, one of its earliest and most influential advocates. His classic explication of the doctrine appears in *Lombard Street* (Bagehot 1873). In the canonical version of Bagehot's Law, the lender of last resort charges a penalty rate, to discourage banks from relying on such assistance and to alleviate moral hazard. During the Great Depression, the Atlanta Fed did not charge a penalty rate.

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, and total Federal Reserve credit to member banks increased by more than $8,100,000 (Wicker, 1996, p. 54).

The Atlanta Fed continued to pursue supportive policies throughout the depression. At the nadir near New Years 1933, the Atlanta Fed 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 Atlanta Fed advocated monetary expansion. 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)."

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, and 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.

Figures 1 illuminates changes in discount lending during the banking panic in the fall of 1930. After the collapse of Caldwell, discounts of the 6th District rose rapidly, peaking at a level more than 40% higher than that before the crisis. Discounts of the 8th District fell gradually, as the extension of new discount loans slowed and existing discount loans expired. During the rest of the depression, discounts of the two districts generally moved in the same direction. In the fall of 1931, following Britain's departure from the gold standard, for example, both districts participated in the system-wide monetary contraction, and at the end of 1932, both districts expanded discount lending.

The last issue concerning Federal Reserve policy is how it affected non-member institutions. The preponderance of banks in Mississippi did not belong to the Federal Reserve System and could not directly access the Federal Reserve discount window. They could, however, discount eligible paper through and borrow funds from banking correspondents. All non-member institutions possessed correspondents which cleared checks, processed wire transfers, and provided other services that linked non-member institution to the wider financial system. Non-member institutions kept deposits at correspondent banks in reserve cities, and these deposits counted as a portion of the non-member's legal reserves. Non-members needing liquidity turned to their correspondents. The Federal Reserve encouraged (or discouraged) correspondents from providing liquidity by promising to loan (or withhold loans) from them in turn. In other words, the Federal Reserve controlled the liquidity of non-member institutions by influencing the willingness and ability of correspondents to extend credit.

2.2 Banking Crises

When, where, and whether banking panics occurred during the Great Depression has been the subject of debate. This section employs multiple independent sources (described in the preceding section) to document the panic that swept Mississippi at the end of 1930 when a sudden shift in depositors' perceptions about the safety 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 maintain cash flow suspended operations temporarily. Solvent institutions which could not bear the costs of the scramble for liquidity went out of business.

Events precipitating the panic began with the collapse of Caldwell and Company, the South's largest financial institution, on November 7, 1930. Bank failures initially spread through correspondent networks to institutions 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. 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 court decision 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 positions. 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, December 19, 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. Bank funs forced the closure of 49 institutions. Many additional 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 that remained in operation slowed the decline in deposits by 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. This panic was the only time in the twentieth century that numerous banks in Mississippi simultaneously held depositors to the thirty-day clause in their deposit contracts. At all other times in the last one hundred years, the preponderance of banks in the state allowed depositors to withdraw savings deposits at will. In January 1931, the number of bank runs fell. In February, the decline continued. The last bank to suspend operations due to deposit losses did so on March 2, 1931.

During this whirlwind of withdrawals, aggregate deposits at Mississippi's banks fell by more than 40%, and they remained at this lower level for the remainder of the depression. During the same period, banks liquidated roughly one-third of their assets. "The amount of paper held by the banks in the form of loans and discounts reached its low figure at the end of the year 1930 (Mississippi Banking Department, 1931, p. 4)." Resources remained near this nadir for the next two years.

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 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 Rule 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, since 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). Liquidity enables financial

institutions to satisfy the demands of depositors without unloading assets at panic prices. Since the Atlanta Fed implemented such a policy in a prompt, ample, and public manner, difference in outcomes between the 6th and 8th Districts (if any) should reveal the effectiveness (or ineffectiveness) of Atlanta's policies.

Non-panic periods serve as a control case which helps to test the homogeneity assumption underlying our analysis. Bagehot's Rule 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.[4] In addition, after the panic in the fall of 1930, the St. Louis Fed adopted policies resembling Atlanta. If policies mattered, we should see different outcomes when policies differed and similar outcomes when policies were the same.

2.5 Basic Patterns in the Data

Table 5 and Figure 2 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 2 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 2 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 2 shows that during the post-Caldwell panic, when policy regimes differed across districts, banks suspended operations (temporarily and permanently) at much higher rates

[4] 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 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.

in the 8th District. During later banking crises, when policies 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.

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 3 presents survival and hazard functions for all banks in Mississippi during the banking crisis in the fall of 1930. The time under analysis is restricted to the four months following the collapse of Caldwell and Company. 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 3, the gray lines depict the 6th District. The black lines depict the 8th District. Figures 3(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.

The remainder of Figure 3 demonstrates that differences in suspension rates across districts during the post-Caldwell panic cannot be attributed to fundamentals or selection. Figures 3(c) and (d) limit the

analysis to banks that operated within one degree latitude of the Federal Reserve district border.[5] 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.[6]

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.

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, 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 Rule, 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. Figures 4(e) and (f) limit the

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[5] 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 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.

[6] Limiting the band to banks within 50 miles of the border does not change this pattern, which persists even for arbitrarily 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.

analysis to banks established before 1913. Figures 4(g) and (h) limit the analysis to banks established after 1913. In each case, the pattern remains the same. The pattern also remains the same when we limit analysis to groups of banks with similar characteristics, such as longevity or stable management, or groups of banks operating in similar environments, such as cities or cotton-growing regions. Subpopulations which we have examined include state banks, non-member banks, member banks, national banks, banks in the western and eastern halves of the state, banks in operation for more or less years than the median age of all banks, banks with and without management changes between 1925 and 1929, 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. When the measure of distress is changed to liquidation, the inter-district differences in bank failure rates retain the same sign but increase in magnitude. The invariance of the pattern across measures of distress and across subpopulations defined by likely correlates with economic fundamentals and selected characteristics suggests that neither fundamentals nor selection drive our results.

