Liquidity from Two Lending Facilities

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Abstract

We examine how the threat of disclosure (stigma) changes the quality of banks that approach emergency lending facilities. We study a financial crisis where two confidential facilities were available to banks. Unexpectedly, a partial list of bank names from one facility was published, suddenly stigmatizing that facility. We find that the composition of banks that approached each facility changed, where the newly stigmatized facility attracted weaker banks that maintained smaller liquidity buffers, while the alternative confidential facility attracted both weaker and stronger banks. Our results shed light on how stigma prevents regulators from reaching many banks to inject critical liquidity into the banking sector during a crisis.

Keywords: Bayesian inference, Discount Window, Financial crises, Lender of last resort, Stigma.
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1 Introduction

When disruptions such as financial panics and bank runs threaten the health of the U.S. economy, the Federal Reserve (the Fed) – as lender of last resort (LOLR) – can help mitigate the threat by making emergency loans to banks facing funding stresses. An issue with an emergency lending facility, however, is that it only works if banks actually use it. Banks may be discouraged from using it if a "stigma problem" emerges. The literature defines stigma in two ways: (i) "bank stigma" refers to banks that have been identified as users of the lending facility, which the public may construe as a signal that the banks are weak; and (ii) "facility stigma" refers to the facility itself, wherein banks become reluctant to seek assistance because the facility cannot guarantee confidentiality about borrower identity. In this paper, we focus on facility stigma. This issue is of current concern for the Fed, in that the Dodd-Frank Act, passed in 2010, forces the Fed to release the names of borrowing banks (Scott, 2016).

The theoretical literature on stigma (Ennis and Weinberg, 2013; Ennis, 2018), which stems from the theory on adverse selection (Philippon and Skreta, 2012), finds that if risky firms borrow from a lending facility, the composition of firms borrowing from the market changes to one of lower repayment risk. However, Drechsler et al. (2016) show that weakly capitalized banks use emergency assistance to buy more risky assets than strongly capitalized banks, suggesting that different types of banks approach lending facilities. Motivated by this literature, we ask how the composition of weaker and stronger banks at an emergency lending facility changes if the facility becomes stigmatized. Empirically answering our research question using a setting from the recent Global Financial Crisis (GFC) is difficult because typically banks do not randomly choose emergency lending facilities nor do lending facilities suddenly and exogenously become stigmatized. In fact, the Fed's main emergency lending facility, the Discount Window, was arguably stigmatized before the crisis began (Armantier et al., 2015).

In this paper, we answer our research question using a setting from the Great Depression. Two emergency lending facilities were available to provide loans to banks: the Reconstruction Finance Corporation (RFC) and the Fed's Discount Window (DW). The Fed's member banks could borrow from either facility or both, and the operations of both facilities were similar. However, on August 22, 1932, the *New York Times* published a partial list of banks that had confidentially borrowed from the RFC. This publication introduced facility stigma at the RFC. Because confidentiality

could no longer be guaranteed, banks became reluctant to approach the RFC, as having their name revealed to the public was costly. Importantly, we focus on those banks that chose the RFC facility knowing that their names might be revealed, not the banks actually named in the publication. The sudden introduction of facility stigma at the RFC, which was unrelated to bank characteristics, and the presence of an alternative confidential facility with no stigma (DW) allow us to compare the composition of borrowing banks at each facility.

Using a unique, hand-collected dataset of DW and RFC loan information for banks in the Sixth Federal Reserve District from January 1931 to June 1933, we test two hypotheses. First, we ask whether a stigma-free facility attracts both stronger and weaker banks. Following Drechsler et al. (2016), stronger banks are defined as banks that obtain more liquid assets after receiving emergency funds, while weaker banks obtain fewer liquid assets after receiving funds. Second, we ask whether a stigmatized facility attracts weaker banks on average. If these hypotheses are true, banks that approached the stigmatized RFC would have held fewer liquid assets on their balance sheet than banks that borrowed from the stigma-free DW.

To investigate these hypotheses, we use a panel data model to compare the balance sheets of banks that borrowed from the stigmatized RFC to banks that borrowed from the DW. However, because banks typically do not choose lending facilities at random and the choice confounds with bank performance due to unobservables, such as risk preferences or management competence, the panel data model may suffer from endogeneity and misspecification biases. Accordingly, we develop a joint model of a bank's choice of facility and subsequent performance to ensure our main results hold once we overcome these methodological concerns.

We find that banks that borrowed from the stigmatized RFC reduced their liquid assets in comparison with banks that borrowed only from the DW. Specifically, banks that borrowed from the RFC after the publication reduced their bonds-and-securities portfolio by 6.3 to 11.2 percentage points, reduced other liquid assets by 2.0 to 3.4 percentage points, and had lower profits by 5.5 percentage points, in comparison with banks that borrowed only from the DW after the publication. In fact, banks that borrowed only from the DW after the publication maintained their liquidity buffers without cutting their lending. In contrast, banks that approached the stigmatized RFC had smaller liquidity buffers and may have relied on RFC funding as a backstop. We believe two mechanisms explain these results: (i) unobservables of bank type are driving a bank's quality and

only through the decision to approach a stigmatized facility is the bank's weaker type exposed, or (ii) stronger and weaker banks use emergency funds differently. Although we are unable to distinguish between these two mechanisms, both are consistent with our results.

Our results imply that a stigmatized emergency lending facility attracts weaker banks that subsequently maintain smaller liquidity buffers. However, an alternative confidential facility attracts many banks, both weaker and stronger, increasing bank participation. If no confidential facility is available, stronger banks may avoid borrowing from the LOLR despite facing liquidity shocks. As a result, the LOLR may be unable to directly reach all banks, limiting the facility's effectiveness. Concerns about banks' abilities to meet liquidity needs were so serious during the GFC that the Basel III Committee introduced a new Liquidity Coverage Ratio intended to ensure that banks had adequate stocks of high-quality liquid assets (HQLA) to withstand a 30-day run (Basel, 2013). In the event of a liquidity shock, banks need to have a substantial buffer of safe assets to sell in order to maintain their credit channels to households and businesses. Therefore, if stronger banks avoid a facility because of stigma, they may not receive adequate liquidity, which would slow the resuscitation of the economy. Stronger banks are important in a crisis. If they stay healthy, they can help improve the recovery of weaker banks through interbank markets and mergers.

Our paper contributes to several strands of literature, two of which are growing theoretical literatures on how the LOLR should disclose information during a financial crisis and how adverse selection affects liquidity in markets. Goldstein and Sapra (2013), in their survey paper about bank stress-test results, show that some disclosure can provide market discipline for individual banks and regulator accountability. Gorton and Ordoñez (2017) show that the average quality of bank assets in the economy depends on bank participation at the facilities and stigma. Finally, Bajaj (2018) discusses the existence of pooling and separating equilibriums based on the fraction of lemons and information in the market. Our paper provides an empirical evaluation of some of the implications of the theoretical models; in particular, we show how the threat of disclosure changes the average quality of banks that approach a lending facility.

Our paper also relates to the literature about why banks approach their LOLR. Drechsler et al. (2016), Carpinelli and Crosignani (2017), and Acharya et al. (2016) all shed light on the type of bank that may be prone to excessive risk-taking using emergency assistance. Acharya et al. (2016) find that the European Central Bank had difficulty separating solvent but illiquid banks from those

prone to excessive risk-taking during the European sovereign debt crisis. Drechsler et al. (2016) show that weakly capitalized banks took out more LOLR loans and used riskier collateral than strongly capitalized banks during the same period. Similarly, Carpinelli and Crosignani (2017) find that banks that experienced a significant negative shock used their funding to restore credit supply instead of reaching for a yield by buying high-yield government bonds. All three papers highlight the difficulty central banks face in trying to ex-ante separate banks that are most desperate for emergency assistance. We contribute to this literature by providing insight as to how facility stigma can change the composition of banks seeking assistance.

Finally, our paper contributes to the literature on lending facilities during the Great Depression. Several studies have examined the RFC (Butkiewicz, 1995; Mason, 2001b, 2003; Calomiris et al., 2013; Vossmeyer, 2016) and the DW (Friedman and Schwartz, 1963; Hamilton, 1987; Wheelock, 1990; Richardson and Troost, 2009). However, a study that jointly examines the operations and outcomes at both facilities has been lacking in the literature. Although most of the RFC studies are at the bank level, DW studies are often limited to aggregate time-series data since bank-level data were not available.[1] Because we employ novel bank-level DW borrowing data, we are able to study how individual banks interact with each facility.

The remainder of the paper is organized as follows. Section 2 describes the RFC and DW facilities, and details the information revelation. Section 3 describes the data, hypotheses, and summary statistics. Section 4 presents the panel data methods and results. Section 5 presents the joint model and results. Finally, Section 6 discusses the implications for future LOLR facilities and concludes.

2 Historical Background

At the end of 1931, an important source of emergency liquidity was the Fed's DW, and access to it was limited to the Fed's member banks, which accounted for 36% of all U.S. banks.[2] As bank failures and runs continued to plague the economy, Eugene Meyer, then Fed Chair, convinced President Hoover to form another facility to assist nonmember banks. This effort led to the passage

[1] Richardson and Troost (2009) is an exception as they use bank-level data, but their primary focus is on a period before the RFC.

[2] As of June 30, 1932, 19,966 banks were operating in the United States. Of these, 7,246 were Federal Reserve member banks (FRB, 1959, 1932). All national banks were members, as were some state banks. See Anderson et al. (2018) for a discussion of the decision to become a member bank.

of the RFC Act on January 22, 1932, with Meyer as concurrent head of both the RFC and the Fed. The RFC began authorizing collateralized loans on February 2, 1932. While the DW remained available to Fed member banks, the RFC was available to all banks.

The DW and RFC were the most important sources of bank liquidity during the Depression because bond and securities markets were largely frozen (Hickman, 1960; Efraim et al., 2018). As of early 1932, Fed member banks looking for emergency assistance had a choice: approach the RFC, the DW, both, or neither.[3] In the next section, we outline the specifics of each facility that would drive banks' choices between the facilities.

