2009

Do Bank Bailouts Work? The Effect of Reconstruction Finance Corporation Aid During the Crisis of 1933

Katherine Bobroff
Scripps College

Do Bank Bailouts Work? The Effect of Reconstruction Finance Corporation Aid during the Crisis of 1933

Katherine Bobroff

Submitted to Scripps College in Partial Fulfillment of the Degree of Bachelor of Arts

Prof. Marc Weidenmier
marc.weidenmier@cmc.edu
(909) 607-8497

Prof. Patricia Dillon
pdillon@scrippscollege.edu
(909) 607-3398

April 24, 2009

Abstract

Do Bank Bailouts Work? The Effect of Reconstruction Finance Corporation Aid during the Crisis of 1933

Do bank bailouts work? Government aid initiatives implemented to stem the current crisis raise important questions about the role of monetary policy in preventing bank failures. The scale of this bailout program defies comparison with any other aid package implemented in the post-World War II period. Fortunately, the operations of the Reconstruction Finance Corporation (RFC) during the Great Depression provide a historical experiment to examine the effects of government rescue programs on financial institutions.

This paper examines the effects of the RFC's loan and preferred stock programs on bank failure rates during the crisis of 1933. Using a new database on Michigan banks, I employ survival analysis to examine the effectiveness of the RFC's loan program and preferred stock purchases on bank failure rates. My analysis suggests that the loan program increased the failure rates of banks during the crisis by increasing the indebtedness of financial institutions. Conversely, I find that the RFC's purchases of preferred stock increased the chances that a bank survived the financial crisis. Injections of capital helped repair the balance sheets of banks and restored confidence in the financial system. Ultimately, this historical experiment provides some insight into how government aid programs might curtail banking crises.

Introduction

The recent financial crisis raises serious questions about the role of monetary policy and regulation in managing banking crises. The failure of several important financial institutions, including Merrill Lynch and Lehman Brothers, demonstrates how the fall of a few key financial intermediaries can freeze credit markets. The waves of bank failures that occurred in the fall of 2008 illustrated that systemic turmoil threatens strong banks as well as weaker institutions. Indeed, many scholars believe that banking crises can have serious economic effects. Friedman and Schwartz (1963), for example, argue that bank failures extend economic downturns by reducing the money supply and decreasing the wealth of bank stockholders. Bernanke (1983), on the other hand, focuses on the economic costs of financial disintermediation.[1] He finds that bank failures reduce the supply of credit, which limits the ability of households and small businesses to borrow. Consequently, a financial crisis can significantly reduce aggregate demand.

Although the government has responded to the banking crisis by extending loans or buying stock in many beleaguered financial institutions, it is unclear whether these policies will be effective. Fortunately, history provides an experiment to examine the effects of a government rescue program on the health of financial institutions. The Reconstruction Finance Corporation (RFC) was a government-sponsored enterprise founded to stem bank failures and reduce the economic costs of financial disintermediation. The RFC was originally established to lend funds to troubled firms. However, after the crisis of 1933, the Corporation directly recapitalized banks by purchasing preferred stock. The program cost approximately $200 billion in current U.S.

[1] Disintermediation refers to the withdrawal of funds from intermediary financial institutions such as banks.

dollars (Lohr 2008). When the RFC ceased operations in the early 1950s, the government-sponsored entity sold its preferred stock and recovered the funds provided by taxpayers.

This paper examines the effects of the RFC's loan and preferred stock programs on bank failure rates during the crisis of 1933. Using a new database on Michigan banks collected from primary sources, I employ survival analysis to examine the effectiveness of the government's loan program and preferred stock purchases on bank survival and failure rates. Michigan banks were selected because Michigan's statewide banking crisis precipitated the national financial crisis of 1933 (Kennedy 1973). The prevalence of bank failures during this crisis provides a rich data set for my study, and illustrates the economic and historical importance of financial crises.

My analysis suggests that the government loan program increased the failure rates of banks during the crisis of 1933 by increasing the indebtedness of financial institutions. Conversely, I find that government purchases of preferred stock increased the chances that a bank survived the financial crisis. Injections of capital helped repair the balance sheets of banks and restored confidence in the financial system. Ultimately, I believe that this historical experiment provides some insight into the effects of the government loan and preferred stock programs in stemming the spread of a banking crisis.

Section I describes the RFC's aid programs during the Great Depression, as well as the banking crisis in Detroit. This is followed by a discussion of the role of the Detroit banking crisis in the March 1933 national bank holiday, the Emergency Banking Act of 1933, and the change in the RFC's mandate from lending to recapitalizing banks. Section II surveys the relevant literature, introducing the theoretical background for an empirical

model of bank failure. Section III tests whether the RFC reduced bank failure rates. Section IV discusses the implications of this historical experiment for the current economic crisis.

Section I: History of the Reconstruction Finance Corporation

Herbert Hoover established the Reconstruction Finance Corporation (RFC) on February 2, 1932[2]. The RFC was originally established to stimulate the economy by increasing liquidity in the financial system by loaning funds to troubled financial institutions. The RFC was an agency of the executive branch of the federal government that had the ability to increase its lending capacity and oversight powers by executive order. Its operations did not depend on Congressional approval (Mason 2003).

During the Great Depression, the RFC conducted four major aid programs: a loan program for financial institutions, a preferred stock program for financial institutions, a railroad loan program, and a commercial and industrial loan program[3]. The loan program for financial institutions was the first program initiated by the RFC. While the RFC charter permitted the Corporation to make loans with maturities of up to three years, most loans had maturities of less than six months. The short duration of the loans increased

[2] This history of the Reconstruction Finance Corporation is based on Mason (2001b).

[3] The RFC's railroad loan program, like its bank loan program, was part of the original RFC Act. However, unlike its loans to banks, the RFC's railroad loans did not need to be fully secured. The RFC also lent to railroads at below market rates. As a result of these lax lending polices, the RFC's railroad loan program was abused, and funds were used for the benefit of railroad company insiders (Mason 2001b).

The commercial and industrial loan program was the final economic stimulation program undertaken by the RFC during the Great Depression. Because the banks had ceased lending, the RFC made loans directly to businesses. The RFC encouraged banks to purchase the right to participate in commercial and industrial loans instead of originating the loans themselves in order to stimulate private sector lending.

However, during the Great Depression, consumers were not increasing their demand for goods or services. As a result, no businesses needed to invest in additional capacity. The commercial and industrial loan program therefore had little impact on the economy.

the RFC's influence over borrowers because the Corporation was prohibited from renewing loans if the directors failed to follow RFC guidelines.

The RFC used its loan program to gain control of the management of troubled banks. Institutions receiving loans were required to limit the compensation of directors, officers, and employees. Indeed, the RFC would not make or extend a loan to a bank whose workers received excessively generous compensation. The RFC also demanded that banks that received loans agreed to limit the salary of employees for the life of the loan.

RFC loans to banks charged a higher interest rate than loans from the Federal Reserve's discount window. The higher interest rates insured that the RFC did not crowd out private sector investment; instead, the RFC provided banks with necessary funds at a penalty rate.[4] The mandate that banks initiate the assistance process, not the government or RFC officials, further ensured that the RFC did not crowd out private investors.

The degree of control the RFC exercised over bank management, its high interest rates, and the fact that banks needed to initiate the lending process all discouraged financial institutions from using the RFC's loan program. According to James Olson (1972), the RFC's strict conditions brought "more problems than solutions." Most importantly, onerous collateral requirements required banks to use their most liquid assets to secure RFC funds. As a result, banks were unable to accommodate any emergency withdrawals by depositors (Olson 1977, Mason 2001a). Econometric analysis of the loan program also suggests that the program was too conservative to end bank failures (Mason 2001a).

[4] The loan program of the RFC recalls Bagehot's Rule, which suggests that very large loans at very high rates are the best remedy for distressed banks.

To correct the flaws of the loan program, the RFC moved from a policy designed primarily to increase liquidity to one directly addressing the shortage of bank capital. On March 9, 1933, Congress passed the Emergency Banking Relief Act, altering the original mandate of the RFC to permit the government-sponsored entity to purchase preferred stock in financial institutions.[5] RFC preferred stock was senior to common stock upon liquidation of a bank. After the issuance of the RFC's preferred stock, all other stock dividends were limited. The bank's remaining earnings were placed in a fund which would eventually be used to buy back the RFC's preferred stock. Finally, RFC preferred stock carried voting rights that gave it the power to institute changes that would increase the solvency and profitability of a bank.

The RFC's control of financial institutions through the preferred stock program discouraged banks from participating. Banks were also worried that participating in the aid program would make them seem weak, causing depositors and shareholders to lose confidence and withdraw their funds from banks. As a result, widespread participation in the preferred stock program occurred only when the FDIC began backing the deposits in solvent banks[6]. Managers of strong and weak banks alike sold preferred stock to the RFC in order to protect the identities of the institutions which were too weak to join the FDIC without additional investment. As a result, the RFC eventually owned more than one-third of the capital of American banks (Mason 2001b). Ultimately, econometric analysis

[5] Emergency Banking Relief Act, Section 304. 73rd Congress, 1933.

[6] According to Jesse Jones (1951), the chairman of the RFC, more than 5,000 banks which had previously claimed to be solvent "required considerable added capital to make them [sufficiently] sound" to join the FDIC (p. 27). Jones personally appealed to the managers of all banks to join the RFC's stock program "so that depositors would not be induced to switch out of …banks when their names were published" (p. 26-27). Thanks to the preferred stock program, the weaker banks were adequately recapitalized and all but 141 of approximately 14,500 American banks joined the FDIC in 1934 (FDIC).

suggests that recapitalizing the banks stabilized the banking sector, although the program did not increase lending (Mason 2001a).

The promising programs and immense resources of the RFC subjected the agency to political pressure and public scrutiny. State and federal politicians, recognizing the benefits of RFC aid, often pressured the government-sponsored enterprise to grant assistance to their constituents. Concerns about the RFC's accountability led to an amendment publicizing the names of its aid beneficiaries. Overall, records of the aid distributed by the RFC suggest the Corporation was unbiased in its lending policies (Mason 2003). Political bias was mitigated by three main factors. First, the loans made by the RFC to financial institutions had to be fully and adequately secured.[7] This restriction was also incorporated into the RFC's credit and capital programs, which ensured that aid recipients were good candidates for recovery. Second, the RFC was funded as a government-owned corporation with an initial appropriation from Congress and capital subsidies from the Treasury. The managers of the RFC relied upon this capital base rather than regular Congressional appropriations, which freed the RFC's managers from political pressure. Finally, RFC aid decisions were made at the regional level; each region's field office was largely independent from the others and immune to political influences.