We confirm the differences apparent in the pictures with the appropriate non-parametric tests for the equality of survivor functions. In all cases, the null hypothesis of the equality of the survival functions in the 6th and 8th can be rejected for the post-Caldwell panic. Similar hypothesis tests for the equality of survival functions following Britain's departure from the gold standard in the fall of 1931 and Roosevelt's election in the fall of 1932, when gold outflows forced the Federal Reserve to raise interest rates and bank failures increased throughout the nation, cannot reject the null hypothesis. This result corroborates the homogeneity assumption underlying our analysis, that banks in northern and southern Mississippi operated in similar economic environments, faced similar challenges, and experienced similar outcomes, except during the panic in the fall of 1930, when discount-lending policies differed between districts.

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 alterations in our non-parametric framework. A non-parametric test for this pattern, 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 (2003). 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 6 presents the results of this exercise. Column (1) reports the basic model. It contains indicator variables for the three surges in bank suspension in the fall of 1930, fall of 1931, and winter of 1933; for whether a bank operated within the 6th District; and for whether during each of three surges in bank suspensions a bank operated within the 6th District. The crisis indicators reveal to what extent liquidation rates rose above the baseline during each surge. 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 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 7 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 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.[7]

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

[7] 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.

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 (2003) 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.

Our model of fundamentals enables us to perform an additional exercise. Split the banks into two groups, those operating in the 6th District and those operating in the 8th District. For each group, use a parsimonious model to predict suspension rates between July 1929 and June 1930. Then, use the coefficients from that regression and characteristics in July 1930 to predict suspension rates during the next year.

Table 8 presents the results. Column (i) indicates the average predicted probability of suspension for 1929. Column (ii) indicates the actual suspension rate in 1929. The null hypothesis that the former equals the latter cannot be rejected, demonstrating that our model fits the data reasonably well. Column (iii) indicates the average predicted probability of suspension for 1930. The prediction for the 8th District changes little, because economic conditions and the balance sheets of banks in the 8th District changed little between July 1929 and July 1930. The prediction for the 6th District falls substantially, because the 6th Districts high failure rate for 1929 was driven by adverse shocks in particular counties. In 1930, fewer banks operate in those counties (in fact, almost all of the banks in those counties had failed). In the remainder of the district, economic conditions and the balance sheets of banks, and thus the predicted probability of failure, changed little between July 1929 and July 1930. Comparing Columns (iii) and (iv)

shows that a model of fundamentals that fits the data well for the first year of the depression does not predict events that occurred during the second year.

A more complicated model, where we define insolvency and illiquidity thresholds, and run a multinomial logistic regression predicting suspensions, liquidations, consolidations, and voluntary departures from the banking business, yields the same conclusion. The relationship between fundamentals and failures changes radically between the first and second years of the depression. During the first year of the depression, fundamentals were worse and failure rates were higher in the 6th District. During the second year of the depression, fundamentals remained much as they had before. Therefore, fundamentals explain neither the collapse of the banking system at the end of 1930 nor inter-district differences in bank failure rates.

4. Robustness

Our conclusion remains robust to a wide variety of alterations in our econometric framework. Parametric models employing different parametric assumptions, explanatory variables, and corrections for heterogeneity and serial correlation yield identical qualitative and similar quantitative results. Non-parametric analysis demonstrates that our results do not depend upon particular mathematical and statistical assumptions. Both types of analysis demonstrate that differences in the observed characteristics of banks and the environments in which they operated do not drive our results. Our results arise from patterns in the raw data that apparent from whatever perspective one views the evidence. Moreover, since all of our parametric models include corrections for unobserved heterogeneity and selection on unobserved characteristics and since our non-parametric models examine subpopulations defined by factors likely correlated with unobserved and/or selected characteristics, unobserved differences among banks are unlikely explanations for the patterns that appear in the data.

Several crucial issues, 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 be one which raised failure rates in the 8th District relative to the 6th District during the period beginning December 19, 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. The shock could not be one which we have controlled for both parametrically and non-parametrically. Such shocks include anything correlated with the characteristics of banks – such as size, age, services, financial characteristics, or Federal Reserve membership – or the economic or demographic

characteristics of the towns or counties in which banks operated – such as population density, number of manufacturing establishments, and cotton cultivation. These facts seem to rule out all possible climatic, cultural, agricultural, and industrial shocks, all of which would seem to be correlated with our controls or to operate on time-horizons longer than ten weeks.

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 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 difference in policy between the districts other than discount lending? One potential candidate is open-market purchases. But for both districts, discount lending far exceeded open market purchases.[8] Moreover, when the districts purchased eligible paper and government securities, they did so as an adjunct to discount lending, in order to provide favorable terms, expedite the process of converting assets to cash, and quickly provide liquidity to specific banks. The quantities of assets that the districts purchased were never large enough to influence macroeconomic aggregates such as the deflation or risk-free interest rate. Such macroeconomic aggregates neither differed

[8] Between September 7 and December 28, 1931, for example, the quantity of United States government securities possessed by the 8th District changed not at all and the quantity of possessed by the 6th District increased by only $4,000. At the same time, the quantity of discounts on the balance sheet of the two districts fell by roughly $4,000,000 and $7,000,000 respectively.

between districts nor varied substantially during the event. So, they cannot explain inter-district differences in bank survival rates.

Another potential candidate is bank standards and supervision. But, nine-out-of-ten banks in Mississippi were state chartered institutions. Mississippi applied identical standards and examination procedures in the northern and southern sections of the state. The *Biennial Report* of Mississippi's Banking Department, which lists the names of the examiners and the institutions which they examined, indicates that examiners rotated among institutions throughout the state. Mississippi's state banking codes required that banks being examined "at least twice each year at irregular intervals without prior notice, and with no bank to be examined by the same examiner twice in succession (Warburton, 1955, p. 15)." So, north/south differences in regulations and examination procedures did not exist.

Another potential candidate is bailouts and subsidies. But, neither the state government nor the Federal Reserve district banks provided such assistance, and no banks in Mississippi received assistance from the Reconstruction Finance Corporation until 1932. Affirmative evidence of the absence of subsidies and bailouts exists. The Board of Governors form St. 6386c contains a section that describes changes in financial structure and assistance received towards reopening. These forms indicate that no banks which reopened following the post-Caldwell panic received subsidies or changed their financial structures in any way. The Board of Governors form St. 6386b, which records bank suspensions, contains a section describing borrowings from the Federal Reserve and borrowing from the RFC and similar institutions, and these forms indicate that none of the state banks which closed their doors (temporarily or permanently) during the post-Caldwell panic held such loans.