2.1 The Tradeoff between the RFC and the DW

On paper, the difference between the two facilities was that the RFC interest rate was 1.5 to 2 percentage points higher than the rate at the Fed's DW, which averaged 3.5% across Federal Reserve Districts (FRB, 1932). The term structure of loan interest rates at both the RFC and DW was flat, both facilities issued six-month loans (also known as advances), and the collateral requirements were stated to be the same where both facilities accepted gold, Treasury securities, and high-quality "investment-grade" paper (Olson, 1977).

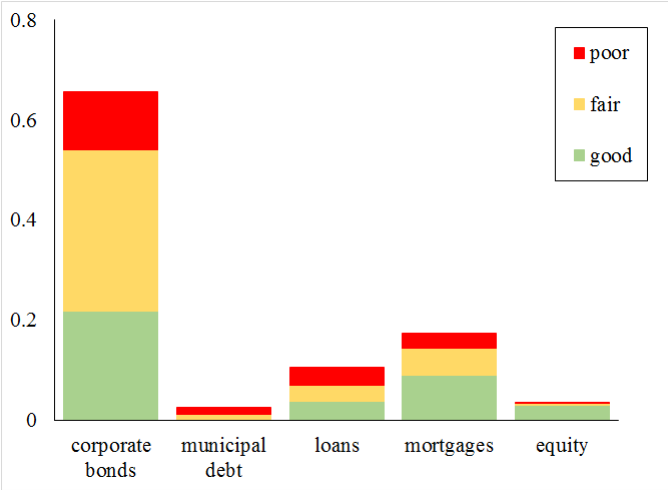
However, in practice, the RFC was much more flexible than the DW with its collateral requirements. We gathered a random sample of RFC application files and examiners' reports from the U.S. National Archives and Records Administration, and we report the types and quality of accepted collateral in Figure 1. More than 60% of collateral posted against an RFC loan consisted of corporate bonds, a majority of which were classified as "poor" or "fair." We include pictures of these applications in Appendix Section 6.1.

In addition to relaxed collateral requirements, the RFC's decision-making process was more flexible. The RFC took into consideration the bank's business environment, the number of nearby banks, and whether or not the bankers were "men of means" (see Appendix Figures A.1, A.2, and A.3). In contrast, the DW decisions were more formulaic, in that a bank had to meet the stated collateral requirements and have sound bank examiner reports.

Therefore, before the RFC became stigmatized, member banks needing assistance faced the

[3]We excluded nonmember banks from our analysis because they did not have this choice set. For a thorough review of the RFC, see Butkiewicz (1995, 1999), Mason (2001a,b, 2003, 2009), and Calomiris et al. (2013). For more information about the DW during the Great Depression, see Richardson and Troost (2009) and Wheelock (1990).

Figure 1: Collateral Accepted at the RFC



following tradeoff: the RFC charged a higher interest rate, but accepted weaker collateral, while the DW charged a lower interest rate, but required stronger collateral. Banks that chose the RFC may not have had strong enough collateral for the DW, or they may have been trying to take advantage of the more lenient conditions at the RFC. Indeed, the RFC interest rate of 5.5% for a six-month loan was still much cheaper than that of private markets, since the bond and bank loan market had frozen by this time (Hickman, 1960; Efraim et al., 2018). And, because many banks ultimately went to both facilities, banks may have dropped off their worse collateral at the RFC and used their best collateral at the DW, exploiting a setting of multiple facilities (Acharya et al., 2017).

2.2 Information Revelation Event

Initially, the RFC kept the identities of all of its borrowers confidential, even going so far as to use elaborate codes in communicating with its loan agencies and individual banks (Olson, 1977). However, on July 21, 1932, the Emergency Relief and Construction Act of 1932 (ERCA) amended the original RFC Act. Section 201(b) required the RFC to make monthly reports of new borrower names for Congress (RFC, 1932). The monthly reports of loan authorizations would be held by the clerks of the Senate and the House of Representatives until Congress resumed session in December (RFC, 1932). South Trimble, the Clerk of the House, reasoned that Congress's intent was to provide the list to the public (NYT, 1932b,g; CFC, 1932); and, on August 22, 1932, he disclosed the first

report and the *New York Times* published a list of banks that had loans recently authorized from the RFC.

The loan authorization date for a bank determined whether the bank's identity was revealed. The first monthly report submitted by the RFC to Congress revealed banks that had loans authorized between July 21, 1932, and July 31, 1932. Because the ERCA was passed on July 21, this first monthly report was the only one to which Mr. Trimble had access. Disclosing all of the names available to him on the monthly list suggests that Mr. Trimble did not choose which banks to reveal in a way that was correlated with bank characteristics. Once Congress came back in session after the August publication, they made it clear to the Clerk that RFC reports were only to be made public while they were in session. Mr. Trimble disclosed six additional lists of borrower names following the August 22, 1932 list, finishing on January 26, 1933, all of which were published in the *New York Times*. The publications included all banks with loans authorized between July 21, 1932, and December 31, 1932, and loans greater than $100,000 authorized between February 2, 1932, and July 20, 1932. Meanwhile, all DW loans remained confidential, as well as loan renewals from the RFC. Appendix Table A.1 and Figure A.5 detail the dates of the publications and the information revealed.

Studies of this event include Butkiewicz (1995), Mason (2001b), Anbil (2018), and Vossmeyer (2019), which focus primarily on the consequences for the revealed banks (bank stigma).[4] Recall, we focus on facility stigma and banks that faced the threat of disclosure, not the banks that were revealed in the publication.

3 Data

3.1 Data Sources

To construct our bank-level sample of RFC and DW borrowing, we gather data from several sources.[5] RFC loan information and borrower names are from the *RFC Card Index to Loans Made to Banks and Railroads 1932–1957*, acquired from the U.S. National Archives and Records Administration. The cards report the name and address of the borrower; the date, request and amount of the loan; whether the loan was approved or declined; and loan renewals. We collect

[4] Other studies that discuss the event include Friedman and Schwartz (1963), Kennedy (1973), Keehn and Smiley (1988), and Keehn and Smiley (1993).

[5] Appendix Table A.3 lists details about each data source, the dates we used, and the variables we collected.

RFC loan information from February 2, 1932, to March 3, 1933. We chose this end date because the Emergency Banking Act of 1933 gave the RFC the authority to recapitalize banks through preferred stock purchases (Mason, 2001b). The names of banks revealed to the public are from the *New York Times* publications (see Appendix Figure A.5).

The DW data are proprietary, have never been used before, and are from the Federal Reserve Bank of Atlanta Archives. The data are from daily ledgers from January 1, 1931, through March 3, 1933. The ledgers report the name and address of the borrower, date, the loan amount outstanding, and the collateral amount outstanding. Because we do not observe DW flows, we assume that a large increase in the loan amount outstanding is a new loan. These loans are advances, not rediscounts, and exclude seasonal loans.

Bank balance sheet data are from *Rand McNally Bankers' Directory,* which was published every six months. We collect the amounts of paid-up capital, surplus-and-profits, deposits, and other liabilities on the liability side of the balance sheet as well as loans-and-discounts, bonds-and-securities, miscellaneous, and cash-and-exchanges (due from banks) on the asset side of the balance sheet. Further, we collect the number of principle correspondents and year of establishment for each bank. The data are hand-collected from six books: December 31, 1930; June 30, 1931; December 31, 1931; June 30, 1932; December 31, 1932; and June 30, 1933. We filter out observations where the balance sheet data are identical from period to period, approximately 11% of the data. We start our balance sheet data at December 31, 1930 to allow for a greater number of time series observations in our panel data analysis. We chose June 30, 1933 as our end date because it is the first date that the balance sheet data are available after all of the lists were published, and it provides enough time for banks' balance sheets to update following the publications.

Because our balance sheet end date is after the Bank Holiday in March 1933, one might be concerned that the Holiday is distorting our June 30, 1933 balance sheet data because of bank closures. However, after checking bank licenses in the 1933 Annual Report of the Office of the Comptroller of the Currency (OCC), we find that only four national banks in our sample remained unlicensed as of December 1933, and most banks reopened by May 1933. Therefore, we do not believe the Bank Holiday distorts our June 30, 1933 balance sheet data.

Finally, we collected data from the Fed Call Reports and from the Individual Statements of the Condition of National Banks from the OCC in December 1931 and December 1933. These

yearly December-only snapshots offer more granular balance sheet data, including the amount of U.S. Treasury securities versus other securities on each bank's balance sheet. Other securities include corporate and real estate bonds. For each bank, we also collect "Reserves held with Federal Reserve Bank" and "Deposits Due from Other Banks." For state and county data, we collect information from the Federal Deposit Insurance Corporation (FDIC) Bank Deposit Data, 1920–1936 (Inter-university Consortium for Political and Social Research) and the 1930 census of population, manufacturing, and agriculture. We verify bank failure dates in the *Moody's Banking & Finance Directory*. Specifics of the data pertaining to each methodology are described in the following sections.

3.2 Data Sample and Hypotheses

Our sample consists of member banks located in the Sixth Federal Reserve District, which covers Alabama, Florida, Georgia, and parts of Tennessee, Mississippi, and Louisiana.[6] This sample is significant because the DW in this District was largely free of stigma – i.e., banks were not reluctant to approach it for assistance – and, therefore, the facility is useful to compare with the stigmatized RFC. The absence of stigma at the DW is apparent from the strong participation of member banks: after the panic in Mississippi during the autumn of 1930, about 58% of member banks received assistance from the DW in 1931. The Atlanta Federal Reserve President (of the Sixth District) and his advisers encouraged loose lending facility standards at the DW (Richardson and Troost, 2009).[7] Since Richardson and Troost (2009) do not document stigma at the Sixth District DW, we believe this District provides a useful setting to uncover differences between the DW and RFC that may not be apparent in other Districts.[8]

We develop two testable hypotheses with this sample. In these hypotheses, we follow Drechsler et al. (2016) in defining stronger banks as banks that obtain more liquid assets after receiving emergency funds, and weaker banks as banks that obtain fewer liquid assets after receiving funds. Importantly, like in Drechsler et al. (2016), these definitions are based on banks' balance sheets after disbursements from an emergency facility.

[6] We do not have data on banks from Mississippi or Louisiana; we believe those banks may have approached the DW at the Sixth District's New Orleans Branch.