A notable exception to the RFC's usual political independence occurred in February 1933 when Michigan Senator James J. Couzens pressured the RFC to lend to the Guardian Detroit Bank. The Guardian Detroit Bank was an important local bank holding company, and the RFC offered aid on the condition that Henry Ford agreed to

[7] The RFC did not specify the level of collateral that was necessary and only its staff could evaluate whether a bank had sufficient assets to secure a loan (Mason 2001b).

keep his personal and corporate deposits in the system. At the time, Ford's Guardian deposits totaled approximately $32.5 million (Awalt 1969). Ultimately, Ford rejected the conditions of the RFC's loan, precipitating a panic across Michigan and the rest of the country (Mason 2003, Butkiewicz 1995).

Banking Crisis of 1933

One prominent feature of the Great Depression is the incidence of repeated banking crises. Waves of bank failures occurred in December 1930, March 1931, and from November 1932 to February 1933. Friedman and Schwartz (1963) and White (1984) attribute the Crisis of 1930 to a decline in asset values after the post-World War I boom. The banks that failed during this crisis were similar to banks that failed during the 1920s. White (1984) suggests that the 1930 bank failures were simply the result of systemic weakness in the U.S. banking system, which depended on smaller independent banks rather than larger branching financial institutions.

Following the Crisis of 1930, Friedman and Schwartz (1963) note an improvement in macroeconomic indicators. However, the Federal Reserve reduced the availability of credit, keeping the money supply at its December 1930 level. In March, a second banking crisis began; this crisis was worsened by adverse economic developments in Europe.

From November 1932 to February 1933, banking crises occurred or were narrowly avoided through government interventions in Nevada, Wisconsin, Pennsylvania, Minnesota, Tennessee, Ohio, Arkansas, Alabama, Missouri, Maryland,

Louisiana, and Michigan[8]. The banking crisis in Michigan in February 1933 was of particular importance; indeed, Kennedy (1973) describes the Michigan banking crisis as a "prelude to the national banking disaster three weeks thereafter." The turmoil experienced in Michigan, the home of the American automobile industry, highlights the devastating effects of banking crises on the national economy.

In Detroit, significant amounts of money began draining from the largest banks with the onset of the Great Depression (Awalt 1969). The Detroit Bankers Company Group and the Union Guardian Group, the two major local bank holding companies, were under additional pressure because of their banks' heavy investment in local real estate (*New York Times* 1933a).[9] Between 1930 and February 1933, approximately $250 million was withdrawn from the First National Bank of Detroit; its local competitors, the Union Guardian Trust Company and the Guardian National Bank of Detroit, also sustained massive withdrawals. By January 1933, these banks lost between $2.5 million and $3 million in deposits each week (Awalt 1969).

To meet the demands of its depositors, the Guardian Trust Company requested additional funds from the RFC. Henry Ford had already attempted to bolster the bank's liquidity with a $7 million deposit. With deposits of approximately $32.5 million in the Guardian Banks and an additional $18 million in the Detroit Bankers' group, Ford had a

[8] Kennedy (1973) suggests that RFC loans initially allowed distressed banks to survive runs and temporarily stalled the "epidemic" of bank failures and panics. RFC loans and statewide banking holidays postponed the national banking crisis, but by February 1933 the Corporation could not meet the widespread demand for its funds.

[9] The Detroit Banks Company Group held the First National Bank of Detroit, Peoples' Wayne County Bank, Detroit Trust Company, eight suburban banks, and a local investment company, the First Detroit Company. The Union Guardian Group, also called the Ford Group, held the National Bank of Commerce, Guardian Union Trust Company, and other local banks (Awalt 350). First National Bank had book assets of $485,846,627 and 146 branch offices outside of its main office in Detroit at the time of the crisis; the Guardian Union Group held book assets of $432,797,434, nine bank components in Detroit and 11 bank branches in other Michigan cities (New York Times 1933b).

strong personal incentive to assist the local financial institutions (Awalt 1969). However, Ford's infusion of cash was not enough to sustain the Guardian Trust Company, and the bank requested an additional $60 million from the RFC, which was already lending to a number of local banks (*New York Times* 1933a; *New York Times* 1933c).

As the RFC considered the application of the Guardian Trust Company, Michigan Senator James Couzens argued that the bank lacked sufficient collateral to justify a loan[10] (*New York Times* 1933a). Couzens asked Henry Ford to grant the government a lien on his $7 million deposit, subordinating his claim to that of the RFC. Ford rejected this plan and an alternative plan requiring him to sign a personal note for the difference between the bank's collateral and the amount to be loaned by the RFC. Contemporary sources indicate that the Ford family and company had already advanced local banks $12 million and felt further efforts to save the banks were futile (Awalt 1969). Angered by the increasing pressure from government officials to personally recapitalize the struggling banks, Ford threatened to withdraw $25 million from the system at the first opportunity. Because such a withdrawal would cause a panic and threaten the survival of the local banks, Francis Awalt, acting Comptroller of the Currency at the US Treasury, felt compelled to prevent the national banks of Detroit from opening (Awalt 1969).

While Awalt recognized the need to keep all Michigan banks closed, he had no authority to do so. Instead, federal officials conferred with Michigan Governor William A. Comstock, who declared a statewide bank holiday on February 14, 1933. The holiday was originally intended to last eight days (Awalt 1969). However, the complex problems

[10] Couzens and Ford were former business partners in the Ford Motor Company. Couzens was also the chairman of the Senate committee responsible for investigating the RFC's loans, so his concerns were sufficient cause to block the Union Guardian Trust Company's aid package (New York Times 1933a).

plaguing the financial system prompted officials to extend the holiday until March 6 (Awalt 1969).

On February 18, soon after the Michigan bank holiday was declared, news circulated of a potential merger of the Guardian Trust Company and the Central Hanover Bank and Trust Company of New York. However, "local pride" motivated Detroit bankers to reject the assistance of the New York banks. At the same time, local rivalries prevented the mergers of Detroit banks (*New York Times* 1933d). On February 24, Henry Ford and his son Edsel, a Chairman of the Union Guardian Trust Company, offered to provide capital for two new banks to help liquidate the assets of the distressed banks. The aid of the Ford family was offered on the condition that they could select the new bank directors and officers (Awalt 1969). Initially, it seemed that the Ford offer, accompanied by an additional $20 million from New York bankers and an RFC pledge of $54 million, would allow depositors to access at least 35 percent of their deposits immediately (*Los Angeles Times* 1933). However, the New York bankers withdrew their offer because of concerns that they might not have clear legal claim to the failing banks' assets. The Ford family then withdrew its contribution, and the bailout plan failed (*New York Times* 1933e).

The effects of the financial crisis were felt acutely in the real economy during the weeks between the initial crisis in Detroit and President Roosevelt's inauguration. Detroit was threatened with a milk shortage and grocers were unable to sell food since they could not cash checks (*New York Times* 1933f; *New York Times* 1933g). Twenty-eight thousand local families supported by the Detroit Public Welfare Department were unable to use their aid checks from the city's accounts with the Guardian Group and First

National; Wayne County, Michigan was unable to support 10,000 ill and insane patients because its deposits in the bank groups were unavailable (*New York Times* 1933g). In late February, the Detroit Clearing House Association considered issuing scrip[11] to provide a medium of exchange during the banking emergency (*New York Times* 1933g).

The situation in Michigan and the concurrent exposure of scandalous business practices among New York bankers exacerbated financial instability across the country. The instability of the Detroit banking system worried officials in Washington, and the public withdrew its deposits from banks nationwide. Over 5,500 banks with deposits totaling $3.4 billion had temporarily closed by March 3. New York banks lost $200 million in gold and $150 million in currency; Chicago also lost $100 million in gold the same day (Awalt 1969). The Federal Reserve banks admitted "they could not support member banks indefinitely, especially those drained by the troubles in Michigan, Maryland, and Ohio" (Kennedy 1973). However, outgoing President Hoover was unwilling to declare a national bank holiday, so comptroller Awalt and other government officials pressured the governors of several states to declare state banking holidays and institute banking restrictions. On March 6, the first business day following President Roosevelt's inauguration, he declared a national bank holiday to try to stem the panic.

On March 9, Congress passed the Emergency Banking Relief Act drafted by Roosevelt and his advisors. The Act granted the federal government power over the

[11] Scrip is a certificate of indebtedness issued as currency or in lieu of money (Oxford English Dictionary).

banking system.[12] Under this act, the RFC could directly capitalize banks by purchasing preferred stock.

The Emergency Banking Act of 1933 helped resolve the crisis. During the holiday, government officials confirmed the solvency of national banks, which were gradually reopened to their depositors beginning March 13. Roosevelt's innovative banking plan and first "fireside chat" soothed depositors to such an extent that when banks reopened, deposits actually exceeded withdrawals. Five thousand three hundred eighty-seven of the Federal Reserve's 6,694 member banks reopened by the end of March; 7,654 of 11,455 state institutions also reopened during that time. By June, 91 percent of deposits in Federal Reserve member banks were available to the public. Confidence in the banking system encouraged stock market values to increase; the values of government bonds, corporate bonds and commodities also increased (Kennedy 1973).

After successfully reopening the first set of banks, Roosevelt's administration addressed the long-term capital needs of the banking system. Through investments made by local businessmen and the RFC, the government engineered the direct recapitalization of certain weak banks. The RFC invested more than $1.2 billion in over 6,000 institutions during its 18 years of operations.[13] Ultimately, the agency lost only $13.7 million and only 206 of the banks which received RFC preferred stock were later forced to close (Kennedy 1973).[14]

---

[12] The Act also contained provisions for reorganizing national banks and issuing preferred stock for banks. It formalized lending by the Federal Reserve to banks, and created a Presidential discretionary fund of $2,000,000 to help carry out the Act.

[13] Equivalent to approximately $19.5 billion in the year 2008 (Officer, 2009).

[14] Equivalent to approximately $227 million in the year 2008 (Officer, 2009).

In Detroit, the RFC orchestrated a "Spokane sale" of the assets of the banks.[15] General Motors and the RFC announced the creation of a new bank on March 21. Half the capital for this new corporation was provided by the RFC, which received preferred stock. The other half of the necessary capital was provided by local interests, including General Motors and Chrysler, which were granted common stock in the company (*New York Times* 1933c). The RFC supervised the management of this new bank, the National Bank of Detroit.