Could the confounding factor be some other unmeasured shock or policy? 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, (iii) read the annual reports and monthly bulletins of the Federal Reserve 6th and 8th Districts, and (iv) scrutinized 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 described a shock to the economy or differences in policies (other than discount lending) which might have caused more banks to fail in the northern than in the southern 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.

What about selection? 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 of these

cases, banks likely to benefit from a supportive discount window 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.

The extant evidence, however, allays such concerns. First, when given the option to change districts in 1913, none of Mississippi's banks chose to do so. Second, statistical tests cannot reject null hypotheses that bank survival, failure, and establishment rates in the 6th District equaled those in the 8th District between 1916 and 1928, the pre-depression years for which we have data. Third, statistical tests cannot reject the null hypotheses that in 1929, banks possessed similar asset portfolios and similar numbers of correspondents in the 6th and 8th Districts.

Selection might have operated through other channels. Managers and depositors are also be mobile. Careful managers who worried about panics, foresaw the need for liquidity, and believed the 6th District would provide more liquidity than the 8th might have migrated to the 6th District. They may also have been better judges of credit, more efficient, and kept more cash on hand. Depositors might also have anticipated benefits from the 6th District's policies and have shifted funds towards the district that promised to provide liquidity. Either reaction might have made banks in the 6th District stronger than those in the 8th District. In this case, the efficacy of monetary intervention would be overstated.

The extant evidence, once again, allays such concerns. First, a sample of bank presidents, vice-presidents, managers, and cashiers drawn randomly from 50 banks (approximately 1/6 of those in Mississippi) for the years 1915, 1925, 1929, and 1930 shows no shifts of management between the 6th and 8th Districts. Second, Clark Warburton's study of banking in Mississippi found no significant shifts in distribution of deposits from 1915 through 1929. Throughout this period, roughly the same percentage of deposits was held by state banks, by failed banks, and by the five largest banks. The five largest institutions, for example, held 25.4% of the deposits in 1915 and 24.3% in 1929 (Warburton, 1955, pp. 31-36). Third, data from banks near the Federal Reserve District boundary shows no change in the quantity of deposits at banks in the 6th District relative to the 8th District between July 1929, just prior to the suspension of deposit insurance, and July 1930, just after Mississippi discontinued its deposit insurance system, a point in time when the danger of bank runs, and thus liquidity assistance, increased suddenly and substantially. Fourth, deposits did not flow from the St. Louis to the Atlanta District in the wake of the post-Caldwell panic. In fact, banks in the 8th District near the border lost fewer deposits than

banks farther from the border, all else held equal, and for banks operating near the border, average deposits at banks which remained in business in the 8th District rose relative to average deposits at banks which remained in business in the 6th District. These patterns are the opposite of what one would expect, if proximity to the border proximity induced the flight of deposits.

Several factors explain the absence of selection. One, the public may not have been aware of policy differences between the 6th and 8th Districts. The St. Louis Fed did not advertise its opposition to intervention or the way in which it operated the discount window. Moreover, since no panics occurred in the 8th District between the founding of the Fed and the Great Depression, the St. Louis Fed never demonstrated the actions that it would take in such an event.

Two, depositors and bankers may have underestimated the likelihood and severity of a potential banking panic, because severe banking panics had not occurred in Mississippi or on a national scale for a generation, and because during the Roaring '20s, few people expected the onset of a catastrophic contraction. Thus, depositors and bankers may not have anticipated the need for a lender of last resort.

Three, the public may not have anticipated beneficial effects from monetary intervention. Debates over the effectiveness of the policy have raged for at least two centuries, dating back to Hume's writings on the topic and continuing vigorously today. The benefits of the approach were disputed during the 1920s. Leading academics, bankers, businessmen, and policy makers, including much of the leadership of the Federal Reserve System, believed that discount lending would exacerbate, rather than alleviate, the situation. It is unclear what depositors believed about the topic or if they had any beliefs at all.[9]

Four, from 1914 until 1930, Mississippi operated a statewide deposit insurance system. Its existence may have rendered the Atlanta Fed's assistance superfluous and may also have reduced depositors' attention to the issue. Mississippi's Superintendent of Banking believed this to be the case. He repeatedly wrote that deposit insurance discouraged depositor monitoring, and therefore, encouraged mismanagement. For this reason, Mississippi discontinued its deposit insurance system on March 13, 1930 (Mississippi Banking Department, 1929 p. 4-9 and 1931 p. 4-5).

Fifth, even if the public had possessed perfect foresight, shifting from one district to another may not have been in their best interest. Bank managers' ability to attract deposits depended on their standing within their community and their reputation for honesty, reliability, and financial acumen. Their ability to earn profits depended on personal knowledge of individuals and businesses and their success at using that knowledge to assess the risks and returns of extending credit. Moving to a new location meant

[9] Perhaps we should point out that even after the fact, the public may not have detected the beneficial effects of discount lending. After all, economists employing evidence, techniques, and theories far beyond those available to ordinary individuals have debated the issue for more than 70 years without approaching a consensus.

abandoning the informational and reputational advantages that enabled individuals to operate banks profitably. Shifting deposits to distant towns also entailed disadvantages. Holding deposits at a distance made it more difficult to monitor the health of one's bank and made it more difficult to withdraw funds during a panic, when individuals at the head of the line received the full value of their deposits, and those at the end of the line lost a large portion of their life savings.