[7] While there is evidence of occasional disagreement between regulators at the DW and RFC, they had similar goals of supporting the banking system, particularly in the Sixth District (NYT, 1932h, 1933a).

[8] The Sixth District is the only one to make Depression-era data on DW lending available and we are the first researchers to use these data.

Hypothesis 1: A stigma-free facility attracts both stronger and weaker banks.

Hypothesis 2: A stigmatized facility attracts weaker banks. Stronger banks would avoid the facility.

Implication: Hypotheses 1 and 2 imply that banks at a stigmatized facility would, on average, obtain fewer liquid assets than banks at a stigma-free facility.

Motivated by our hypotheses, we classify the Fed's member banks in this District into three mutually exclusive groups defined by banks' choice of facility after the RFC became stigmatized, i.e., borrowing after August 22, 1932.[9] Table 1 displays the definitions for each group.

Table 1: Group Definitions

DWBank	Banks that *only* borrowed from the DW after the publication (not revealed)
RFCBank	Banks that borrowed from the RFC after the publication (not revealed)
Nonapplicant	Banks that did not borrow from either facility

Banks that went to both facilities after the publication are classified in the "RFCBank" group. "After the publication" refers to the time period of August 23, 1932 to March 3, 1933. We remove any bank revealed in the publications from our sample.

RFCBanks, as defined in Table 1, faced the threat of disclosure and gambled with whether their identity would be revealed because they chose to borrow from the RFC after the publication. To test our hypotheses, we compare the balance sheets of these banks with banks that avoided the stigmatized RFC and only approached the DW (DWBanks) to see if DWBanks built a larger buffer of liquid assets after receiving emergency funds. Table 1 also includes a definition for Nonapplicants, which expands the sample to all member banks not revealed in the publications and provides a benchmark for healthy banks since these banks did not need assistance (Vossmeyer, 2016).

Table 2 describes balance sheet statistics of RFCBanks, DWBanks, and Nonapplicants before and after the RFC became stigmatized. Before the publication, RFCBanks and DWBanks had roughly similar balance sheets. However, after the publication, DWBanks' balance sheets looked

[9] We remove any bank revealed in the publications from our sample (55 banks) because they experienced immediate deposit withdrawals (Anbil, 2018). We confirm that the banks in our sample were not experiencing consequences from depositors in Appendix Table A.6.

Table 2: Summary Statistics

Variable	**RFCBank**	**DWBank**	**Nonapplicant**
No. Banks	51	120	85
Average Financial Ratios as of June 30, 1932 (before publication)			
Bonds-and-Securities/Assets	0.23	0.25	0.31
Surplus-and-Profits/Assets	0.07	0.05	0.08
Treasury-Securities/Assets	0.11	0.14	0.17
Average Financial Ratios as of June 30, 1933 (after publication)			
Bonds-and-Securities/Assets	0.24	0.30	0.32
Surplus-and-Profits/Assets	0.07	0.08	0.08
Treasury-Securities/Assets	0.16	0.21	0.20
County Characteristics (1930 averages)			
Population ($\times$1000)	42.7	58.5	54.0
No. Manufacturing Firms	51	81	65
Cropland ($\times$1000 acres)	94.0	87.7	81.1
Average Amounts Borrowed (after publication)			
DW Facility per bank	258,000	260,490	
RFC Facility per bank	267,764	.	

This table provides summary statistics for RFCBanks, DWBanks, and Nonapplicant banks as of June 1932 and June 1933 from the *Rand McNally Bankers' Directory*. County data are from the 1930 census and Treasury securities data are from the December issues of OCC Individual Statements and Fed Call Reports.

more similar to Nonapplicants and less similar to RFCBanks. DWBanks may have used the emergency assistance to build their bonds-and-securities portfolios to levels seen at the well-capitalized Nonapplicant banks, whereas RFCBanks did not (evidence supporting Hypothesis 2).[10]

The bottom rows of Table 2 show that RFCBanks were receiving assistance from both facilities after the publication, implying that the DW was attracting a large pool of banks, likely both stronger and weaker (evidence supporting Hypothesis 1). While the raw data in Table 2 provide preliminary evidence supporting our hypotheses, it also displays differences in county characteristics between our groups of banks, suggesting that a simple comparison of balance sheets omits important details about banks' business environments. Our panel data analysis in Section 4 controls for these county characteristics, along with bank and time fixed effects, to examine whether the balance sheets of RFCBanks and DWBanks were statistically different from one another.

Finally, because the RFC had a higher interest rate and accepted worse collateral than the DW, one might expect the RFC to attract weaker banks even without stigma at the facility. Table 3

[10] Appendix Figure A.4 presents a photo of the RFC's loan application, displaying aggregate balance sheet information and the bank's stated purpose for applying, e.g, "general bank needs." Based on information from applications, we believe examiners would not have been able to a priori determine stronger or weaker banks.

presents descriptive statistics, where we group banks by their choice of facility regardless of timing. "All RFC" refers to banks that borrowed from the RFC at anytime. Similarly, "All DW" refers to banks that borrowed from the DW at anytime. These two groups are not mutually exclusive and banks can belong to both categories. We observe that the differences across balance sheets as of June 30, 1933 are far less pronounced than in Table 2, providing evidence that it was the choice of facility *after the publication* driving the differences, not the choice of facility regardless of timing. While these summary statistics indicate few differences between "All RFC" and "All DW" banks, our methodology in Section 5 formally models the choice of facility to separate effects from the threat of disclosure from effects due to collateral and interest rate differences at the facilities.

Table 3: Summary Statistics

Variable	**All RFC**	**All DW**
Average Financial Ratios as of June 30, 1932 (before publication)		
Bonds-and-Securities/Assets	0.22	0.23
Surplus-and-Profits/Assets	0.08	0.07
Treasury-Securities/Assets	0.11	0.12
Average Financial Ratios as of June 30, 1933 (after publication)		
Bonds-and-Securities/Assets	0.24	0.27
Surplus-and-Profits/Assets	0.07	0.08
Treasury-Securities/Assets	0.17	0.19

This table provides summary statistics as of June 1932 and June 1933 from the *Rand McNally Bankers' Directory*. "All RFC" refers to banks that borrowed from the RFC between February 1932 and March 1933. "All DW" refers to banks that borrowed from the DW between January 1931 and March 1933. County data are from the 1930 census and Treasury securities data are from the December issues of OCC Individual Statements and Fed Call Reports.

4 Panel Data Analysis

4.1 Set Up and Methodology

We construct a linear panel data model akin to a difference-in-differences setting, which allows us to make straightforward comparisons of balance sheet composition between RFCBanks and DWBanks before and after the RFC became stigmatized. We exclude Nonapplicants from this analysis to avoid selection issues induced by comparing banks that received emergency assistance with those that did not.

We estimate the following bank-level linear, panel data model by ordinary least squares (OLS),

where t runs biannually from December 31, 1930, through June 30, 1933:

$$Y_{it} = \alpha + \beta_1 RFCBank_i \times 1\{t \geq List\} + \beta_2 RFCBank_i \times 1\{t = List - 1\} \\ + \boldsymbol{\gamma} X_i \times 1\{t \geq List\} + \eta_t + \delta_i + \epsilon_{it}. \tag{1}$$

Y_{it} is the outcome of interest measured every six months t for bank i. $RFCBank_i$ is an indicator equal to 1 for RFCBanks defined in Table 1, and $1\{t \geq List\}$ is a indicator equal to 1 for observations that occur after the publication (i.e., December 31, 1932 and June 30, 1933). The coefficient of interest, β_1, measures the change in Y_{it} following the publication for RFCBanks in comparison with DWBanks (the omitted group). Note that we do not include a $1\{t \geq List\}$ indicator, nor an $RFCBank_i$ indicator, because these are captured in the half-year and bank fixed effects. However, we include a "1 period before the list" ($t = List - 1$, i.e., an indicator for June 30, 1932) interaction to capture evidence of the parallel trend assumption. If the coefficient on this term is insignificant, it is evidence that the balance sheets of RFCBanks were not statistically different from that of DWBanks before the publication, meaning that were it not for the publication, RFCBanks would have had similar balance sheet trends to DWBanks.

For the outcome variable, Y_{it}, we use two proxies to study bank performance: bonds-and-securities at time t divided by total deposits from *t-1*, and surplus-and-profits at time t divided by total deposits from *t-1*. We use the level of bonds-and-securities on a bank's balance sheet as a measure of its liquidity. If DWBanks had a larger securities portfolio than RFCBanks, then these banks had a larger liquidity buffer to withstand a depositor run. We recognize that bond-and-securities is an imperfect measure, as defaults on bonds were high during this period (Calomiris, 1993) and it overlaps with collateral pledged at the facilities.[11] As a result, in Section 5, we focus on alternative liquidity variables collected from the Fed Call Reports. The Call Report liquidity variables are only available in some years; thus, we do not employ them in this section to keep T large.[12] Our second measure, surplus-and-profits, is a proxy for the profits of each bank's securities portfolio to provide insight on how much cash the securities portfolio would yield during a liquidity stress scenario.

We scale bonds-and-securities and surplus-and-profits by total deposits from *t-1* to ensure that a bank's funding structure is not confounding Y_{it} contemporaneously. Moreover, we find scaling

[11] Appendix Table A.2 provides evidence that bank examiners viewed bonds-and-securities as a viable measure of liquidity. Of 32 random bank examiner reports from 1932-1933, 60% referred to a bank's bond-and-securities portfolio as a source of liquidity.

[12] See Mason (1998) for a discussion of the availability of Fed Call Reports during the Great Depression.

by deposits provides more meaningful comparisons of our results because we can observe how a bank's securities portfolio, and its profits, are affected by a $1 loss in deposits. However, one might be concerned that a bank's funding structure may not be correlated with its size. Accordingly, in our robustness checks, we control for bank size using total assets (see Appendix Table A.5). For failed banks, we record zero for these ratios over their period of failure; in turn, the bank leaves the sample, resulting in an unbalanced panel.