The National Bank of Detroit immediately took control of the assets and liabilities of the Guardian group and the National group. On April 24, the National Bank of Detroit distributed 30 percent of holdings to the old depositors and began liquidating the assets of the Guardian and National groups in May. The efficiency of the RFC's "Detroit plan" spurred numerous applications for reorganization in other communities. In total, the RFC and Treasury Department authorized 257 similar relief operations. These rehabilitations finished the repair begun with the passage of the Emergency Banking Act and allowed the financial system to rebuild on stronger foundations following the banking crisis of 1933.

[15] "Spokane sales" were used to dissolve banks who provided valuable services to the community but whose assets covered less than half of their debt. Conservators arranged the sale of "desirable assets in bulk…to an existing bank or a bank newly organized for that purpose," and creditors were immediately paid from the revenue generated by the sale (Kennedy 1973). After the sale and allocation of the proceeds, the old banks could be liquidated.

Section II: Literature Review

Conventional studies of financial crises suggest that bank failures worsen economic downturns because of their effect on the money supply (Friedman and Schwartz 1963). Banking crises cause the supply of money to decrease as loans are recalled and the wealth of bank shareholders decreases. These monetary effects have a detrimental effect on national income (Dow 2000).

Bernanke (1983) argues that non-monetary effects also contribute to economic downturns. He suggests that the depth and duration of the Great Depression, which are not fully explained by changes in the money supply, can be partially explained by the non-monetary effects of financial crises. In particular, Bernanke examines the non-monetary effects of decreased institutional efficiency and increasingly costly financial intermediation.

Bernanke's analysis of the Great Depression suggests that bank failures caused borrowers to shift to other forms of credit. As borrowers relied more on trade credit and other non-bank lending agencies, the efficiency of the lending process declined since these other agencies lacked the banks' institutional knowledge. The credit system was further disrupted by the widespread increase in borrowers' defaults and bankruptcies. Between 1930 and 1933, deflation caused the value of borrowers' collateral to decrease while their debt burden increased. The increasing spread between Baa-rated corporate debt instruments and Treasury bonds indicates that banks found lending to be increasingly risky. Bernanke suggests that the increasing difficulty of obtaining loans, even for creditworthy borrowers, limited the ability of the economy to recover from macroeconomic shocks.

Finally, Bernanke examines whether the increasing costliness of credit intermediation affected the supply side or demand side of the economy. He tests the theory that the credit crunch, which was caused by the inability of financial institutions to effectively share risk or fund large projects, decreased aggregate supply. Since producers did not need to increase the aggregate supply of goods and services during the Great Depression, Bernanke argues that this effect was not very important. Instead, Bernanke suggests that increases in the costs of borrowing decreased investment and consumption spending, which lowered aggregate demand. As a result, the financial crisis impacted the real economy through changes in consumption and investment.

Calomiris and Mason (1994) examine another aspect of bank failures. They note that some scholars attribute financial panics to imperfect information, since depositors may cause a run on banks when they cannot distinguish between strong and weak institutions.[16] Depositors seeking to protect their money during a financial crisis may withdraw funds from banks until they can pinpoint the troubled institutions. The deposit withdrawals are "socially costly," disrupt the payment system, and reduce the supply of credit (Calomiris and Mason 1994). However, scholars suggest that interbank cooperation normally helps strong banks survive panics since banks have better information than depositors regarding the financial condition of other financial institutions.[17] To test whether banks mutually assisted one another during the Great Depression, Calomiris and Mason examine the June 1932 Chicago banking panic.

[16] See Calomiris and Gorton (1991), Bhattacharya and Thakor (1993), and Kaufman (1994).
[17] See Gorton (1985), Calomiris and Kahn (1991), Calomiris and Gorton (1991), Calomiris and Schweikart (1991), and Calomiris (1993).

Calomiris and Mason assess the solvency of financial institutions by examining banks' market-to-book value of equity, their debt, the interest rates paid on debt, and the rates of withdrawal of debt during 1931 (Calomiris and Mason 1994). Banks with higher market-to-book values of equity were more likely to survive panics, as were banks with a higher proportion of demandable debt. Calomiris and Mason also find that the interest rate paid by failed banks and risky banks was higher than that paid by banks that survived the panics. Finally, banks that failed also experienced a higher withdrawal rate than those which survived. The analysis suggests that banks which survived the panic were fundamentally different from those which failed.

Calomiris and Mason attribute the concentrated bank failures during the Great Depression to negative shocks to the value of common assets. Contagion, or depositors' inability to distinguish solvent banks from insolvent banks, was not a significant factor. Calomiris and Mason also find that strong banks continued to cooperate throughout the 1932 crisis, supporting their hypothesis that interbank lending between sound banks remained the norm during the Great Depression. Calomiris and Mason's research suggests that government aid should support only fundamentally strong and solvent banks, as opposed to insolvent institutions. Their results also support the use of government funds to reinforce interbank lending.

Calomiris and Mason (2000) build on their earlier research by conducting an econometric analysis of the factors contributing to bank failures during the Great Depression. They examine banks' individual characteristics, the possible effects of contagion, and the effects of macroeconomic changes including external currency drains and agricultural disturbances. They find that the causes of bank failures vary over time

and by region. As a result, national macroeconomic indicators do not provide a good explanation of the timing of bank failures; bank fundamentals prove better predictors of bank survival or collapse.

Calomiris and Mason find some evidence of contagion only in the 1933 bank failures. Prior to that date, their analysis suggests that bank fundamentals and regional characteristics are better predictors of bank failure. Their findings challenge Friedman and Schwartz's (1963) attribution of early Depression-era banking crises to national macroeconomic factors. Calomiris and Mason's results support Wicker's (1996) theory that regional characteristics were usually more important factors than national contagion. The results also support Friedman and Schwartz and Wicker's shared view that the bank failures in 1933 resulted in part from contagion during a nationwide panic.

Ultimately, Calomiris and Mason (2000) suggest that contagion and liquidity crises are not major determinants of bank failures; bank fundamentals are more important. Therefore, a bailout of strong banks might prevent widespread panic, but increasing liquidity is unlikely to resolve financial crises like those faced during the Great Depression.

Mason (2001a) conducts an in-depth analysis of the operations of the Reconstruction Finance Corporation (RFC). Mason examines the effect of RFC loans and preferred stock purchases on Chicago Federal Reserve member banks. His analysis suggests that as the RFC assumed greater default risk, its aid programs more successfully limited bank failures.

Mason finds that the RFC loans alone did not lower bank failure rates. His findings challenge earlier work by Butkiewicz (1995), which suggests that RFC lending

did reduce bank failures in early 1932-1933. Mason's findings are supported by the fact that banks were required to use their highest quality and most liquid assets as collateral for RFC loans. Therefore, banks receiving RFC loans were unable to accommodate unexpected withdrawals of funds.

In contrast to the RFC's unsuccessful loan program, Mason finds evidence that the agency's preferred stock program helped prevent banks from failing. Under the preferred stock program, the RFC bore a greater amount of default risk and made its collateral requirements less stringent. Mason suggests solvent banks could operate more efficiently and regain strength as a result of government infusions of capital stock.

The work of Bernanke, Calomiris, and Mason motivates further research into effective government aid programs which can limit bank failures during financial crises. These earlier papers analyzed the first three banking crises of the Great Depression; my research is the first to explore whether the RFC's recapitalization program was effective in limiting the crisis of 1933, which spread from Detroit, Michigan throughout the United States. The RFC's program resembles the current bailout plan in that both have two provisions: the government may make direct loans to banks, and it may inject additional funds by purchasing preferred stock in financial institutions. An analysis of RFC assistance should provide a historical perspective on whether the current bailout plan is likely to limit bank failures.

Section III: Data and Methodology

The purpose of this analysis is to measure the effect of the RFC's loan and preferred stock programs on bank failure rates, after controlling for other factors. The models use a cross-sectional set of bank-level data describing RFC loans and preferred stock investments in each bank, local economic conditions, individual bank financial characteristics, and the incidence and time of bank failure.

Individual bank financial data come from the Federal Reserve member bank *Reports of Condition and Income*. From 1929 to 1936, the regulators of state and national banks did not publish data on bank earnings and expenses. Bank-level earning and expense data are available in the *Reports of Condition and Income* of the Federal Reserve (Mason 2001a, 1998). This means that the sample is restricted to Federal Reserve member banks. Federal Reserve banks include both national and state-chartered banks, which provides some institutional diversity in the sample. The sample of banks is restricted to the state of Michigan. There are detailed data on the individual characteristics of the troubled financial institutions during the financial crisis of 1933 in Detroit as well as the rest of the state. The database also includes data on the number and size of loans each bank received from the RFC. Michigan banks were also among the first to join the RFC's preferred stock program. As a result, Michigan banks provide a rich data set to examine the impact of this historical experiment.

The sample includes data on 197 Michigan member banks in the Seventh Federal Reserve District. The bank failure data for the national banks are taken from the Comptroller of the Currency's *Annual Report*. The *Rand-McNally Bankers' Directory* provides the failure data for state banks. For the purposes of the analysis, receiverships

and voluntary liquidations are treated as bank failures, though banks which reopen after receivership are not considered failed. Of the 197 banks in the sample, 82 (42 percent) failed between December 1929 and December 1936. Seventy-eight banks received RFC loans, 41 (53 percent) of which failed. Twenty (34 percent) of the 59 institutions participating in the preferred stock program failed.

RFC loans and preferred stock purchases were hand-coded from the monthly *Reports of Activities of the Reconstruction Finance Corporation.*[18] The *Reports* include the amount of each loan and preferred stock purchase. Many banks received multiple loans or infusions of capital in the form of preferred stock. According to Mason (2001a), 32 percent of banks in the United States received more than one loan from the RFC and 12 percent borrowed from the government-sponsored entity more than twice. Previous studies have examined the average amount of each loan or preferred stock purchase by dividing the amount of each by the number of loans or preferred stock purchases (Friedman and Schwartz, 1963; Butkiewicz, 1995; Keehn and Smiley 1988, 1993). However, because so many banks received several loans or preferred stock purchases, the averages of RFC outlays may be biased downward. Correcting for the multiple-loan bias, Mason (2001a) shows that for Chicago banks involved in the 1932 banking crisis, the RFC's purchases of preferred stock appeared to help banks survive, but RFC loans did not.