A final type of evidence completes the case. Three sources report the quality of assets at failed banks. First, the Board of Governors St. 6386 forms indicate examiners *ex-ante* (i.e. before the suspension) assessment of the quality of assets at suspended banks. Examiners reported the quality of assets at banks to be *good*, and neither to have been a primary nor a contributing cause of the suspension, or *problematic* (i.e. either slow, doubtful, or worthless) and to have been either a primary or contributing cause of the suspension. Table 9 presents this information. It shows that the quality of assets at institutions that suspended operations in the 8th District was better than the quality in the 6th District. During the post-Caldwell panic, the majority of the banks that suspended operations in the 8th District had portfolios consisting predominantly of good assets. Second, Clark Warburton's study, *Deposit Guaranty in Mississippi*, provides evidence on recoveries from the assets of failed banks (Warburton, 1955, pp. 41-51 and Tables 11 through 13). From 1916 to March 1930, when Mississippi guaranteed bank deposits, recoveries averaged just over 51.5% (i.e. on average, assets with a book value of $100.00 yielded $51.50). Recoveries from the assets of banks that failed during the post-Caldwell panic averaged 70.4%. Third, the *Biennial Report* of Mississippi's Banking Department (Mississippi Banking Department, 1929, 1930, and 1931, Tables F and G) records information on recoveries from banks in liquidation. For 39 banks that failed during the post-Caldwell panic, data exists on (a) recoveries from the initial sale of assets shortly following suspension (these sales were supposed to be of assets that yielded nearly book value or better), (b) the initial estimate of the value of the remaining assets, and (c) eventual recoveries from sales of the remaining assets during the years 1931 through 1933. After the initial liquidation, examiners estimated the total value of the assets remaining from banks in the 6th District to be $1,022,025. By the end of 1933, recoveries from the sale of those assets equaled $1,014,735 (i.e. 99.3% of their estimated value). After the initial liquidation, examiners estimated the total value of the assets remaining from banks in the 8th District to be $2,738,760. By the end of 1933, recoveries from the sale of those assets equaled $2,179,231 (i.e. 79.6% of their estimated value).

Together, the sources show banks which failed in the 8th District, where the Federal Reserved did not act as a lender of last resort, were healthier than banks which failed in the 6th District, where the Federal Reserve strove to expand the supply of credit. Banks which failed during the panic, when

liquidity forced banks with cash flow problems out of business, were healthier than banks which failed when liquidity was abundant. After the panic, the value of bank assets (primarily loans to local businesses, consumers, and farmers) fell more in the 8th District, where more and healthier banks failed, than the 6th District, where prompt intervention by the Federal Reserve enabled many banks to weather the storm.

5. Discussion

The multiple sources and methods employed in the previous sections 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, bank failure rates would have been lower.

The quasi-experimental structure of our study, which frees our estimates from difficulties of inference that typically trouble studies of firms in complex, changing, and endogenous economic environments, strengthens our conclusion. Our methods are reliable for the first 18 months of the depression, when the majority of Mississippi's bank failures occurred and when 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 downturn's influence on Mississippi's economy had been limited. Widespread withdrawals had not yet drained the financial system of funds. 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.

The limitations of our quasi-experimental 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.[10]

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

[10] Mississippi's experience provides an accurate representation of the banking pandemic during the first 18 months of the depression, when large numbers of banks failed throughout the South and Midwest, but may not be representative of events which occurred in northern industrial cities at later times, such as the panics Chicago 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 these periods, our findings – that the preponderance of banks failed for fundamental reasons – are consistent with the conclusions of Temin, White, Calomiris, and Mason.

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 banks in Mississippi were medium-to-small-sized state-chartered institutions. Their customers tended to be individuals, farmers, and businesses lacking 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. The widespread reporting of the bank failures – including incessant 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.

Evidence that the Atlanta Fed's policies influenced broader business conditions comes from several sources. Economic historians have shown that the depression followed a unique course in the 6th Federal Reserve District. The 6th District experienced a contraction during 1929 and 1930 as sharp and severe as the hardest hit Federal Reserve Districts, but the 6th District's recovery began earlier and progressed swifter than anywhere else in the United States. The 6th District's recovery began during the first quarter of 1931, which was the quarter that the Atlanta Fed embarked on its efforts to extend discount

loans to banks and expand the supply of credit.[11] During that quarter, the contraction accelerated in all other districts, and by 1933, the 6th District's economy was the healthiest in the nation. This pattern appears in data on employment and unemployment (John Wallis, 1989) and indices of industrial production (Joshua Sundstrom and William Rosenbloom, 1999). The pattern also appears in data on banks. In the 6th District, depositors kept more of their savings in the financial system; bankers held lower excess reserves and made more loans; and businesses borrowed more money. Scholars refers to the pattern as the Southern Paradox, since they have failed to find any features of the Southern economy that can explain the South's sudden, singular recovery (Robert Margo, 1993).

Several strands of the literature suggest that if concerted action by the entire Federal Reserve System had stemmed the banking panics, the depression may have been shorter and shallower for the nation as a whole. First, many macroeconomic models highlight a connection between the onset of banking panics in the fall of 1930 and the depression's acceleration at that time. 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).

Second, monetarists such as Friedman and Schwartz (1963) emphasize the correlation between the onset of banking panics in the fall of 1930 and the collapse of the monetary system. The initial panic marks the point where the money multiplier, the deposit-currency ratio, the deposit-reserve ratio, and all measures of the money supply plummeted. Their decline from November 1930 to March 1933 was the most rapid and prolonged in American economic history. Their decline lowered the price level, raised real wages and interest rates, and through those and other channels, reduced both aggregate supply and demand.

Was concerted action feasible? The weight of the evidence suggests the Federal Reserve System could have done more to combat the initial wave of banking panics in the fall of 1930. At that time, the Federal Reserve knew the theoretical justification and operational procedures for intervening to halt banking panics. Bagehot's Rule predated the doctrine of real bills and was standard operating procedure at

[11] Eichengreen and Jefferey Sachs (1985) show that the same relationship existed between monetary policy and economic recovery in all industrialized nations during the 1930s. Recovery began during the quarter when monetary expansion began, typically after nations abandoned the gold standard to reclaim control over their monetary base.

central banks throughout Europe including the Bank of England. The Federal Reserve also had the ability to act as a lender of last resort. Gold stocks were large. Gold was flowing into the country. Credit could have been extended to banks without endangering the exchange-rate regime.

The policies followed by the Atlanta Fed required the commitment of few resources. The extra manpower required to extend emergency loans, the forms that had to be filled out, and the fuel required to move cash from the Fed to commercial banks was trivial. The financial costs were also limited. The Federal Reserve Bank of Atlanta was not saddled with large liabilities like the government incurred during the Savings and Loan Crisis of the 1980s. In contrast, the Atlanta Fed profited by extending emergency credit, because the loans were repaid. Atlanta's credibility may have been one reason for the low cost of its policies. In expectational panics of the Diamond-Dybvig type, a lender of last resort that credibly commits to fulfilling its mission may expend fewer resources than a central bank that makes a belated and halfhearted attempt to halt a panic. Atlanta's experience demonstrates, in other words, that the costs of action are sometimes less than the costs of inaction.