To capture local and macroeconomic conditions, we include $X_i \times 1\{t \geq List\}$, where X_i is a vector of controls at the state and county levels. X_i includes the following covariates at the state level: total deposits, total deposits at suspended banks, the number of banks, and the number of suspended banks. X_i includes the following covariates at the county level: the total population, the number of manufacturing establishments, the total dollar sales of wholesale establishments, the total dollar sales of retail establishments, acreage of cropland, the number of unemployed persons, and the unemployment rate. These state- and county-level covariates are intended to capture observable proxies for macroeconomic and local economic conditions, and are important to control for given the differences in county-level characteristics between RFCBanks and DWBanks apparent in Table 2. These controls are interacted with $1\{t \geq List\}$ to ensure the covariates do not confound Y_{it} (Barrot, 2016).

Finally, we include bank fixed effects, δ_i, to control for time-invariant bank characteristics and to capture the extent to which each bank affects Y_{it}. We also include half-year fixed effects, η_t, to account for time trends in Y_{it}, eliminating the concern that aggregate changes in Y_{it} and the publication of the list occurred together. Standard errors are clustered at the bank level according to Bertrand et al. (2004). Furthermore, all continuous variables are winsorized at the 1% level to avoid outliers driving the estimation results. However, the results are robust to not winsorizing.

4.2 Panel Results

Table 4 presents the results of Equation (1) with many control variables excluded for brevity. Appendix Table A.4 reports the results for the full set of variables. From Column (1), we find that RFCBanks reduced their securities portfolio (bonds-and-securities divided by lagged deposits) by 11.2 percentage points relative to DWBanks after the publication. This finding suggests that RFCBanks were weaker because they had less bonds-and-securities (and likely less liquid

Table 4: The Securities Portfolio and ROD of RFCBanks in comparison with DWBanks

	(1) Bonds	(2) ROD
$RFCBank \times 1\{t = List - 1\}$	-0.049**	-0.008
	(-2.04)	(-0.52)
$RFCBank \times 1\{t \geq List\}$	-0.112**	-0.055**
	(-2.60)	(-2.26)
Time FE	Yes	Yes
Bank FE	Yes	Yes
Controls on after list	Yes	Yes
Observations	734	734
R^2	0.7956	0.8088

Bonds (securities portfolio) is bonds-and-securities scaled by deposits at $t-1$ and ROD (return-on-deposits) is surplus-and-profits scaled by deposits at $t-1$. $RFCBank \times 1\{t \geq List\}$ equals 1 for RFCBanks for all t after the list publication (December 31, 1932 and June 30, 1933). $RFCBank \times 1\{t = List - 1\}$ equals 1 for RFCBanks one period before the publication (June 30, 1932). Controls is a vector of state- and county-level controls that occur when $1\{t \geq List\}$ equals 1, and are measured as of December 31, 1930. State-level controls include total dollar deposits, total dollar deposits at suspended banks, the number of banks, and the number of suspended banks. County-level controls include the total population, the number of manufacturing establishments, the dollar amount of wholesale sales, the dollar amount of retail sales, the amount of cropland, the number of unemployed persons, and the unemployment rate. Standard errors are clustered at the bank level and t-statistics are presented in parentheses. All continuous variables are winsorized at the 1% level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

assets) to sell to withstand a depositor run.[13] However, we also find that the coefficient on $RFCBank \times 1\{t = List - 1\}$ is statistically significant, showing that RFCBanks' securities portfolios were 4.9 percentage points lower than DWBanks before the publication. Thus, the change in the securities portfolios after the publication was likely smaller, closer to 6.3 percentage points. The statistical difference before the publication may be driven by unobservables, such as collateral valuations or management competence, potentially introducing endogeneity biases in our results. The importance of the joint model in Section 5 is clear: the joint model overcomes these methodological issues by endogenizing banks' choice of facility and controlling for the differences across facilities. Nevertheless, an F-test of the $RFCBank \times 1\{t = List - 1\}$ and $RFCBank \times 1\{t \geq List\}$ parameters shows that they are statistically different from one another. Indeed, RFCBanks reduced

[13] Did DWBanks maintain larger liquidity buffers by reducing their lending? If yes, the LOLR may reconsider lending to these banks because they were liquidity hoarders at the expense of lending to households and businesses. In Appendix Table A.7, we explore a specification where the outcome variable is loans-and-discounts divided by lagged deposits. We find no statistical differences between RFCBanks and DWBanks, implying that the liquidity buffer was not at the expense of lending to the real economy.

their securities portfolio relative to DWBanks after the publication.

Next, we use the bank's surplus-and-profits as a proxy for the performance of the securities portfolio. We refer to this numerator scaled by lagged deposits as the return-on-deposits (ROD). A low ROD would suggest that a bank's securities portfolio was of poor quality, especially because the bond market had dried up by 1932, and non-government bonds were performing very poorly (Hickman, 1960; Efraim et al., 2018). Column (2) of Table 4 presents the results of the same regression specification, except with ROD as the outcome variable. We find that RFCBanks experienced a drop of 5.5 percentage points in their ROD relative to DWBanks after the publication. This drop suggests that whatever assets RFCBanks were holding, their securities portfolio was not performing as well as DWBanks. As a result, RFCBanks were less likely to withstand a run, as their securities portfolios yielded less cash. We also find that RFCBanks and DWBanks were statistically similar in terms of ROD before the publication. This finding provides suggestive evidence that it was the use of the emergency funds that led the balance sheets of RFCBanks and DWBanks to diverge.

Our results imply that RFCBanks were weaker after the publication. These banks were unwilling or unable to maintain their funding because of their shrinking securities portfolios. The possible mechanisms that explain this result are either: (i) unobservables of bank type drove a bank's quality and only through the decision to approach a stigmatized facility was the bank's weaker type exposed, or (ii) RFCbanks did not use the emergency funds to build up a liquidity buffer, possibly because they relied on the RFC as a backstop for future funding. Although we are unable to distinguish between these two mechanisms, both are consistent with the main result of our paper – that the quality of banks at a stigmatized facility is weaker than that of a confidential facility. While DWBanks were clearly stronger with larger liquidity buffers, most RFCBanks were also receiving assistance from the DW, which implies that the DW attracted both stronger and weaker banks (evidence supporting Hypothesis 1). The RFC, on the other hand, attracted weaker banks, with stronger banks avoiding it (evidence supporting Hypothesis 2). Had the DW not existed, stronger banks may not have received any assistance, constraining their ability to provide support to weaker banks and liquidity to households.

4.2.1 Timing of Assistance

Our groups in Table 1 are defined by a bank's choice of facility after the publication. However, the RFC and DW facilities were operating well before the publication and some of the banks in our groups received assistance both before and after the publication, while others only received assistance after. "Early" borrowers, defined as banks that borrowed from either facility before the publication, were then allowed more calendar time for balance sheet adjustments. "Late" borrowers, defined as banks that borrowed after the publication but not before, could have been less prepared for the crisis ahead. Then, the timing of emergency assistance could be a driver of subsequent bank performance, which is not captured by our model in Equation (1).

Therefore, we test whether the balance sheets of early borrowers were different from those of late borrowers for robustness. We use the specification and sample from Table 4, except now our groups of interest are defined by early versus late borrowing. Table 5 displays the regression results. We find that there are no statistical differences between early and late borrowers. This result suggests that the timing of borrowing was not important; early borrowers were not necessarily more prepared for the crisis and not better banks to begin with.

Table 5: The Securities Portfolio and ROD of Early Borrowers in Comparison with Late Borrowers

	(1) Bonds	(2) ROD
$EarlyBorrower \times 1\{t = List - 1\}$	-0.025	-0.000
	(-0.81)	(-0.04)
$EarlyBorrower \times 1\{t \geq List\}$	-0.043	0.006
	(-0.80)	(0.34)
Time FE	Yes	Yes
Bank FE	Yes	Yes
Controls on after list	Yes	Yes
Observations	734	734
R^2	0.7918	0.8060

The sample and specification are identical to Table 4, but the group of interest is "Early" borrowers (banks that borrowed from either facility before the publication) and the omitted group is "Late" borrowers (banks that borrowed from either facility after the publication, but not before).

Another related timing complication may arise because our panel analysis includes two balance sheet observations well before the RFC's establishment (December 31, 1930 and June 30, 1931). Our

panel analysis uses these earlier balance sheet observations to help provide evidence of a parallel trend between RFCBanks and DWBanks before the publication and to establish a longer time series. However, to alleviate concerns that these earlier balance sheet observations over-emphasize the DW's presence, where banks could borrow from the DW much earlier than the RFC, we perform a robustness analysis by removing these earlier balance sheet observations from our specifications in Tables 4 and 5. Appendix Tables A.8 and A.9 present the results of a panel specification that begins at December 31, 1931 (just before the RFC's establishment). We find the results of this analysis to be consistent with our main results. Including earlier balance sheet observations in our panel analysis does not bias our main results.

5 Joint Model

5.1 Set Up and Methodology

In this section, we overcome the methodological concerns of Section 4 to ensure our results are robust. We expressed endogeneity concerns about our RFCBank results in Table 4. Given that facility choice is likely nonrandom, unobservables associated with our measures of bank performance (bonds-and-securities and ROD) may be correlated with a bank's decision to approach the RFC or DW. For instance, we do not have time varying controls for risk preferences or management competence. Unfortunately, these unobservable variables may relate to both facility choice and bank performance, and thus may introduce endogeneity biases in our estimates.

To overcome these biases, we develop a system of three equations that jointly models a bank's RFC choice, DW choice, and its subsequent performance, and simultaneously estimate the parameters of the system using a simulation-based algorithm. The framework models the variance-covariance matrix of facility choice and bank performance to allow for nonzero correlation in the unobservables. Then, the results from the joint model should not suffer from misspecification biases that arise from ignored correlation in the errors.