---

[18] These reports were published when Congress was in session after fall 1932. The reports were reproduced in the *Congressional Serial Set* and, until 1933, in the *Commercial and Financial Chronicle*. The Archive of the Clerk of the House of Representatives preserved the reports submitted while Congress was in recess and remains the only source for these reports.

Due to complications in obtaining the reports submitted while Congress was in recess, this analysis does not include data from September 1935. However, the limited RFC aid activity throughout the fall of 1935 suggests that the additional data would not have a material effect on the results of this analysis.

This analysis focuses on whether loans or preferred stock purchases increased the likelihood of survival for Michigan banks. Parametric and non-parametric survival analysis techniques illustrate trends in bank failures from December 31, 1929 to December 31, 1936.[19] The Kaplan-Meier survivor functions depict bank failures over time. Smoothed hazard functions depict shifts in the probability of failure over time. Finally, a probit model and a log-logistic survivor model are employed to examine the effect of aid allocations on bank failure rates within a multiple regression framework. The formal econometric analysis suggests that RFC loans decreased the likelihood and duration of bank survival, whereas direct recapitalization increased the likelihood of bank survival.

Methods and Empirical Results

Survival analysis techniques are superior to Ordinary Least Squares (OLS) regressions or binary dependent variable regressions (logit and probit) at capturing the relationship between RFC aid allocations and failure rates over a specific time period. OLS produces misleading results when analyzing censored data, truncated data, or time-varying covariates (Jenkins 2005). Furthermore, OLS models present a structural issue: they simply do not express results in terms of observed transitions between states or completed spells (Jenkins 2005). Binary dependent variable models, which address the censoring and structural issues introduced by OLS, do not address "the differences in time in which each person is at risk of experiencing the event" (Jenkins 2005). The statistical techniques used in survival analysis were developed to address "the sequential nature of the data, and are able to handle censoring and incorporate time-varying

[19] Non-parametric means that "no prior assumptions are made about the shapes of the relevant functions" (Jenkins 2005).

covariates" (Jenkins 2005). As a result, survival analysis allows us to incorporate the most information in our study of the relationship between RFC aid policies and bank failure rates.

The specification of survival models depends on whether the process occurs in continuous time, or in discrete time intervals. Most economic phenomena are observed in continuous time. However, the data describing spell lengths are likely presented in grouped form. For example, durations are expressed in days or hours, not as fractions thereof. The length of the intervals used relative to average spell length helps determine whether the data should be treated as discrete or continuous (Jenkins 2005). In the case of the bank survival times in this data set, duration is measured in days and the typical bank survives for a period of years. Therefore, the survival time data used in this analysis is treated as if it were continuous.

Both graphical and multiple regression techniques are used to analyze the failure rates of Michigan banks. Kaplan-Meier survivor functions and smoothed hazard functions graphically describe the failure rates of the entire sample of Michigan banks, and the failure rates of subgroups determined by aid type. We then present a probit model of bank failures as a straightforward introduction to the relationship between RFC aid allocations and failure rates. To demonstrate the specific effects of different covariates on bank failure rates over time, we use a log-logistic survival model. The log-logistic parameterization assumes a specific shape for the survival function based on the history of bank failures during the Great Depression.

Survivor and Hazard Functions

Figure 1 is an estimate of the survival function of all Michigan banks, derived by the Kaplan-Meier method (Appendix I).[20] The Kaplan-Meier estimate of the survival function "is given by the product of one minus the number of exits divided by the number of [entities] at risk of exit" (Jenkins 2005).[21] From the survival function, one can also estimate the integrated hazard and failure functions of a population. These functions are typically depicted as step functions, where the height of each step varies depending on the estimated survival function, and the width of each step varies depending on the times at which failures occurred. The shape of the function reflects the fact that the non-parametric Kaplan-Meier method depends on the dates of observed transitions between states and on the length of the largest non-censored survival time.[22] Smoothing the function would demand additional assumptions about failure rates at dates between within-sample failure times and beyond the maximum observed failure time (Jenkins 2005).

Figure 1 shows the percentage of banks in business each day from December 31, 1929 to December 31, 1936. Figure 1 also indicates important historical events related to bank failure rates, including (1) the onset of the crisis of 1933, (2) when the RFC commenced operations, and (3) the beginning of the major bank liquidations caused by

---

[20] In each of the estimated survival functions and estimated hazard functions, the population at risk is all banks in the sample.

[21] The proportion of those entering a state who survive to the first observed survival time, t_1, $S(t_1)$, is simply one minus the proportion who made a transition out of the state by that time, where the latter can be estimated by the number of exits divided by the number who were at risk of transition: $d_1/(d_1+m_1)=d_1/n_1$. More generally, at survival time t_j, $\widehat{S}(t_j) = \prod_{j|t_j<t} \left(1 - \frac{d_j}{n_j}\right)$. (Jenkins 2005).

[22] "A survival time is censored if all that is known is that it began or ended within some particular interval of time, and thus the total spell length (from entry time until transition) is not known exactly" (Jenkins 2005).

the crisis of 1933. The survivor function shows that bank liquidations increased dramatically following the crisis of 1933. Figure 1 shows that the RFC liquidated failed banks for eighteen months following the crisis. After 1934, liquidations virtually ceased. The smoothed hazard estimate in Figure 2 offers additional evidence that the Crisis of 1933 threatened banks across Michigan.[23] The hazard ratio for bank failure reaches its highest point as the RFC completes the liquidations of banks that failed during the crisis of 1933.

Figures 3 and 4 divide the sample between banks which received RFC loans and banks in which the RFC bought preferred stock. Figure 3 shows that a greater proportion of the banks which received loans failed, relative to banks which did not receive loans. In contrast, a greater proportion of the banks which received capital from the RFC survived, relative to banks which did not receive an infusion of funds through preferred stock. Figure 4 shows that if a bank received a loan and preferred stock, it was no more likely to survive the Great Depression than if it had received only a loan. Banks that received capital from the RFC were more likely to survive than the banks which received no aid. If the bank received a loan or a loan and stock, it was less likely to survive than those banks which received no aid. Table 1 illustrates these same results (Appendix II).

---

[23] The hazard function is estimated using "kernel-based smoothing of the…change in the cumulative hazard between successive failures. The smoothed value at a given time is based on a weighted average of the values in the neighborhood of that point" (Jenkins 2008).

The shape of the step function used in the Kaplan-Meier estimation means one cannot directly estimate the hazard function. As Jenkins explains, "trying to estimate the slope of the integrated hazard function at each of the observed survival times is equivalent to trying to find the slope at the corner of each of the steps. Clearly, the slope is not well-defined…nor [does it yield] a non-parametric estimate of the hazard rate" (Jenkins 2005). However, by smoothing the integrated hazard function, which can be derived from the Kaplan-Meier survivor function, one can derive the slope at any point. Smoothing the hazard function incorporates additional assumptions about the data; one must carefully consider the degree to which the function should be smoothed and select the smoothing bandwidth accordingly.
In this analysis, the bandwidths are 28 days. Richardson and Troost (2006) suggest that "bandwidths of 28 days on graphs spanning…years…are wide enough to smooth daily volatility without obscuring [meaningful] shifts in the probability of failure."

Of all the aid groups, the banks which received capital and no loans from the RFC had the largest proportion of survivors by the end of 1936. Banks which received loans or a combination of loans and stock had fewer survivors than the banks which received capital.

The log-rank and Wilcoxon tests are used to test whether the subgroup differences observed in survivor functions are statistically significant (Jenkins 2008). The log-rank and Wilcoxon tests reject the null hypothesis that the survival function for banks which received loans equaled that for banks which did not receive loans at the 1 percent level. The tests are less robust for preferred stock purchases, however. The log-rank and Wilcoxon tests reject the null hypothesis that the survival function for banks which received preferred stock from the RFC equaled that of banks which did not receive a capital infusion from the RFC at the 15 percent level and 10 percent level, respectively. Finally, the log-rank and Wilcoxon tests reject the null hypothesis that the survival function for banks which received loans equaled that of banks which received preferred stock at the 1 percent level.

The graphs suggest that loans are associated with increased bank failure rates, while preferred stock purchases are associated with decreased bank failure rates. For an intuitive examination of the effect of RFC loans and preferred stock purchases relative to other bank characteristics, we consider the results of the probit model.

Probit Model

A probit model is a normally-distributed discrete choice model used to examine the percentage of entities entering a state (Greene 1993). In Table 2, we examine the relationship between aid allocations, bank characteristics, and bank failures (Appendix II). RFC aid allocations are represented by binary variables. The bank characteristics selected as determinants of failure have been widely analyzed in the literature (Alston et al. 1994; Calomiris and Mason 1997, 2000; Cole and Gunter 1995). Each bank characteristic is included at its value as of December 31, 1931.[24] The ratio measuring capital adequacy (net worth/total assets) should be associated with lower failure risk. Conversely, the less liquid a bank's assets, the greater its risk of failure. Real estate owned and reported losses indicate the level of foreclosed and nonperforming assets on the balance sheet of the bank, and should be associated with higher failure risk. Bonds, stocks, and securities owned, and loans and discounts, suggest the possibility of increased credit risk and should be associated with increased risk of failure. Paper eligible for rediscount at the Federal Reserve indicates low credit risk assets and should be associated with a decreased risk of bank failure. Because interest and discount rates should be higher for riskier borrowers, interest and discount earnings should be positively related to failure risk, assuming the higher earning are the result of higher interest rates charged by the banks. Also, since interest rates were generally declining during the Great Depression, interest rate risk on liabilities (bills payable and rediscounts) should have a positive relationship to failure rates. Finally, recoveries, which may capture a sudden recovery in bank asset values following a macroeconomic downturn, may also be

[24] This analysis uses time-fixed covariates. Modeling these bank characteristics as time-varying covariates might better describe their effect on the likelihood of failure and bank failure rates.

positively associated with failure risk[25]. Controlling for all of these bank characteristics allows us to isolate the effect of RFC loans and preferred stock purchases on bank failure rates (Mason 2001a).

The relationship between illiquid assets and bank failure rates is positive, as expected, and significant in all of the probit regressions in Table 2. Real estate owned is also associated with an increased risk of bank failure and is statistically significant in regressions (1), (3), and (4). None of the other bank characteristics show a significant relationship to bank failure rates, though the signs on the coefficients of net worth, bills payable and rediscounts, and interest and discount on loans are as expected.