In sum, the evidence presented in this essay indicates that the Federal Reserve System missed an opportunity to take inexpensive actions which would have stemmed the initial wave of banking panic in the fall of 1930. The broader implications of this finding remain to be determined. To what extent did Atlanta's intervention influenced the fate of firms and farms or the lending behavior of banks? To what extent could the Federal Reserve System as a whole follow Atlanta's example? Would mitigating the initial wave of panics have prevented the panics which came later? What were the relative strengths of the money and credit channels for the transmission of monetary policy? All of these inquiries remain open questions. The evidence presented in the preceding paragraphs is only suggestive.

However, we believe the approach that we pioneer – applying quasi-experimental methods to panels of data on banks and businesses exposed to different monetary regimes along Federal Reserve district borders – can be extended to answer these and other questions concerning monetary policy, financial intermediation, and the causes, consequences, and possibilities of preventing Great Depression.

Table 1

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

			State Banks			National Banks		
Begin 1 July		End 30 June	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 1.

Table 2
Characteristics of Banks in Mississippi, 1 July 1929

	All Banks			6th Federal Reserve District						8th Federal Reserve District					
				All 6th			1º Border			All 8th			1º Border		
# of Banks	310			141			76			169			112		
	Median	Mean	SD	Median	Mean	SD	Median	Mean	SD	Median	Mean	SD	Median	Mean	SD
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
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
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
Charters															
State Bank		0.89	0.32		0.85	0.36		0.88	0.33		0.92	0.28		0.90	0.30
Federal Reserve Member		0.12	0.33		0.15	0.36		0.12	0.33		0.10	0.30		0.12	0.32
Age															
Years in Operation	23	22.4	13.4	24	23.2	12.3	24.5	24.0	12.7	20.5	21.8	14.2	21	21.9	14.9
% Operating Before Fed		0.64	0.48		0.69	0.46		0.72	0.45		0.60	0.49		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

Sources: See Section 1.

Table 3
Characteristics of Counties in Mississippi, 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	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
(1)	Population (1,000s)	24.5	14.4	22.4	14.4	28.2	17.7	26.8	14.2	30.4	17.2
(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: See Section 1.

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 (a)	Other and unsecured (b)	US Govt (a)	Eligible (c)	Ineligible (d)	(e)
1929	Atlanta (6th)	29,347	107	21,357	2,573	5,310	--	--
	St. Louis (8th)	17,938	109	2,908	12,446	2,475	--	--
1933	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-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 7
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

Table 8
Fundamentals and Failures Before and During the Panic Period
Predictions from Probit of Suspension on Bank and County Characteristics

	1929		1930	
	Predicted (i)	Actual (ii)	Predicted (iii)	Actual (iv)
6th District	7.1 %	7.1 %	4.5 %	14.2 %
8th District	3.0 %	3.0 %	3.0 %	39.5 %

Table 9
Asset Quality at Suspended Banks
Mississippi, January 1929 through March 1933

			Percent Good	Percent Problematic
(1)	6th District	Panic	23.1	76.9
(2)		Non-Panic	8.3	91.7
(3)	8th District	Panic	53.4	46.6
(4)		Non-Panic	25.0	75.0

Note: Rows (1) and (3) present figures for all banks suspending during October, November, and December 1930 and January, February, March 1931. Rows (2) and (4) present figures for banks suspending operations in all other months from January 1929 through March 1933. Rows sum to 100 percent. Columns indicate the percentage of suspended banks in each district in each period whose assets were judged by examiners to be *good*, and thus, neither to have been a primary nor a contributing cause of the suspension, and *problematic* (i.e. either slow, doubtful, or worthless) and to have been either a primary or contributing cause of the suspension. Source: National Archives and Records Administration, Record Group 82. See Richardson 2005 for details.

Figure 1
Discount Response After the Collapse of Caldwell
Aggregate Discounts Each Week as a Percent of Initial Level