The system of three equations is

$$y_{i1} = 1\{\boldsymbol{x}'_{i1}\boldsymbol{\beta}_1 + \varepsilon_{i1} > 0\} \tag{2}$$

$$y_{i2} = 1\{\boldsymbol{x}'_{i2}\boldsymbol{\beta}_{21} + x_{i2,endog}\beta_{22} + \varepsilon_{i2} > 0\} \tag{3}$$

$$y_{i3} = \boldsymbol{x}'_{i3}\boldsymbol{\beta}_{31} + \boldsymbol{x}'_{i3,endog}\boldsymbol{\beta}_{32} + \varepsilon_{i3} \tag{4}$$

for banks $i = 1, \ldots, n$. The first outcome, y_{i1}, takes the value 1 if the bank borrowed from the DW and 0 otherwise (between January 1931 and March 1933). The second outcome, y_{i2}, takes the value 1 if the bank borrowed from the RFC and 0 otherwise (between February 1932 and March 1933). The third outcome, y_{i3}, is surplus-and-profits measured in June 1933 scaled by lagged deposits (ROD) to ensure the results in Section 4.2 are robust. Other liquidity variables are also considered for y_{i3}, which are detailed below and in Section 5.2.1. If the bank failed between 1931 and 1933, we record a 0 for y_{i3}. Finally, the model assumes $\varepsilon_i \equiv (\varepsilon_{i1}, \varepsilon_{i2}, \varepsilon_{i3}) \sim N_3(0, \mathbf{\Omega})$, where $\mathbf{\Omega} = \begin{pmatrix} 1 & \omega_{12} & \omega_{13} \\ \omega_{21} & 1 & \omega_{23} \\ \omega_{31} & \omega_{32} & \omega_{33} \end{pmatrix}$. The off-diagonal elements in $\mathbf{\Omega}$ capture the aforementioned covariances between facility choice and bank performance (an independence assumption $\omega_{12} = \omega_{13} = \omega_{23} = 0$ is not imposed here).

The model is specified for the historical setting. There are separate equations for DW choice and RFC choice because these facilities had different interest rates and collateral requirements; hence, we allow the determinants of each choice to differ. We endogenize DW lending in 1931 in the RFC choice equation ($x_{i2,endog}$) because participation at the DW before February 1932 could sequentially and endogenously influence a bank's choice to approach the RFC. We endogenize the facility choices in the bank performance equation ($\boldsymbol{x}_{i3,endog}$) because a liquidity injection from a facility drives subsequent balance sheet movements. Lastly, we do not require proportional substitution between the facilities. We are not asserting that the RFC is taking over the role of the DW or that the facilities are interchangeable. Simply, as of February 1932, if a member bank needed a loan, it had a choice. We allow for the RFC-DW choices to be correlated, but we do not put a structure on that correlation.[14]

Although time dynamics are not explicitly modeled (which is a benefit of the panel data model in the previous section), an advantage of not needing t every six months is that we can employ more granular balance sheet data. We collect data from Fed Call Reports and OCC Reports of the Condition of National Banks in December 1931 and December 1933. From this data collection, we construct collateral-specific covariates and we introduce two new bank liquidity variables as of December 1933 – reserves held with the Fed (ReservesFed) and deposits due from other banks

[14]The setting here is akin to a multivariate probit model, which does not require independence of irrelevant alternatives and allows for multiple choices. This setting differs from a multinomial setting where only one choice is made and proportional substitution is required (McFadden, 1974; Train, 2003).

(DepositsDue) – to be used as outcome variables for y_{i3}. These new liquidity variables, in addition to ROD measured in June 1933, do not suffer from the same biases as the bonds-and-securities outcome variable in Section 4 because changes in these variables are independent from collateral pledged at the facilities. In a panic, banks could draw on ReservesFed or DepositsDue because they acted as a liquidity buffer. Carlson and Wheelock (2018) and Mitchener and Richardson (2019) use these variables as measures of liquidity in studying the interbank network, contagion, and liquidity shocks. Further, we find evidence from a random sample of bank examiner reports, shown in Appendix Table A.2, that bank examiners viewed these components of the balance sheet as valid measures of bank liquidity.

The covariates selected for each equation follow from information provided in the facility applications. For the RFC choice equation, Equation (3), RFC examiners often commented on features of the county in which the bank operated, including manufacturing and agriculture. Thus, we include county information (county population, number of manufacturing establishments, and acreage of cropland) as covariates in $\boldsymbol{x}_{i2}$. However, since we do not observe this commentary in DW documentation, it is excluded from $\boldsymbol{x}_{i1}$ in the DW choice equation, Equation (2). Neither RFC examiners nor DW documentation commented on bank age or nearby employment but these characteristics may influence our liquidity outcome in Equation (4); hence, we include them in $\boldsymbol{x}_{i3}$. The data support these application-based exclusions, as they were formally tested via model comparison in Vossmeyer (2016).

Additional covariates that enter $\boldsymbol{x}_{i1}$, $\boldsymbol{x}_{i2}$, and $\boldsymbol{x}_{i3}$ in Equations (2), (3), and (4) respectively, include bank balance sheet information (loans-and-discounts divided by total assets, deposits divided by total liabilities, other securities divided by total assets, and Treasury securities divided by total assets) and the number of principle correspondents as of December 31, 1931. The Treasury and other securities variables, which were collected from OCC Reports and Fed Call Reports, allow us to better control for the eligible collateral at each facility. Also included in Equation (3) is $x_{i2,endog}$, an indicator of whether the bank borrowed from the DW before the RFC's establishment.

In Equation (4), $\boldsymbol{x}_{i3}$ also includes a variable for the number of months between the bank's first emergency loan and June 1933. Banks that borrowed from a facility earlier may have had more time to adjust their balance sheet than later borrowers. By including this variable, like in Section 4.2.1, we ensure that our results are not being influenced by the amount of time that a bank

had to use their emergency funds. The endogenous covariate vector, $\boldsymbol{x}_{i3,endog}$, is a set of indicator variables defined by the mutually exclusive groups in Table 1: RFCBanks, DWBanks (base group), and Nonapplicant banks. These three groups are an exhaustive set of banks that were eligible for both facilities and did not appear in the publication.

Finally, the sample of banks used in this section is larger than that of Section 4. We include nonapplicant banks, which were excluded from the panel analysis to avoid the sample selection issues that would arise from comparing banks that did and did not borrow from an emergency facility. Because the facility selection equations are modeled jointly here, we can include nonapplicants without selection issues. We estimate the joint model by Markov chain Monte Carlo (MCMC) methods. We provide motivation for using MCMC simulation and details about the estimation algorithm in Appendix Section 6.3.

5.2 Joint Model Results

Table 6 displays the results for the joint model. Columns DW, RFC, and ROD display the results for the system of three equations: Equation (2) that models DW choice, Equation (3) that models RFC choice, and Equation (4) that models bank performance using return-on-deposits (ROD). The following discussion briefly reports the results for each equation and then focuses on the main findings and policy implications. Appendix Table A.10 presents the results for the variance-covariance matrix $\boldsymbol{\Omega}$.

The results for Equations (2) and (3) help us understand the determinants of facility choice. The results in the DW and RFC columns demonstrate that the ratio of loans-and-discounts to total assets had a positive effect on borrowing from both the DW and RFC. Interestingly, the ratio of other securities divided by total assets is not statistically different from 0 for borrowing from the DW but is positively associated with borrowing from the RFC. This finding aligns with the applications and examiner reports in Appendix Section 6.1, which show flexibility in the RFC's collateral requirements. Therefore, banks with collateral other than Treasury securities were more likely to approach the RFC. The Treasury securities ratio, on the other hand, is not statistically different from 0 for either facility. This result is likely influenced by the large Treasury securities holdings of Nonapplicants (shown in Table 2), shedding light on why they did not borrow from either facility.

Table 6: Results for the Joint Model

	DW	RFC	ROD
Intercept	1.599 (0.997)	-3.354 (1.316)	0.193 (0.047)
	[-0.05, 3.22]	[-5.53, -1.21]	[0.12, 0.27]
Loans-and-Discounts / Assets	2.237 (1.091)	3.357 (1.150)	
	[0.61, 3.94]	[1.50, 5.27]	
Treasury Securities / Assets	0.788 (1.150)	0.643 (1.430)	-0.033 (0.074)
	[-1.09, 2.69]	[-1.65, 2.99]	[-0.16, 0.09]
Other Securities / Assets	0.487 (1.192)	3.987 (1.457)	-0.095 (0.092)
	[-1.48, 2.45]	[1.63, 6.41]	[-0.25, 0.05]
Deposits / Liabilities	-3.775 (0.788)	-1.726 (0.880)	
	[-5.08, -2.50]	[-3.19, -0.28]	
No. Correspondents	0.017 (0.043)		
	[-0.05, 0.08]		
Bank Age			0.082 (0.050)
			[-0.00, 0.16]
County Population		0.526 (0.265)	
		[0.08, 0.96]	
Manufact. Est.		-0.006 (0.003)	
		[-0.01, -0.00]	
Cropland		-0.085 (0.144)	
		[-0.32, 0.15]	
Unemployment rate			-1.159 (0.491)
			[-1.96, -0.33]
Number of months since 1st loan			-0.000 (0.003)
			[-0.01, 0.01]
Endog: DW, Pre-RFC		0.447 (0.213)	
		[0.01, 0.97]	
Endog: RFCBank			-0.055 (0.027)
			[-0.10, -0.01]
Endog: Nonapplicant			-0.041 (0.042)
			[-0.10, 0.03]

Posterior means, standard deviations (in parentheses), and 95% credibility intervals (in brackets, calculated using quantiles) are based on 11,000 MCMC draws with a burn-in of 1,000. If the credibility interval does not include zero, the result is statistically different from zero. The priors are centered at 0 with a variance of 25. Column DW reflects the results for Equation (2), where $y_{i1} = 1$ if the bank borrowed from the DW and 0 otherwise (between January 1931 and March 1933). Column RFC reflects the results for Equation (3), where $y_{i2} = 1$ if the bank borrowed from the RFC and 0 otherwise (between February 1932 and March 1933). Column ROD reflects the results for Equation (4), where y_{i3} is surplus and profits measured in June 1933 divided by lagged deposits. Endog: DW, Pre-RFC is the estimate for the endogenous covariate $x_{i2,endog}$ in Equation (3), an indicator if the bank borrowed from the DW before the RFC's establishment. Endog: RFCBank and Endog: Nonapplicant are estimates for the endogenous covariates in Equation (4), an indicator for RFCBanks and an indicator for Nonapplicants (defined in Table 1). The omitted group is DWBanks, so the results are relative to DWBanks. The balance sheet covariates in the DW, RFC, and ROD columns are from December 1931. The county covariates are from the 1930 Census of Population, Manufacturing, and Agriculture.