RFC loans are positively and significantly related to bank failure. Preferred stock purchases are negatively related to bank failure. When the banks receive only a direct capital infusion from the RFC and do not receive loans (regression 5), the coefficient is negative and statistically significant. Though direct recapitalization does not have a statistically significant effect on the likelihood of failure in regressions (2), (3), and (6), the coefficient on preferred stock purchases is always negative. When both types of RFC aid are included in the regression, the variables are not statistically significant. However, the coefficients still indicate a positive relationship between RFC loans and failure, and a negative relationship between RFC preferred stock purchases and failure. When the variables are examined using a Wald test, we find that the loan and preferred stock purchase variables are jointly significant.

Table 3 shows the marginal effects of RFC loans and preferred stock purchases. Banks receiving loans are approximately 25% more likely to fail, holding other

[25] Mason (2001a) notes, "recoveries may be positively associated with failure risk, if they capture a rebound in bank asset values following a trough."

characteristics constant (regressions 1 and 3). However, banks in which the RFC purchased preferred stock are less likely to fail. A bank receiving only stock, and no loan from the RFC (regression 5), has a 27% lower risk of failure.

While the probit model allows us to examine the relationship between bank characteristics, RFC aid allocations, and the probability of bank failure, it is not sensitive to the timing of bank failure rates and leads to inaccurate results. We are interested in when banks failed; therefore, we estimate an accelerated failure time model to examine the effect of RFC aid on bank failure rates.

Accelerated Failure Time Model

In contrast to a probit model, which represents only whether banks failed, a model of accelerated failure time uses the time before failure as the dependent variable. These survival models therefore measure how covariates "affect the incidence of failure… [and] the length of time elapsed before failure" (Mason 2001a). Also, survival models, which measure the conditional probability of failure, adjust for the survivorship bias inherent in the unconditional probabilities of failure estimated by probit models (Kiefer 1988). The survival model selected for this analysis uses the log-logistic function to parameterize the model. This parameterization was selected because its non-monotonic hazard function accurately describes the expected shape of the baseline survival rate of the sample over time. We expect the rate of bank failures to increase initially because of the repeated financial crises which occurred between 1930 and 1933. Following the crisis of 1933, the rate of bank failures should decrease.

Table 4 summarizes the accelerated failure time models used to examine the relationship between binary variables representing RFC aid, bank characteristics, and

survival time (Appendix II). The unit of observation is the individual bank, and duration is measured in days. Banks are observed from December 31, 1929 until December 31, 1936. The coefficients on each covariate are time ratios. Time ratios less than 1 are associated with a shorter estimated survival time; time ratios greater than 1 are associated with a longer estimated survival time. The bank characteristics modeled are the same as those used in the probit analysis.

As in the probit analysis, illiquid assets are significantly negatively related to survival time. None of the other bank characteristics demonstrate a significant effect on survival time; however, the sign of the coefficients of certain variables supports our earlier hypotheses. Bonds, stocks, and securities owned are associated with shorter survival time. Bills payable and rediscounts and interest and discount on loans are also associated with a shorter estimated survival time. Bank size (net worth) is associated with a longer estimated survival time.

RFC loans and preferred stock purchases are significant in every regression. RFC loans are associated with shorter estimated survival times, while preferred stock purchases are associated with longer survival times. A bank receiving only preferred stock, and no RFC loans, has the longest estimated survival time. While the time ratios are significant at the 10 percent level or higher for every aid variable, the Wald test for joint significance suggests that the relationship between RFC loans and RFC preferred stock purchases could be even stronger than our regression results imply.

The results of the log-logistic regressions correspond with the results of the non-parametric survival analysis and the results of the probit model. In each case, RFC loans are associated with decreased survival. In contrast, RFC preferred stock purchases are

associated with increased survival. Mason (2001a) suggests the negative relationship between loans and bank survival is due to the RFC's onerous collateral requirements. Historians corroborate this interpretation. James notes:

> High collateral requirements forced [banks] to isolate their most liquid assets as security for RFC loans. In April 1932, for example, the Reconstruction Finance Corporation loaned the Reno National Bank over $1,100,000, but in the process took as collateral over $3,000,000 of the bank's best securities. This in itself left the bank unable to meet any future emergency demands for funds by depositors (1938).

The banks subordinated the interests of their shareholders to the government when they obtained a RFC loan. Mason (2001a) hypothesizes that investors might have chosen to close the bank in order to reduce their losses. He also suggests that depositors could have run on the banks in hopes of keeping their assets from the RFC.

Preferred stock purchases of the RFC carried no collateral requirements. The government bore a considerable share of the risk of bank failure, and it did not subordinate the claims of existing creditors or equity holders. The positive relationship between preferred stock purchases and bank survival supports the idea that high collateral requirements and the subordination of other stakeholders caused the loan program to fail in its objective of helping banks.

While this analysis did not find bank characteristics to have a significant effect on survival, these characteristics were entered as time-fixed covariates[26]. If they were

[26] Bank characteristics were analyzed as of December 31, 1931.

tracked over time, prior research indicates they would prove significant (Calomiris and Mason 2000, Mason 2001a).

Section IV: Conclusion

Do bank bailouts work? Policymakers and the financial press have spent a considerable amount of time trying to address this question in the wake of the current financial crisis. Determining the efficacy of recent aid initiatives is complicated because the government has not intervened in financial markets on this scale in the post-World War II period. Fortunately, the operations of the Reconstruction Finance Corporation provide a historical experiment to examine the effects of government loan and preferred stock programs on distressed financial institutions. The effects of RFC loans and preferred stock purchases provide insight into whether the current aid policies will help prevent bank failures and reduce the costs of financial disintermediation.

My empirical analysis suggests three conclusions. First, loans from the RFC did not help banks survive the Great Depression, but direct recapitalizations in the form of preferred stock did increase the likelihood of bank survival. One explanation for this result is that banks were required to use some of their best assets as collateral to receive loans from the RFC. Second, the preferred stock program did not burden the bank with heavy collateral requirements or subordinate the claims of other stakeholders. Direct recapitalization allowed banks to operate more efficiently and improved their chances of surviving the Great Depression by repairing their balance sheets.

The results suggest that policymakers should allow the government to assume a substantial share of the risk of bank failure if they want to rescue the financial system. The government could assume this risk by directly recapitalizing the banks with equity

purchases, or by granting loans without heavy collateral requirements. Using its power as a shareholder or major creditor, the government can ensure that bank managers implement beneficial changes and improve oversight in their firms. Such direct intervention will restore public confidence in troubled institutions and allow the banks to operate efficiently. As the institutions stabilize, the government can gradually return control to private stakeholders and recover the funds provided by taxpayers.

References

Alston, Lee J., Wayne A. Grove, and David C. Wheelock. "Why Do Banks Fail? Evidence from the 1920s." *Explorations in Economic History* 31, October 1994, 409-31.

Awalt, Francis Gloyd. "Recollections of the Banking Crisis in 1933." *The Business History Review*, 43 (3), 1969, 347-71.

Bernanke, Ben S. *Non-Monetary Effects of the Financial Crisis in the Propagation of the Great Depression*. Cambridge: National Bureau of Economic Research, 1983.

Bhattacharya, Sudipto, and Anjan V. Thakor. "Contemporary Banking Theory." *Journal of Financial Intermediation* 3, 1993, 2-50.

Butkiewicz, James L. "The Impact of a Lender of Last Resort during the Great Depression: The Case of the Reconstruction Finance Corporation." *Explorations in Economic History* 32, April 1995, 197-216.

Calomiris, Charles W. "Regulation, Industrial Structure, and Instability in U.S. Banking: An Historical Perspective." In Michael Klausner and Lawrence White, eds., *Structural Change in Banking*. Homewood, Illinois: Business One Irwin, 1993, 19-116.

Calomiris, Charles W. and Gary Gorton. "The Origins of Banking Panics: Models, Facts, and Bank Regulation." In R. Glenn Hubbard, ed., *Financial Markets and Financial Crises*. Chicago, University of Chicago Press 1991, 109-73.

Calomiris, Charles W. and Joseph R. Mason, eds. *How to Restructure Failed Banking Systems: Lessons from the US in the 1930's and Japan in the 1990's*. Cambridge, Massachusetts: National Bureau of Economic Research, 2003.

———. *Causes of US Bank Distress during the Depression*. Cambridge: National Bureau of Economic Research, 2000.

———. *Contagion and Bank Failures during the Great Depression: The June 1932 Chicago Banking Panic*. Cambridge: National Bureau of Economic Research, 1994.

———. "Contagion and Bank Failures during the Great Depression: The June 1932 Chicago Banking Panic." *American Economic Review* 87, December 1997, 863-83.

Calomiris, Charles and Larry Schweikart. "The Panic of 1857: Origins, Transmission, and Containment." *Journal of Economic History* 51, December 1991, 807-34.

Cole, Rebel A. and Jeffery W. Gunther. "Separating the Likelihood and Timing of Bank Failure." *Journal of Banking and Finance* 19, September 1995, 1073-89.

Comptroller of the Currency. Annual Report. Washington, DC: U.S. Government Printing Office, various years.

Cox, David R., "Regression Models and Life-Tables," *Journal of the Royal Statistical Society* Series B 34 (1972), 187–220.

Dow, James. "What is Systematic Risk? Moral Hazard, Initial Shocks, and Propagation." *Monetary and Economic Studies*, December 2000.

Federal Deposit Insurance Corporation. "A History of the FDIC 1933-1983." http://www.fdic.gov/bank/analytical/firstfifty/index.html.

Friedman, Milton and Anna Jacobson Schwartz, eds. *A Monetary History of the United States, 1867-1960*. Princeton, New Jersey: Princeton University Press, 1963.

Gorton, Gary. "Clearing Houses and the Origin of Central Banking in the U.S." *Journal of Economic History* 45, June 1985, 277-83.

Greene, William H. *Econometric Analysis*, 2nd Ed. New York: Macmillian Publishing Company, 1993.

James, F. Cyril. *The Growth of Chicago Banks*, vol 2. New York: Harper and Brothers, 1938.

Jenkins, Stephen P. "Estimation of the (integrated) hazard and survivor functions: Kaplan-Meier product-limit and lifetable methods." University of Essex, June 2008.

———. "Survival Analysis: Lecture Notes." University of Essex, July 2005.