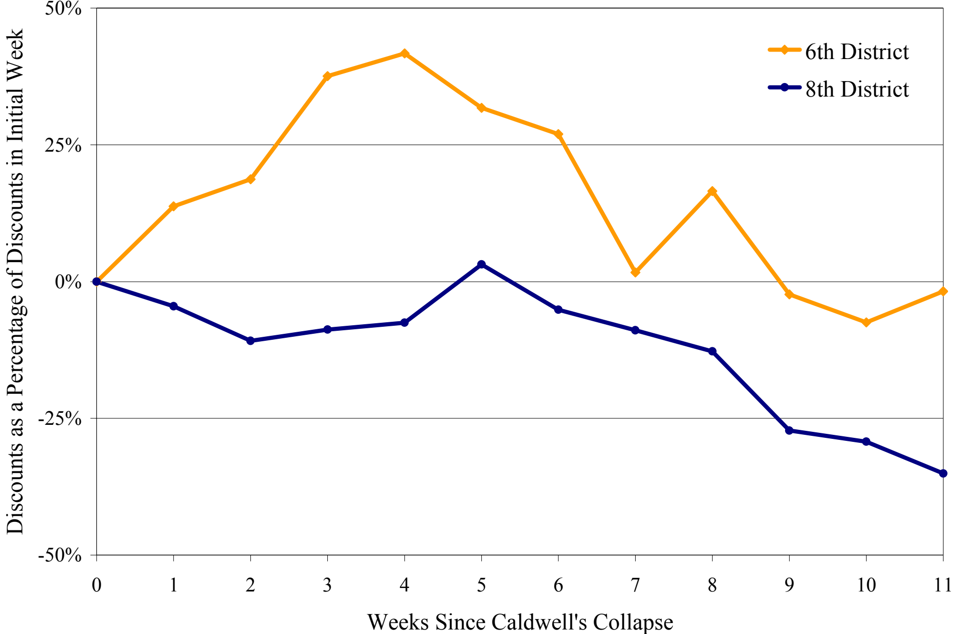
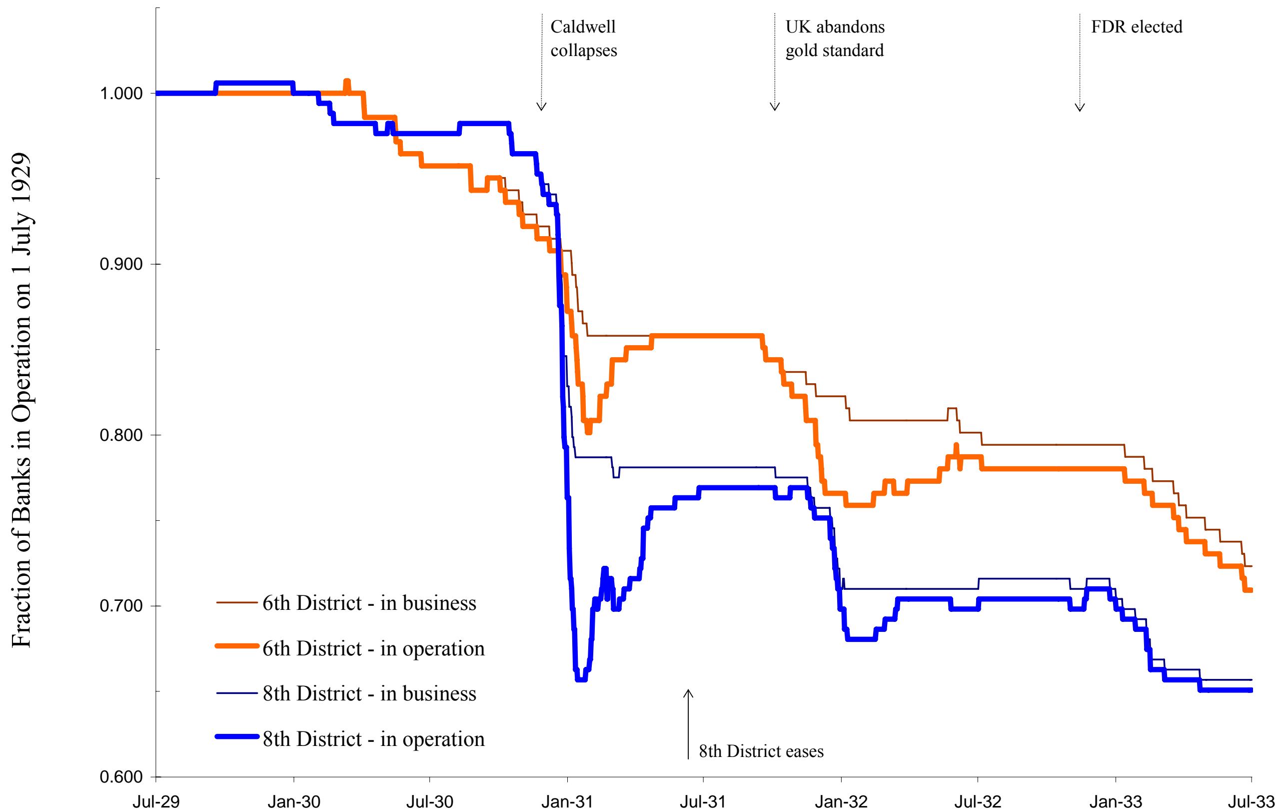


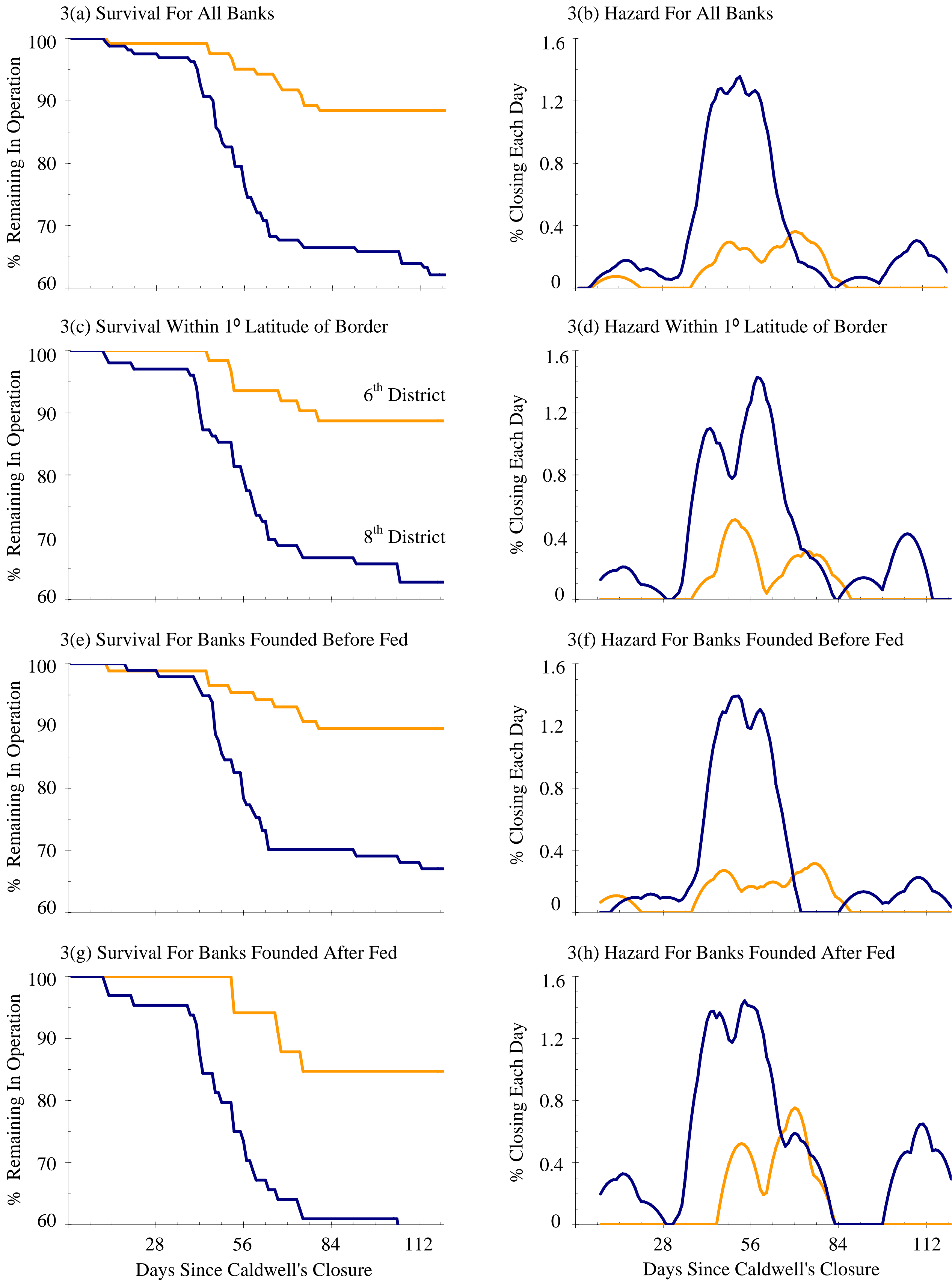
Figure 2
Percentage of Banks in Business and in Operations in the 6th and 8th Federal Reserve Districts
Mississippi, July 1929 to June 1933



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.