Column RFC also displays results for the county covariates in $\boldsymbol{x}_{i2}$, as this information was considered by RFC examiners. We find that county population had a positive effect on borrowing from the RFC, and cropland and manufacturing had negative effects (cropland not statistically different from 0). These results align with Calomiris and Mason (2003) and Richardson (2007), who find that bank distress is a continuation of agricultural and local economic distress. The endogenous covariate is "DW, Pre-RFC." This variable is an indicator that takes the value of 1 if the bank borrowed from the DW in 1931, before the RFC's establishment. The result is positive and statistically different from 0. Thus, after controlling for banks' balance sheets and business environments, we find that borrowing from the DW in 1931 increased the probability of borrowing from the RFC. This result implies that the facility choices are interrelated and entering banks' utility functions. This finding also aligns with the notion that banks would want to approach both facilities – one to borrow at a lower rate and the other to borrow against their worse collateral (Acharya et al., 2017).

Focusing on the ROD equation, Equation (4), we find that the unemployment rate in a county had a negative effect on ROD. Thus, areas with higher unemployment rates had worse performing banks. We also find that the time since the first loan is not statistically different from zero and therefore does not affect ROD, agreeing with the results in Section 4.2.1. The results for the endogenous covariates show the following about ROD relative to DWBanks: (i) RFCBanks had a lower return (-5.5 percentage points); and (ii) Nonapplicant banks were not statistically different from DWBanks. Therefore, the results of the joint model are consistent with the panel specification in that the portfolio of RFCBanks was not performing as well as DWBanks. This section contributes to our overall results by showing that DWBanks became statistically indistinguishable from Nonapplicants, which were well-performing banks. Given that Table 2 shows how different DWBanks and Nonapplicant banks appeared before the list publication, it is impressive that one year later DWBanks were able to build their surplus-and-profits similar to that of Nonapplicants.

5.2.1 Additional Liquidity Results

We consider two alternative outcome variables for y_{i3}: reserves held with the Fed scaled by lagged deposits (ReservesFed) and deposits due from other banks scaled by lagged assets (DepositsDue), as additional measures of bank performance. These variables represent a bank's liquidity buffer

and are measured as of December 1933. We acknowledge that using data from December 1933 is imperfect because these conditions are after the nadir of the crisis and encompasses a large period with significant changes to the banking system. However, the Fed Call Reports from June 1933 are incomplete (Mason, 1998).

Table 7: Liquidity Outcome Variables

	ReservesFed	DepositsDue
Endog: RFCBank	-0.020 (0.010)	-0.034 (0.018)
	[-0.04, -0.00]	[-0.07, 0.00]
Endog: Nonapplicant	-0.009 (0.017)	0.020 (0.04)
	[-0.03, 0.02]	[-0.04, 0.07]

Posterior means, standard deviations (in parentheses), and 95% credibility intervals (in brackets, calculated using quantiles) are based on 11,000 MCMC draws with a burn-in of 1,000. If the credibility interval does not include zero, the result is statistically different from zero. The priors are centered at 0 with a variance of 25. The specifications of these models are the same as Table 6 except, in column ReservesFed, y_{i3} is reserves held with the Fed measured in December 1933 scaled by lagged deposits and, in column DepositsDue, y_{i3} is deposits due from other banks measured in December 1933 scaled by lagged assets.

Table 7 presents the results of $\boldsymbol{x}_{i3,endog}$ in Equation (4) of the model. The full results are presented in Appendix Tables A.11 and A.12. The results show that, relative to DWBanks, RFCBanks reduced their position of liquid assets during the financial crisis (-2.0 percentage points for ReservesFed and -3.4 percentage points for DepositsDue). DWBanks, on the other hand, demonstrated their quality by making their liquidity buffer statistically indistinguishable from Nonapplicants. These results are consistent with the ROD results in Table 6 and the panel results in Table 4.

The mechanism that explains these results could be that there were unobservable quality differences between RFCBanks and DWBanks which were only exposed through the bank's decision to approach the stigmatized RFC, or that weaker and stronger banks used their emergency funds differently. Regardless, we show that the stigmatized RFC attracted a weaker group of borrowing banks; banks that obtained fewer safe, liquid assets after receiving emergency funds (evidence supporting Hypothesis 2). Alternatively, the DW attracted both stronger and weaker banks, reaching a larger population of banks in need of assistance (evidence supporting Hypothesis 1).

6 Implications for LOLR Facilities

We study how stigma and the threat of disclosure change the quality of banks that approach emergency lending facilities. We examine a setting from the Great Depression, where a partial list of banks that borrowed from the Reconstruction Finance Corporation (RFC) was published in the *New York Times*. This sudden introduction of stigma at the RFC and the presence of an alternative confidential facility (DW) allow us to investigate changes in the composition of weaker and stronger banks at each facility. Stronger banks are those that obtain more liquid assets after receiving emergency assistance, whereas weaker banks obtain fewer (Drechsler et al., 2016).

Using novel bank-level data on emergency lending in the Sixth Federal Reserve District from 1931-1933, we find that banks that borrowed from the stigmatized RFC (but were not named in the publication) maintained smaller liquidity buffers and had lower profits in comparison with banks that solely approached the DW. Banks that solely approached the DW built up their liquidity buffers so much that they became statistically indistinguishable from the well-capitalized banks that did not apply for any assistance. However, the majority of banks that approached the stigmatized RFC also approached the DW, suggesting that the DW attracted a large pool of borrowers.

Our results imply that a stigmatized lending facility attracts weaker banks, whereas a confidential facility attracts both stronger and weaker banks. If no confidential facility is present, stronger banks may not participate at any facility, which constricts the LOLR's ability to reach many banks and inject liquidity into the real economy.

Our results have implications for how lender of last resort facilities should be designed. Policymakers often comment that the fall of 2007 was the most uncertain period during the recent financial crisis, because the magnitude of the subsequent crisis was not yet apparent. Frictions in interbank markets were increasing, preventing banks from finding short-term funding, but bank participation at the standing-facility remained stagnant because of its stigma problem. In response, the Fed created the Term Auction Facility (TAF) to attract bank participation. The Fed realized that an alternative stigma-free facility was needed to increase bank participation and attract stronger banks. Had the standing-facility attracted bank participation, it might have been able to alleviate interbank funding frictions earlier during the crisis, and been more effective at mitigating the panic.

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Appendix

6.1 Appendix: Historical Documents

RFC Applications and Examiner Files: Below is a collection of images from the RFC loan applications and examiner files. They are displayed here for several reasons: (i) to capture the RFC's flexibility with regard to collateral (Figure A.1), (ii) to show that the RFC considered aspects outside of the bank's balance sheet, including county characteristics, local market information, and bank management personal characteristics (Figures A.2 and A.3), and (iii) to demonstrate that the RFC examiners were looking at aggregate balance sheet information and that the applicants' reasons for approaching was often left vague (Figure A.4).

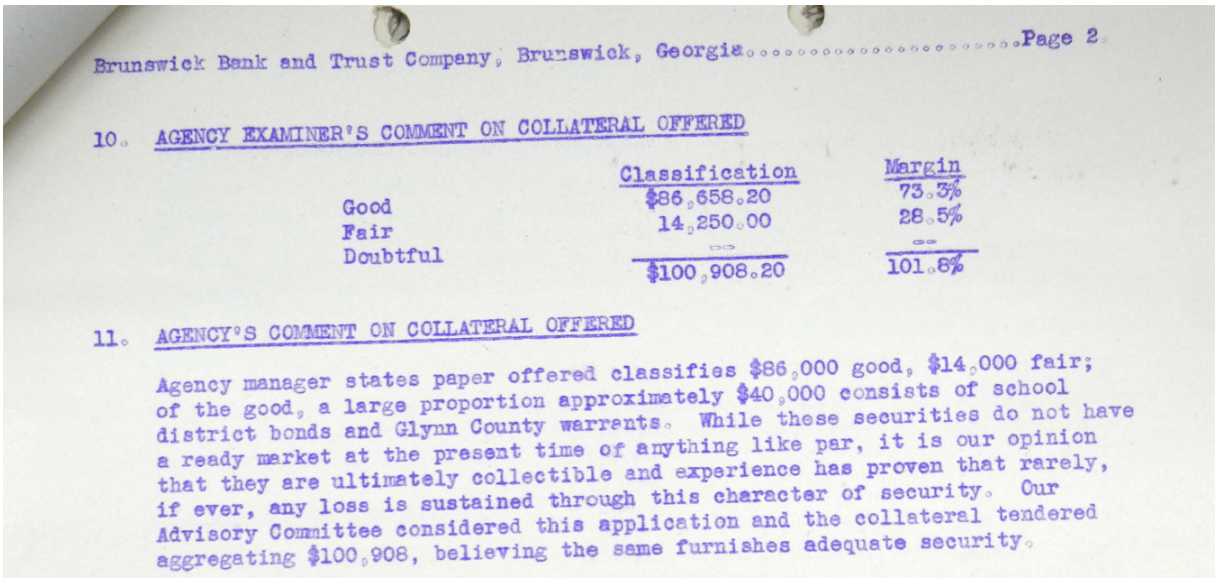
Figure A.1 displays an application where the RFC accepted school district bonds and municipal warrants as collateral with a haircut of 150%. The loan application is from Brunswick Bank & Trust Company in Brunswick, Georgia on May 1932. Their collateral were classified into three categories: "good", "fair", and "poor" where the RFC agency examiner decided the appropriate haircut. The examiner notes that these bonds were completely illiquid, but still accepted the collateral for an RFC loan. Additionally, the Brunswick Bank & Trust Company was authorized a loan of $50,000 in late May 1932 despite having another outstanding loan to the RFC of $25,000 authorized in February 1932. Frequently, we observe the RFC authorizing new loans to banks that already had existing unpaid loans. Because the RFC was more lenient in the collateral it accepted over the DW, it seems banks could roll over their existing six-month loans more easily for up to two-years.