Jones, Jesse H. and Carl Howard Pforzheimer. *Fifty Billion Dollars: My Thirteen Years with the RFC, 1932-1945*. New York: Macmillan, 1951.

Kaufman, George G. “Bank Contagion: A Review of the Theory and Evidence.” *Journal of Financial Services Research* 8 (2), 1994, 123-50.

Keehn, Richard H. and Gene Smiley. “U.S. Bank Failures, 1932-1933: A Provisional Analysis.” *Essays in Economic and Business History* 4, 1988, 136-56.

———. “U.S. Bank Failures, 1932-1933: Additional Evidence on Regional Patterns, Timing, and the Role of the Reconstruction Finance Corporation.” *Essays in Economic and Business History* 11 (1993), 131-45.

Kennedy, Susan Estabrook. *The Banking Crisis of 1933*. Lexington, Kentucky: University Press of Kentucky, 1973.

Kiefer, Nicholas M. “Economic Duration Data and Hazard Functions.” *Journal of Economic Literature* 26 (2), 1988, 646-79.

Lohr, Steve. “Intervention Is Bold, but Has a Basis in History.” *New York Times*, October 13, 2008.

Los Angeles Times. “Ford Backs Two Banks.” February 27, 1933, 1.

Mason, Joseph R. "The Political Economy of Reconstruction Finance Corporation Assistance during the Great Depression." *Explorations in Economic History* 40 (2), 2003, 101-21.

———. "Do Lender of Last Resort Policies Matter? The Effects of Reconstruction Finance Corporation Assistance to Banks during the Great Depression." *Journal of Financial Services Research* 20 (1), 2001a, 77-95.

———. “Reconstruction Finance Corporation Assistance to Financial Intermediaries and Commercial and Industrial Enterprises in the United States, 1932-37.” In Stijn Claessens, Simeon Djankov, and Ashoka Mody, eds. *Resolution of Financial Distress: An International Perspective on the Design of Bankruptcy Laws.* Washington, D.C.: The World Bank Group, 2001b, 167-204.

———. “The Determinants and Effects of Reconstruction Finance Corporation Assistance to Banks during the Great Depression.” Doctoral dissertation, University of Illinois at Urbana-Champaign, 1996.

New York Times. “Ford’s Bank Action Told.” February 15, 1933a, 2.

New York Times. “Michigan Bankers Act to Reorganize.” February 23, 1933b, 12.

New York Times. “R.F.C. Acts to Spur Bank Reopenings.” March 21, 1933c, C25.

New York Times. “Detroit Rejects ‘Wall Street’ Aid.” February 19, 1933d, 21.

New York Times. “Detroit Banks Face Hitch in Loan Here.” March 1, 1933e, 5.

New York Times. “New Detroit Banks Formed.” February 25, 1933f, 21, 25.

New York Times. “Scrip is Planned for Use in Detroit.” February 26, 1933g, N7.

Officer, Lawrence H. and Samuel H. Williamson, "Purchasing Power of Money in the United States from 1774 to 2008," *MeasuringWorth*, 2009. http://www.measuringworth.com/ppowerus/

Olson, James S. *Herbert Hoover and the Reconstruction Finance Corporation, 1931-1933*, 1st ed. Ames: Iowa State University Press, 1977.

———. “The End of Voluntarism: Herbert Hoover and the National Credit Corporation.” *Annals of Iowa* 41, Fall 1972, 1104-13.

Rand-McNally Bankers’ Directory. Rand McNally: Chicago. Various issues, 1929-1936.

“Report of Activities of the Reconstruction Finance Corporation” (monthly, unpublished). National Archives, Records of the Clerk of the House of Representatives, various issues.

“Reports of Condition and Income of Federal Reserve Member Banks” (unpublished reports, Microfilm). Washington, DC: Federal Reserve Board, 1931-1935.

Richardson, Gary and William Troost. *Monetary Intervention Mitigated Banking Panics During the Great Depression? Quasi-Experimental Evidence from the Federal Reserve District Border in Mississippi, 1929 to 1933.* Cambridge: National Bureau of Economic Research, 2006.

White, Eugene Nelson. “A Reinterpretation of the Banking Crisis of 1930.” *Journal of Economic History* 44, March 1984, 119-38.

Wicker, Elmus. “A Reconsideration of the Causes of the Banking Panic of 1930.” *Journal of Economic History* 40, September 1980, 571-83.

Appendix I: Figures

Figure 1. **Kaplan-Meier estimated survival function**
This model represents the percentage of banks in business in Michigan between December 31, 1929 and December 31, 1936. Bank failure data are from the Comptroller of the Currency's *Annual Report* and the *Rand-McNally Bankers' Directory*.

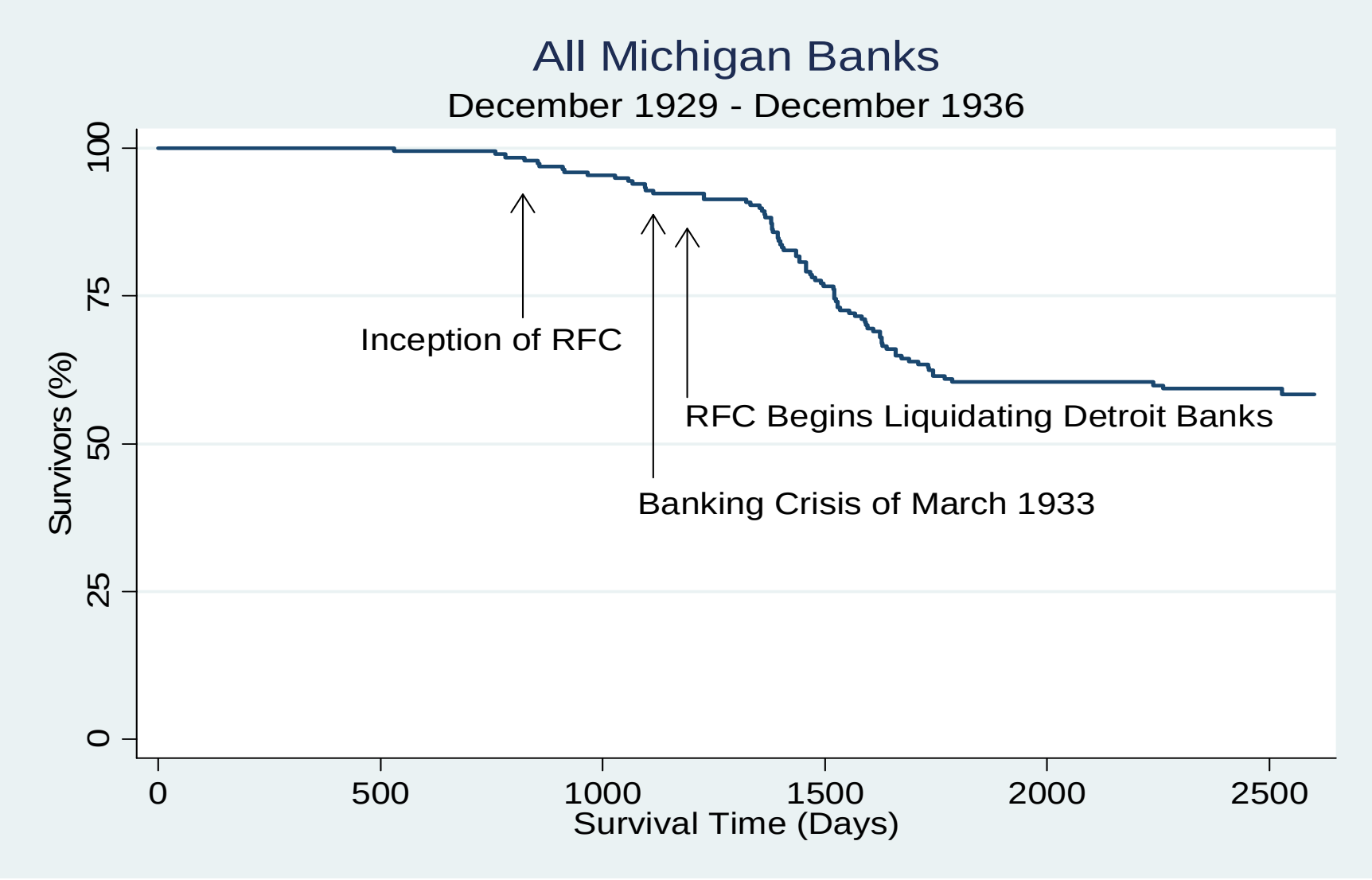


Figure 2. **Smoothed hazard estimate of all Michigan banks**
This model represents the hazard ratio at a given point in time, derived by calculating the change in the cumulative hazard between successive failures. Bank failure data are from the Comptroller of the Currency's *Annual Report* and the *Rand-McNally Bankers' Directory.*