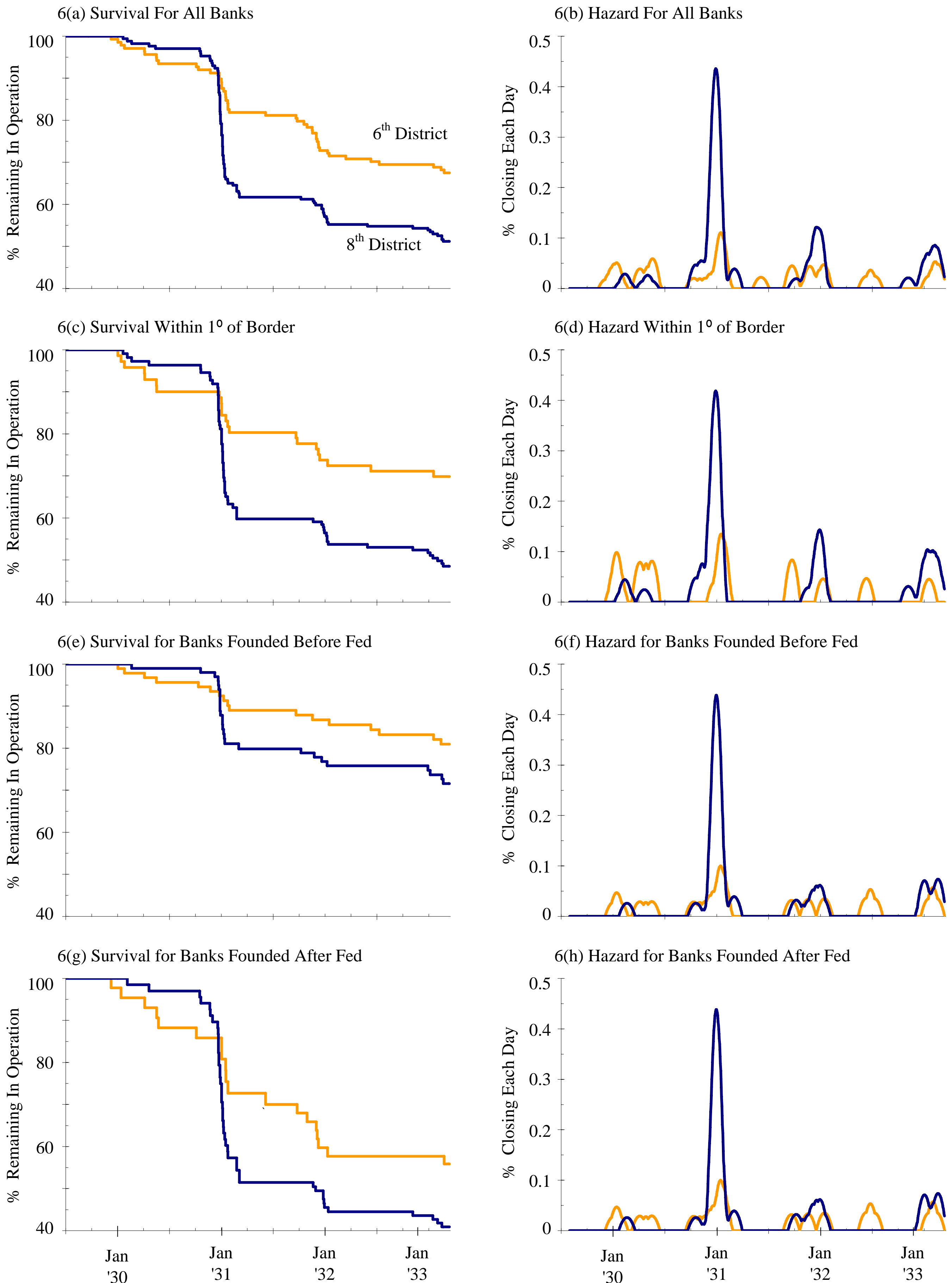
Source: See Section 1.

Figure 3
Survival and Hazard During the Banking Panic in 1930
Principal Non-Parametric Controls



Note: Gray line depicts 6th District. Black line depicts the 8th District.

Figure 4
Bank Suspension July 1929 through March 1933
Non-Parametric Estimates and Controls



Notes: Gray line indicates 6th District. Black line indicates 8th District.

Bibliography

Anderson, Clay J. *A Half-Century of Federal Reserve Policymaking, 1914-1964*. Philadelphia: Federal Reserve Bank of Philadelphia, 1965.

Bagehot, Walter. *Lombard Street: A Description of the Money Market*. New York: Scriber, Armstrong and Company, 1873.

Bernanke, B. S. "Nonmonetary Effects of the Financial Crisis in the Propagation of the Great Depression." *American Economic Review*, June 1983, (73), pp. 257-276.

Board of Governors of the Federal Reserve System. *Annual Report*. Washington, D.C.: Government Printing Office. Various dates 1928 to 1933.

----- *Banking and Monetary Statistics, 1914-1941*. Washington, D.C.: Federal Reserve System, 1943.

Bradstreet's Weekly. New York: Bradstreet Company, various issues.

Calomiris, Charles W. and Joseph R. Mason. "Contagion and Bank Failures During The Great Depression: The June 1932 Chicago Banking Panic." *American Economic Review,* December 1997, *87(*5), pp. 863-883.

----- "Fundamentals, Panics, and Bank Distress During the Depression." *American Economic Review*, December 2003, *93*(5): pp. 1615-1646.