We observe the RFC's consideration of the bank's environment and local economic factors. Figure A.2 displays a photo of the loan application of the First National Bank in Linden, Alabama. This photo indicates that RFC examiners noted that the First National Bank was the only bank in the town, and that the town was a large farming and dairying section of Alabama. We observe no such comments in the surviving DW loan applications, suggesting that location and market size were more relevant for RFC examiners. We also observe RFC examiners commenting on bank management and whether the bankers were "men of means." Appendix Figure A.3 displays a photo of the loan application of the Commercial National Bank in Laural, Mississippi. The RFC examiner noted that the management of this bank was highly regarded as to character and ability. This bank received a haircut of 80% on collateral of real estate mortgages and municipal bonds for an authorized loan of $135,000. We observe no such commentary about bank management on the

DW ledgers.

Next, Figure A.4 displays a photo of the first page of the RFC's loan application. This particular one was submitted by the First National Bank in Kingsport, Tennessee in early 1932. Under "Statement of Condition" we observe that examiners had access to aggregate balance sheet information. Further, we see that the bank's reason for applying was "general bank needs." Banks often provided vague reasons for applying, offering minimal information to examiners.

Figure A.1: RFC Examiner Classifying Bank Collateral



Brunswick Bank and Trust Company, Brunswick, Georgia.....Page 2.

10. AGENCY EXAMINER'S COMMENT ON COLLATERAL OFFERED

	Classification	Margin
Good	$86,658.20	73.3%
Fair	14,250.00	28.5%
Doubtful	--	--
	$100,908.20	101.8%

11. AGENCY'S COMMENT ON COLLATERAL OFFERED

Agency manager states paper offered classifies $86,000 good, $14,000 fair; of the good, a large proportion approximately $40,000 consists of school district bonds and Glynn County warrants. While these securities do not have a ready market at the present time of anything like par, it is our opinion that they are ultimately collectible and experience has proven that rarely, if ever, any loss is sustained through this character of security. Our Advisory Committee considered this application and the collateral tendered aggregating $100,908, believing the same furnishes adequate security.

Figure A.2: RFC Examiner Commenting on Nearby Banking Conditions

13. AGENCY EXAMINER'S COMMENT ON APPLICANT

Linden, Alabama, a town with about 1,500 population, is the County Seat of Marengo County, a large farming and dairying section in the Black Belt of Alabama.

The First National Bank is the only bank in this town, having taken over the Marengo County Bank in January, 1931 and sustaining a loss of $6,700.00 thereby.

At present this bank owes the Selma National Bank $20,000.00 and the Federal Reserve Bank $28,000.00. The proceeds of this loan are to be used to retire the indebtedness to the Selma National Bank and to provide $30,000.00 additional funds to meet the decline in deposits. It is not making any new loans at all and unless the depositors should become disturbed we do not feel that it will have occasion to borrow additional funds.

Figure A.3: RFC Examiner Commenting on Management and Local Economy

17. AGENCY EXAMINER'S COMMENT ON APPLICANT

Laurel is a town of 15,000 population and is the County Seat of Jones County, situated in the southeastern part of Mississippi. It is an average agricultural region for the hill country of Mississippi. This County averages approximately 15,000 bales of cotton per year. They have considerable fruit and truck. This town also contains two of the largest saw mill operations in the south. The management of this bank is highly regarded, both as to character and ability. Directors are men of means.

Figure A.4: Aggregate Balance Sheet Information and Applicant Reason Provided to the RFC

1. Nashville Agency

FIRST NATIONAL BANK

Kingsport, Tennessee

Member Federal Reserve System? Yes.

Agency No. 53
Docket No. 2788
Appl. No. 1
Date of Appl. 4/19/32
Date of Report 5/3/32

2. STATEMENT OF CONDITION

	6/30/31	12/31/31	4/18/32		6/30/31	12/31/31	4/18/32
Cash	449	319	214	Deposits	1652	1805	1488
Bonds	273	393	365	Bills Pay.	-	-	102
Loans	1117	1279	1191	Due N.C.C.	-	-	-
Bnk,F.& F.	139	137	138	Other Liab.	-	-	-
Other R.E.	-	-	-	Capital	100	100	100
Other Assets	1	-	7	Surp.& Prof.	112	111	113
				Other Res.	15	12	12
				Circulation	100	100	100
Total	1979	2128	1915	Total	1979	2128	1915

3. LOAN APPLIED FOR

Amount	Int.Rate	Amount Collateral	% Margin	Maturity
$100,000	5½%	$177,942.87	78%	9/1/32

Loan $100,000 was approved by the Board April 29, 1932.

4. AGENCY EXAMINER RECOMMENDS	$100,000.00	78%
5. AGENCY RECOMMENDS	$100,000.00	78%
6. WASHINGTON EXAMINER RECOMMENDS	$100,000.00	78%

7. PURPOSE OF LOAN AND APPLICANT'S COMMENTS

This loan is desired for the purpose of "general bank needs."

Publications of RFC Loan Authorizations: Table A.1 presents the six publication dates of the *New York Times* articles and the information that was revealed. Across the publications, all banks with loans authorized between July 21, 1932, and December 31, 1932, and loans greater than $100,000 authorized between February 2, 1932, and July 20, 1932 were revealed to the public. Figure A.5 presents snapshots of the headlines of the articles.

Table A.1: Publication Dates of RFC Loan Authorizations in the *New York Times*.

Date	**Revealed**	Reference
August 22, 1932	Loans authorized between July 21-31, 1932	NYT (1932e)
October 7, 1932	Loans authorized in August 1932	NYT (1932a)
October 22, 1932	Loans authorized in September 1932	NYT (1932f)
November 28, 1932	Loans authorized in October 1932	NYT (1932c)
December 22, 1932	Loans authorized in November 1932	NYT (1932d)
January 26, 1933	Loans authorized in December 1932 and loans greater than $100,000 authorized between February 2, 1932 and July 21, 1932	NYT (1933c,b)

Figure A.5: *New York Times* Headlines

Report of the R. F. C., Listing Some of Loans and Showing Financial Condition

Special to THE NEW YORK TIMES.

WASHINGTON, Aug. 22.—The text of the first monthly report of the Reconstruction Finance Corporation to the secretary of the Senate and the clerk of the House under the terms of the unemployment relief act, made public today by the clerk of the House, follows:

Sir:

Pursuant to the provisions of Title 2, Section 201 (B) of the emergency relief and construction act of 1932, approved July 21, 1932, the Reconstruction Finance Corporation submits this report of its activities and expenditures during the period from July 21, 1932, the date the act became a law, to July 31, 1932, inclusive, together with a statement of the loans authorized during the period mentioned showing the name, amount and rate of interest in each case.

Under the provisions of Section 5 of the Reconstruction Finance Corporation act the corporation during this period authorized 437 loans aggregating $45,057,556.10 and authorized increases aggregating $1,653,500 in loans authorized prior to July 21, 1932, making a total of $46,711,056.10, as shown in Table 1.

Of this amount $32,000,180.23 was authorized to banks and trust

IOWA.

Andrew—Andrew Savings Bank 60,000
Armstrong—First Trust and Savings Bank 25,000
Belle Plaine—Corn Belt Trust and Savings Bank 30,000
Charles City—First Security Bank and Trust Company 75,000
Craig—Farmers Savings Bank 10,000
Des Moines—Valley National Bank 250,000
Garner—Farmers National Bank 6,000
Goldfield—Goldfield State Bank and Trust Company 25,000
Hanlontown—Citizens Savings Bank 25,000
Harcourt—Harcourt Savings Bank 12,000
Keota—Farmers Savings Bank 30,000
Lamoni—Lamoni State Bank 25,000
Mallard—Mallard Trust and Savings Bank 11,500
Maxwell—Farmers State Bank 60,000
Mondamin—Mondamin Savings Bank 30,000
Morley—Jones County Savings Bank 5,000
Mount Pleasant—Henry County Savings Bank 170,000
New London—Farmers State Bank 35,000
Pocahontas—Pocahontas State Bank 5,000
Quimby—State Trust and Savings Bank 25,000
Rainbeck—First Savings Bank of Rainbeck 5,000
St. Ansgar—First National Bank 5,000
Westbranch—Citizens Savings Bank 7,000
Westbranch—Westbranch State Bank 30,000
Williamsburg—Williamsburg Savings Bank 15,000
Winterset—Citizens National Bank 37,000

OREGON.

Beaverton—Bank of Beaverton 17,750
Bend—Lumbermen's National Bank 75,000
Klamath Falls—American National Bank 28,000
Pendleton—First Inland National Bank 50,000
Portland—Montavilla Savings Bank 49,400
Scappoose—First National Bank 6,500
Wallowa—Stock Growers and Farmers National Bank 10,500
Woodburn—Bank of Woodburn 31,000

PENNSYLVANIA.

Allentown—Liberty Trust Company 100,000
Altoona—Central Trust Company 60,000
Bethlehem—Bethlehem National Bank 300,000
Blairsville—Blairsville Savings and Trust Company 100,000
Chester—Chester-Cambridge Bank and Trust Co. 260,000
Clairton—Union Trust Company 91,600
Coraopolis—Coraopolis Trust Company 352,000
Dale, Johnstown Postoffice—Dale National Bank 16,800
Duffield—Union Bank and Trust Company 65,000
Duquesne—Duquesne Trust Company 157,500
Erie—Erie Trust Company 200,000
Glassport—Glassport Trust Company 34,000
Grove City—First National Bank 94,200
Lancaster—Farmers Trust Company 753,810.13
McKeesport—Peoples Bank 176,000
Old Forge—Old Forge Discount and Deposit Bank 31,500
Parsons—Citizens Bank of Parsons 60,000

NORTH CAROLINA.

Dunn—Home Building and Loan Association of Dunn 12,000
Greenville—Greenville Building and Loan Association 6,500
Huntersville—Huntersville Mutual Building and Loan Association 5,000
Elkin—Elkin-Jonesville Building and Loan Association 10,000
Rockingham—Richmond County Building and Loan Association 15,000

NORTH DAKOTA.

Grand Forks—Grand Forks Building and Loan Association 100,000

OHIO.