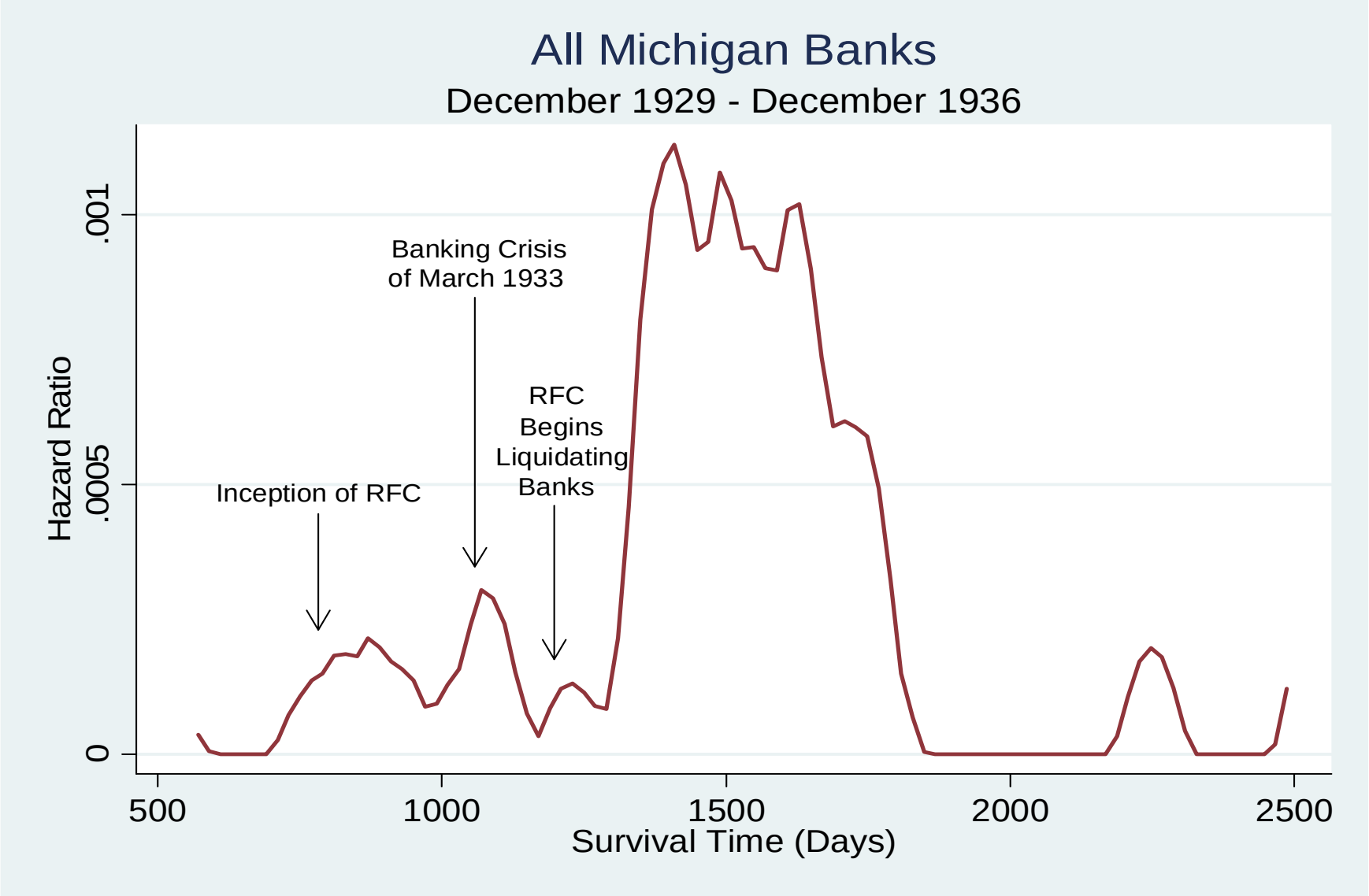
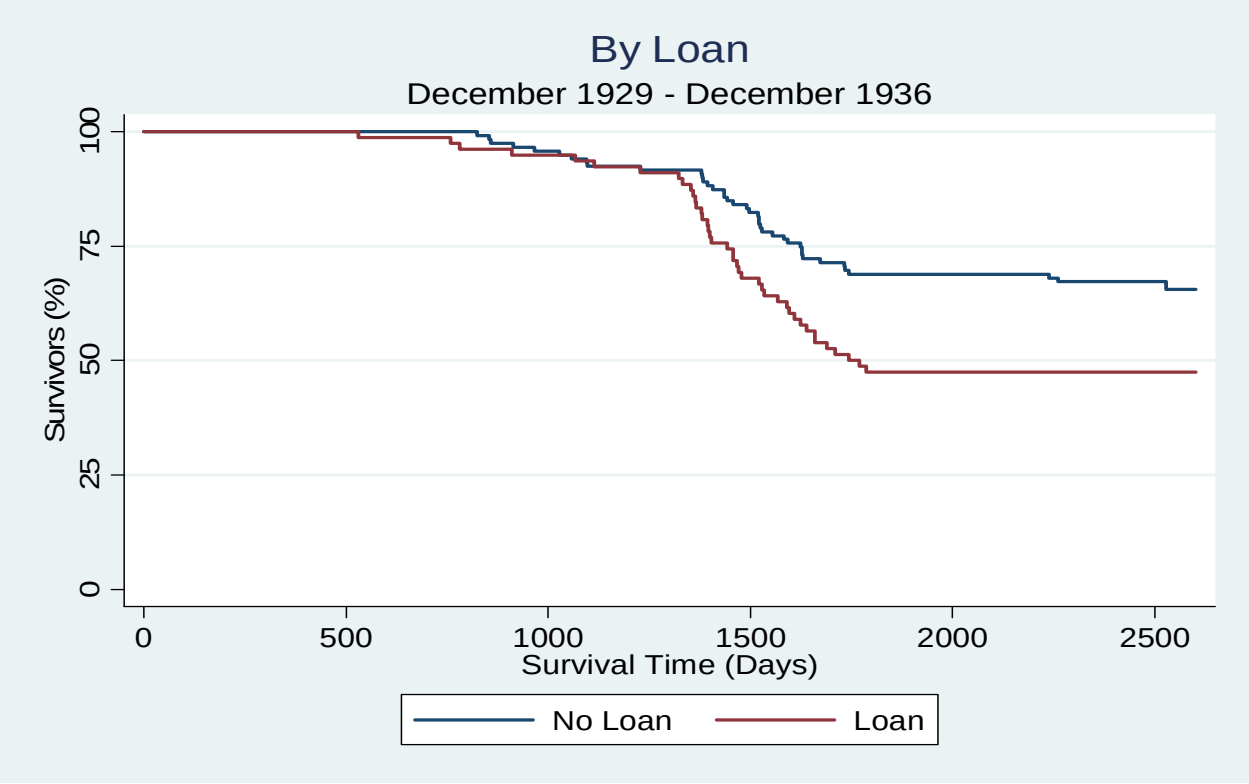


Figure 3. **Kaplan-Meier estimated survival function for sample subgroups**
This model represents the percentage of banks in business, stratified by the type of aid received. Bank failures are measured between December 31, 1929 and December 31, 1936. Bank failure data are from the Comptroller of the Currency's *Annual Report* and the *Rand-McNally Bankers' Directory*.



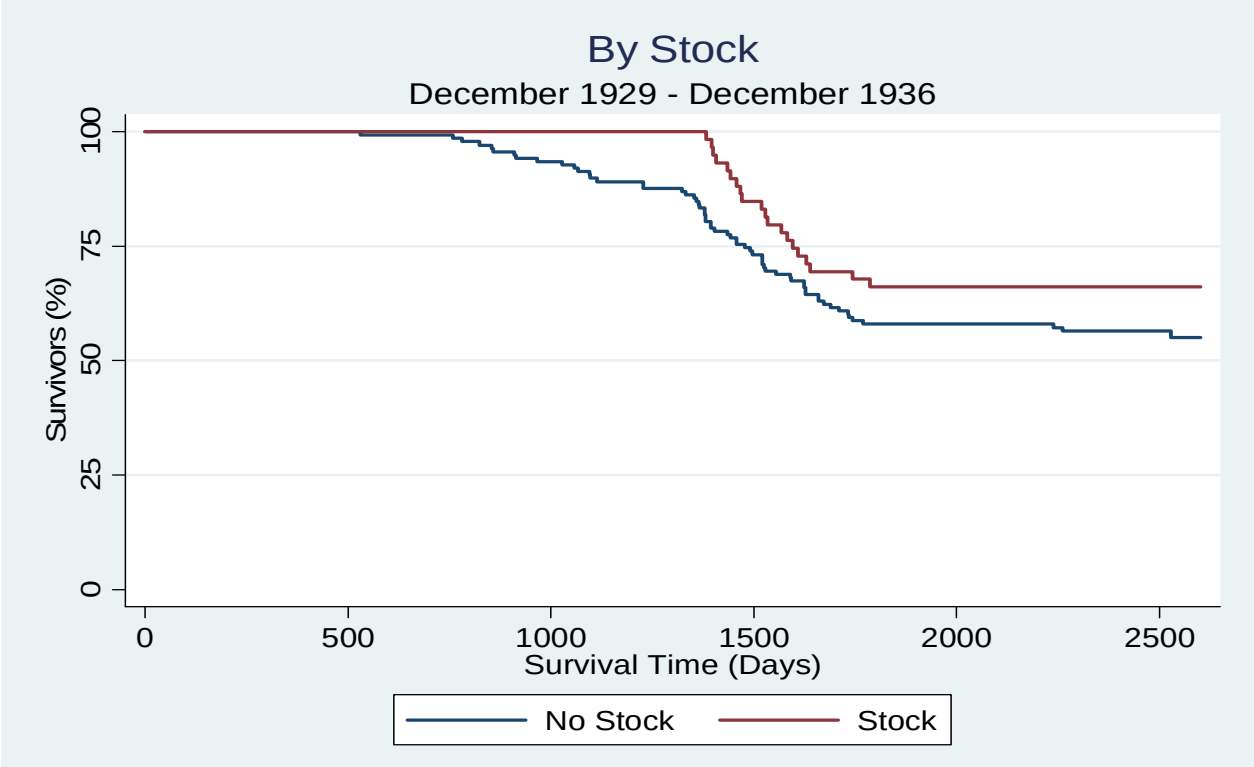
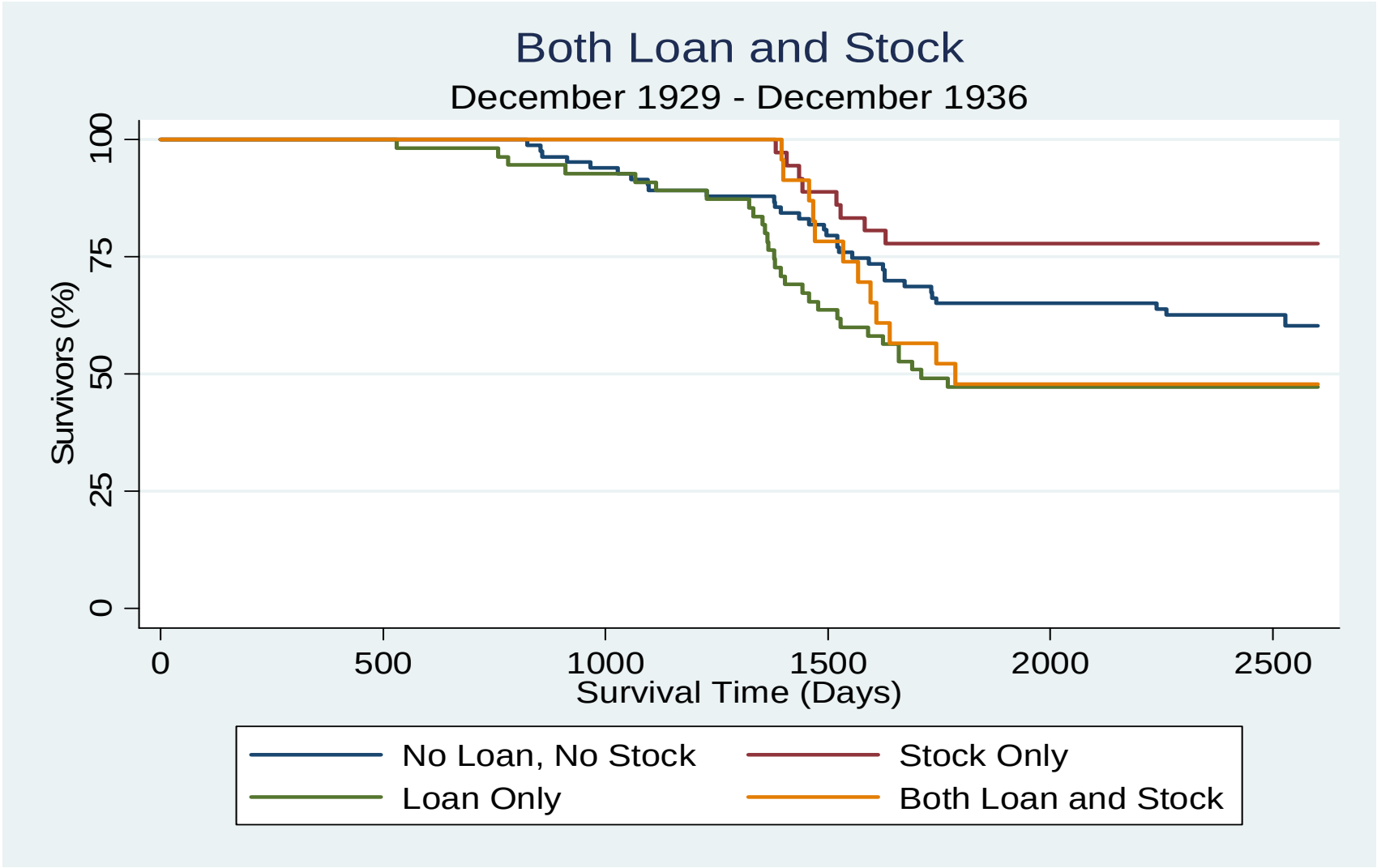