Carlson, Mark. "Are Branch Banks Better Survivors? Evidence from the Depression Era." *Economic Inquiry*, January 2004, (42), pp. 111-126

Cecchetti, Stephen G and Karras, Georgios. "Sources of Output Fluctuations during the Interwar Period: Further Evidence on the Causes of the Great Depression." *The Review of Economics and Statistics*, 1994, 76(1): pp. 80-102

Chandler, Lester Vernon. *American Monetary Policy 1928-1941*. Harper and Row Publishers, 1971.

Christiano, Lawrence J., Roberto Motto, and Massimo Rostagno. "The Great Depression and the Friedman-Schwartz Hypothesis," *Working Paper 0318, Federal Reserve Bank of Cleveland*. 2004.

Clark, Lawrence E. *Central Banking Under the Federal Reserve System*. New York: Macmillan, 1935.

Commercial and Financial Chronicle. New York: William B. Dana Company. Various issues.

Diamond, Douglas W. and Philip H. Dybvig. "Bank Runs, Deposit Insurance, & Liquidity," *Journal of Political Economy*, 1983, Vol. 91, pp. 401-419.

Dun's Review: A Weekly Survey of Business Conditions in the United States and Canada. R.G. Dun and Company, various issues 1928 to 1935.

Eichengreen, Barry. *Golden Fetters*. New York: Oxford University Press, 1992.

----- and Jeffrey Sachs. "Exchange Rates and Economic Recovery in the 1930s." *Journal of Economic History*, Vol. 45, No. 4 (Dec., 1985), pp. 925-946.

Friedman, Milton and Anna J. Schwartz. *A Monetary History of the United States, 1867-1960*. Princeton:

Princeton University Press for the National Bureau of Economic Research. 1963.

Gamble, Richard. *A History of the Federal Reserve Bank of Atlanta, 1914-1989*. Federal Reserve Bank of Atlanta, 1989.

Goldenweiser, Emanuel A. *American Monetary Policy*. New York: McGraw-Hill for the Committee on Economic Development. 1951.

Hardy, Charles O. *Credit Policies of the Federal Reserve System*. Washington, D.C.: The Brookings Institution, 1932.

Historical, Demographic, Economic, and Social Data: The United States, 1790-1970. Intrauniversity Consortium for Political and Social Research Study # 3. Ann Arbor, MI: University of Michigan and ICPSR.

Jacklin, C. and Bhattacharya, S. 1988. "Distinguishing Panics and Information-Based Bank Runs: Welfare Policy Implications." *Journal of Political Economy*, June 1988, (96), pp. 568-592.

Margo, Robert A. "Employment and Unemployment during the 1930s." *Journal of Economic Perspectives*, Volume 7, Number 2, Spring 1993, pp. 41-59.

Martin, Antoine. "Liquidity Provision vs. Deposition Insurance: Preventing Bank Panics Without Moral Hazard." RWP 01-05. Federal Reserve Bank of Kansas City, September 2004.

McFerrin, J. B. 1969. *Caldwell and Company*. North Carolina University Press. 1939.

Meltzer, Allan H. "Monetary and Other Explanations for the Start of the Great Depression." Jo*urnal of Monetary Economics* 2 (1976): 455-72.

----- *A History of the Federal Reserve, Volume 1, 1913-1951*. Chicago: University of Chicago Press, 2003.

Mississippi Banking Department. *Biennial Report of the Banking Department of the State of Mississippi*. Various issues 1916 to 1939.

Mitchener, Kris. "Are Prudential Supervision and Regulation Pillars of Financial Stability? Evidence from the Great Depression." Leavey Business School Working Paper 03/04-06-WP. 2004.

Moore, Carl H. *The Federal Reserve System: a history of the first 75 years*. McFarland and Company, Inc, 1990.

Rand-McNally Bankers' Directory. Rand McNally: Chicago. Various issues 1929 through July 1935.

Richardson, Gary. "Categories and Causes of Bank Distress, 1929 to 1933, New Data from the Archives of the Board of Governors." UC Irvine Mimeo, 2004.

----- "The Central Subject File of the Federal Reserve Board of Governors, 1913 to 1954: An Archival Survey." *Journal of Financial History* (expected spring 2006).

Richardson, Gary and William Troost. "Monetary Intervention Mitigated Banking Panics During the Great Depression: Additional Evidence and Robustness Checks." UC Irvine Mimeo, 2005.

Romer, Christina. "The Nation in Depression." *The Journal of Economic Perspectives.* Vol 7, No. 2 (Spring, 1993), pp. 19-39.

Romer, Christina and David Romer. "Does Monetary Policy Matter? A New Test in the Spirit of Friedman and Schwartz." In Olivier Blanchard and Stanley Fischer, eds., *NBER Macroeconomics Annual*, Cambridge MA: MIT Press. 1989.

Rosenbloom, Joshua and William Sundstrom. "The Sources of Regional Variation in the Severity of the Great Depression: Evidence from U.S. Manufacturing, 1919-1937." *Journal of Economic History* 59, September 1999, pp. 714-747.

Thomas, Lloyd B. *Money, Banking, and Financial Markets*. New York: Thomson, South-Western. 2005

Temin, Peter. *Did Monetary Forces Cause the Great Depression?* New York: W.W. Norton, 1976.

---- *Lessons from the Great Depression*. Cambridge, MA: MIT Press, 1989.

Warburton, Clark. *Deposit Guaranty in Mississippi*. Manuscript, Division of Research and Statistics, Federal Reserve Deposit Corporation, 1955.

Wallis, John J. "Employment During the Great Depression: New Data and Hypotheses." *Explorations in Economic History*, January 1989, Volume 26, pp. 45-72.

Westerfield, Ray B. Marginal Collateral to Discounts at the Federal Reserve Banks. *American Economic Review*, Vol. 22, No. 1, March 1932, pp. 34-55.

Wheelock, David. "Member Bank Borrowing and the Fed's Contractionary Monetary Policy During the Great Depression." *Journal of Money, Credit and Banking* November 1990, (22) pp. 409-426.

-----*The Strategy and Consistency of Federal Reserve Monetary Policy, 1924-1933*. Cambridge University Press, 1991.

Whitney, Caroline. *Experiments in Credit Control, The Federal Reserve System*. New York: Columbia University Press, 1934.

Wicker, Elmus. *Federal Reserve Monetary Policy: 1917-1933*. New York: Random House, 1966.

-----*The Banking Panics of the Great Depression*. Cambridge: Cambridge University Press, 1996.