Figure 4. **Kaplan-Meier estimated survival function for sample subgroups**
This model represents the percentage of banks in business, stratified by the type of aid received. The banks which received RFC loans, the banks in which the RFC purchased preferred stock, and the banks which received loans and direct capital infusions via preferred stock are shown on the same graph for comparison. Bank failures are measured between December 31, 1929 and December 31, 1936. Bank failure data are from the Comptroller of the Currency's *Annual Report* and the *Rand McNally Bankers' Directory*.



Appendix II: Tables

Table 1. **Survivor estimates, stratified by subgroup**
This table lists the survivor function estimates for each RFC aid subgroup. Survivor rates are expressed as percentages.

Time (Days)	Preferred stock only	Preferred stock	Loan	Loan only	No Aid
531	100	100	99	98	100
789	100	100	96	95	99
1047	100	100	95	92	92
1305	100	100	91	87	89
1563	83	80	64	60	82
1821	78	66	47	47	72
2079	78	66	47	47	72
2337	78	66	47	47	71
2595	78	66	47	47	70

Table 2. **Probit model of RFC discount loans and preferred stock purchases**

Each model estimates the determinants of bank failure from December 31, 1929 to December 31, 1936. Bank financial data are from Federal Reserve *Reports of Condition and Income* . RFC loan and preferred stock data are from monthly *Reports of Activity of the RFC* . Standard errors are in parentheses.

	(1)	(2)	(3)	(4)	(5)	(6)
Bank failure equation						
Constant	-2.943	-2.178	-2.804	-2.370	-2.621	-2.602
	(0.25)	(1.95)	(2.03)	(1.97)	(1.99)	(2.01)
Loan binary	0.652**	---	0.672**	---	---	---
	(0.48)		(0.30)			
Preferred stock binary	---	-3.128	-0.356		---	---
		(0.30)	(0.31)			
Loan only binary	---	---	---	0.659*	---	0.511
				(0.344)		(0.36)
Preferred stock only binary	---	---	---	---	-0.697**	-0.536
					(0.37)	(0.38)
Illiquid assets/total assets	4.159*	4.445**	4.318*	3.882*	4.931**	4.459*
	(2.22)	(2.22)	(2.26)	(2.21)	(2.30)	(2.32)
Bonds, stocks, and securities owned/illiquid assets	-0.537	-0.982	-0.690	-0.720	-0.970	-0.842
	(1.40)	(1.39)	(1.41)	(1.39)	(1.39)	(1.40)
Real estate owned/illiquid assets	24.430*	17.772	23.893*	23.423*	18.090	22.067
	(14.34)	(12.97)	(13.99)	(13.88)	(13.06)	(13.63)
Loans and discounts/illiquid assets	-0.377	-0.580	-0.440	-0.499	-0.535	-0.508
	(0.95)	(0.93)	(0.97)	(0.95)	(0.945)	(0.96)
Paper eligible for rediscount at the Fed/loans and discounts	0.369	0.282	0.213	0.183	0.313	0.159
	(1.19)	(1.17)	(1.20)	(1.18)	(1.18)	(1.19)
Net worth/total assets	-3.492	-5.249	-3.759	-4.109	-4.951	-4.275
	(4.08)	(3.98)	(4.12)	(4.04)	(4.00)	(4.07)
Bills payable and rediscounts/debt	2.973	2.110	1.800	1.891	2.054	1.315
	(3.92)	(4.01)	(4.07)	(3.95)	(3.98)	(4.01)
Interest and discount on loans/total earnings	0.083	0.093	0.194	0.122	0.167	0.227
	(1.08)	(1.10)	(1.08)	(1.09)	(1.10)	(1.09)
Recoveries/total earnings	-0.203	-0.321	-0.439	-0.135	-0.584	-0.534
	(2.91)	(2.95)	(2.95)	(2.96)	(2.92)	(2.97)
Losses/total expenses	-0.119	-0.030	-0.096	-0.008	-0.123	-0.066
	(0.77)	(0.75)	(0.77)	(0.77)	(0.75)	(0.77)
Log-likelihood	-54.39	-56.39	-53.72	-55.03	-55.05	-54.02
Chi-squared (k-1 df)	20.47**	16.47	21.80**	19.19*	19.15*	21.21**
Number of banks with RFC authorization of each type	41	38	---	23	20	---
Wald test for joint significance	---	---	6.13**	---	---	5.55*
Number of observations (banks)	94					
Number of failures	52					

*, **, *** Statistically significant at the 10%, 5%, 1% level.

Table 3. **Marginal effects of RFC discount loans and preferred stock purchases in probit model**
RFC loan and preferred stock data coefficients express the percentage change in the likelihood of failure when aid is received. Standard errors are in parentheses.

	(1)	(2)	(3)	(4)	(5)	(6)
Marginal effects						
Loan binary	0.250**	---	0.257**		---	---
	(0.11)		(0.11)	---		
Preferred stock binary	---	-0.123	-0.140	---	---	---
		(0.12)	(0.12)			
Loan only binary	---	---	---	0.244**	---	0.193
				(0.12)		(0.13)
Preferred stock only binary	---	---	---	---	-0.272**	-0.211
					(0.14)	(0.15)
Log-likelihood	-54.39	-56.39	-53.72	-55.03	-55.05	-54.02
Chi-squared (k-1 df)	20.47**	16.47	21.80**	19.19*	19.15*	21.21**
Number of banks with RFC authorization of each type	41	38	---	23	20	---
Wald test for joint significance	---	---	6.13**	---	---	5.55*
Number of observations (banks)	94					
Number of failures	52					

*, **, *** Statistically significant at the 10%, 5%, 1% level.

Table 4. **Accelaterated failure time models with RFC loans and preferred stock purchases**

Each model measures the determinants of log survival time, measured in days, from December 31, 1929 to December 31, 1936. All survival models use a log-logistic parameterization. Time ratios less than one are associated with a shorter estimated survival time; time ratios greater than one are associated with a longer estimated survival time. Bank financial data are from the Federal Reserve Reports of Condition and Income. RFC loan and preferred stock information are from monthly Reports of Activity of the RFC. Standard errors are in parentheses.

	(1)	(2)	(3)	(4)
Time Ratio				
Loan binary	0.783**	---	0.777***	---
	(0.48)		(0.81)	
Preferred stock binary	---	1.217*	1.232*	
		(0.14)	(0.14)	
Loan only binary	---	---	---	0.795**
				(0.10)
Preferred stock only binary	---	---	---	1.267*
				(0.17)
Illiquid assets/total assets	0.124***	0.118***	0.117***	0.116***
	(0.11)	(0.10)	(0.10)	(0.10)
Bonds, stocks, and securities owned/illiquid assets	1.041	1.189	1.045	1.055
	(0.56)	(0.64)	(0.55)	(0.55)
Real estate owned/illiquid assets	0.024	0.019	0.021	0.020
	(0.08)	(0.07)	(0.07)	(0.07)
Loans and discounts/illiquid assets	1.175	1.2655	1.251	1.262
	(0.43)	(0.45)	(0.44)	(0.44)
Paper eligible for rediscount at the Fed/loans and discounts	0.941	0.975	1.045	1.053
	(0.43)	(0.45)	(0.46)	(0.47)
Net worth/total assets	8.114	17.132	9.909	10.648
	(13.72)	(29.31)	(16.38)	(17.45)
Bills payable and rediscounts/debt	0.098	0.195	0.176	0.191
	(0.17)	(0.33)	(0.30)	(0.32)
Interest and discount on loans/total earnings	0.802	0.775	0.727	0.721
	(0.36)	(0.34)	(0.32)	(0.317)
Recoveries/total earnings	1.089	1.224	1.218	1.236
	(1.31)	(1.59)	(1.45)	(1.48)
Losses/total expenses	1.071	1.002	1.072	1.068
	(0.30)	(0.29)	(0.29)	(0.30)
Log-likelihood	-64.69	-65.81	-62.93	-62.98
Chi-squared (k-1 df)	24.10***	21.87**	27.62***	27.53***
Number of banks with RFC authorization of each type	41	38	---	Loans: 23 Stock: 20
Wald test for joint significance	---	---	8.83***	8.71***
Number of observations (banks)	94			
Number of failures	52			

*, **, *** Statistically significant at the 10%, 5%, 1% level.