Cleveland—Altna Savings and Loan Association 50,000
Hamilton—Home Loan and Building Association 75,000
Toledo—United Savings Association 112,000
Toledo—United Savings Association 200,000
West Jefferson—West Jefferson Building and Loan Company 30,000

TENNESSEE.

Dyersburg—Dyer County Building and Loan Association 15,000

VIRGINIA.

Petersburg—Petersburg Mutual Building and Loan Association, Inc. 25,000

WEST VIRGINIA.

Wellsburg—Brooke County Building and Loan Association 25,000
Wheeling—Wheeling Savings and Loan Association 76,000

WISCONSIN.

New London—New London Building and Loan Association 12,000

Details of the Loans Made During August by the Reconstruction Corporation

Special to THE NEW YORK TIMES.

WASHINGTON, Oct. 1.—The text of the second monthly report of the Reconstruction Finance Corporation to the House of Representatives was made public today by the clerk of the House as follows:

Sept. 28, 1932

Hon. South Trimble,
Clerk of the House of Representatives,
Washington, D. C.
Sir:

City and Name.	Amount Authorized. (F.C.)	Int. Rate.
ARIZONA		
Holbrook—The First National Bank	2,300	5½
Holbrook—The First National Bank	25,000	5½
Nogales—The Nogales National Bank (Receiver)	45,000	5
Phoenix—The Valley Bank and Trust Company	280,000	5½
Prescott—The Sandy Anderson Co.	51,250	5½
Prescott—Yavapai County Savings Bank	32,500	5½
Tucson—United Bank and Trust Company	30,000	5½
ARKANSAS		
Allison—State Bank of Allison	24,000	5½
Ames—Ames Trust and Savings Bank	124,000*	5½
Ames—Union Story Trust and Savings Bank	120,000	5½
Arcadia—Arcadia State Bank	5,000	5½
Ashton—The First National Bank in Ashton	8,000	5½
Atlantic—Farmers Savings Bank	13,983	5½
Avoca—The Avoca State Bank	27,000*	5½
Bloomfield—Davis County Savings Bank	65,000	5½
Boone—Boone State Bank	46,000*	5½
Bronson—The Bronson Savings Bank	9,000	5½
[illegible]		
Hartford—Olney National Bank	27,000	5½
Highland Park—Highland Park State Bank	2,600,000*	5½
Hudsonville—The Hudsonville State Bank	20,000	5½
Iron Mountain—First National Bank	100,000	5½
Jackson—Jackson City Bank and Trust Company	101,730	5½
Jonesville—The Grosvenor Savings Bank	45,000	5½
Lenox—Macomb County Savings Bank	100,000	5½
Lincoln—Lincoln State Bank	5,000*	5½
Manistee—First National Bank of Manistee	16,000	5½
Manistique—The State Savings Bank of Manistique	42,071.19	5½
[illegible]		

R.F.C. Reports Loans and Disbursements in September

Special to THE NEW YORK TIMES.

WASHINGTON, Oct. 22.—The text of the monthly report of the Reconstruction Finance Corporation to Congress showing loans authorized in September totaling $137,346,000 follows, as made public by South Trimble, Clerk of the

City and Name.	Amount Authorized
IOWA	
Spragueville—Farmers Savings Bank	25,000
Tostarville—Union Savings Bank	6,000
Treas—Farmers Savings Bank	*40,000
Treynor—Treynor State Bank	*40,000
Victor—Farmers Savings Bank of Victor	27,000
Waterville—Farmers and Merchants Sav-	
NEW MEXICO	
Clovis—Citizens Bank of Clovis	*14,000
Mountainair—First State Bank	*10,000
Tucumcari—American National Bank of Tucumcari	12,500
Tucumcari—First National Bank	*25,000
[illegible]	
VIRGINIA	
Bloxom—Peoples Bank of Bloxom	25,00
Clifton Forge—Clifton Forge National Bank	100,00
Lawrenceville—Brunswick Bank & Trust Company	25,00
New Church—Bowman & Westbrook Bank	25,00

Reconstruction Corporation Loans Authorized in October

Special to THE NEW YORK TIMES.

WASHINGTON, Nov. 28.—Following is the monthly report of the Reconstruction Finance Corpora-

gray, $25,000; Hollandale, Bank of Hollandale, $10,000; Jackson, Citizens Savings Bank and Trust Company, *$150,000; Kosciusko, Kosciusko State Bank, $25,000; Leland, Commercial Bank and Trust Company of Leland, $112,500.39; Lumberton, First National Bank, $76,811.03;

Self-Liquidating Projects Backed in October

Special to THE NEW YORK TIMES.

WASHINGTON, Nov. 28.—Table No. 9 of the Reconstruction Finance

$80,77; Mangum, First National Bank, $1,676.45; Marlesan, Farmers State Bank, $800; New Holstein, Peoples State Bank, $1,000; New Richmond, Bank of Richmond, $2,100; Oconto Falls, Bank of Oconto Falls, $2,000; Port Washington, Farmers State Bank, $800.

and Trust Co., $305.89; Greensboro: North Carolina Bank and Trust Co., $316,984.94 and $344,982.71.

OHIO—Akron: Commercial Bank and Trust Company, $1,000; Ashtabula, Ashtabula Savings Bank, $1,000; Cambridge, Cambridge State Bank, $300; Canton: Georgia First National Bank, $300; Canton: Georgia

Reconstruction Corporation's Report to Congress on Its Loans in November

Special to THE NEW YORK TIMES.

WASHINGTON, Dec. 23.—Following is the monthly report of the Reconstruction Finance Cor-

000; Rogers, State Bank of Rogers, $15,000; Rushford, Rushford State Bank, $20,000; Rushville, First State Bank, $10,000; Sacred Heart, Farmers and Merchants Bank and Trust Company, $25,000; Sacred Heart, Merchants State Bank, $5,000; St. Clair, St.

Statement of Condition by Finance Corporation With Receipts and Expenditures for November

Savings Bank, $24,000; Bayfield, First National Bank of Bayfield, $5,000; Bloomington, Bloomington State Bank, $20,000*; Cassville, Carolina State Bank, $25,000*; Cuba City, Cuba City State Bank, $25,000*; Gov. Dodge, State Bank of Cash, $25,000*;

Self-Liquidating Projects Backed in November

Special to THE NEW YORK TIMES.

WASHINGTON, Dec. 23.—Table 3 of the Reconstruction Finance Corporation's report

Dorchester, Citizens State Bank of Dorchester, $150; Hartkin, State Bank of Hartkin, $300; Marinette, Bank of Marinette, $200; Schofield, Banking House of F. Pelon, $300;

R.F.C. Monthly Report, Showing the Loans Which Were Authorized in December

WASHINGTON, Jan. 26.—Following is the monthly report of the Reconstruction Finance Corporation, showing loans authorized last December (exclusive of amounts with-

Statement of Condition by Finance Corporation, With Receipts and Expenditures for December

ton, $4,000*; Bisden, Exchange Bank, $7,000; Bloomfield, Farmers & Merchants State Bank, $4,000; Boskin, Boskin State Bank, $3,000; Callaway, Farmers State Bank, $5,000; Cambridge, Bank of Cambridge, $20,000; Ca Will, Farmers & Merchants Bank, $5,000; Elkhorn, State

$5,523,709 Lent in December To Banks in Receivership

ing & Loan Association, $6,500*; Fairchild, Cross Creek Building & Loan Association, $300,303.19; Gaston, Home Building & Loan Association, $30,000*; Hendrum, Hendrum Building & Loan Association, $12,000*.

NORTH DAKOTA—Grand Forks, Dakota

Reconstruction Finance Loans of $100,000 or More From Feb. 2 to July 21, 1932

Special to THE NEW YORK TIMES.

WASHINGTON, Jan. 26.—The Reconstruction Finance Corporation's report of all loans authorized by it from Feb. 2 to July

Reconstruction Finance Corporations Loans Up to July 21, 1932.

Summary by classes of loans authorized from Feb. 2, 1932, to July 20, 1932, inclusive, and changes in such loans from July 21, 1932, to Jan. 6, 1933, inclusive, [illegible]

ILLINOIS.

Continued From Previous Column.

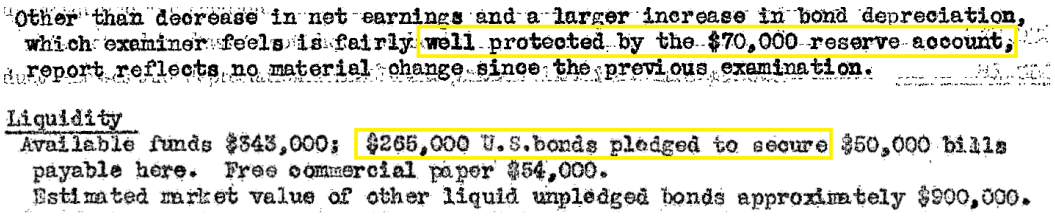
Federal Reserve Examination Files: We searched the Federal Reserve Board Archives for physical copies of examination files to understand how bank examiners viewed liquidity on bank balance sheets. We found examination files from the Federal Reserve District of Chicago (1932-1933). We reviewed 32 random bank examiner reports. Table A.2 summarizes the frequency that certain components of the balance sheet were referred to as liquid. Figure A.6 provides an example of such references.

Of the 32 we viewed, 19 reports mention the bank's bond-and-securities as a measure of the bank's liquidity, and only one report forces the bank to writedown their bond-and-securities portfolio. 18 examination files mention the deposits due from other banks as another measure of the bank's liquidity. 5 files mention the bank's reserve position as a source of liquidity. Therefore, we believe these examination files provide evidence that our outcome variables used in Sections 4.2 and 5.2 (bond & securities, deposits due, and reserves) were considered reasonable sources of liquidity.

Table A.2: Bank Examiner Liquidity References

Category	Count
No. Examiner Reports Viewed	32
Mentions Bonds & Securities as Liquidity	19
Mentions Deposits Due as Liquidity	18
Mentions Reserves as Liquidity	5
Forced Bonds & Securities writedown	1

Figure A.6: Example of Liquidity References


Other than decrease in net earnings and a larger increase in bond depreciation, which examiner feels is fairly well protected by the $70,000 reserve account, report reflects no material change since the previous examination.

Liquidity
Available funds $343,000; $265,000 U.S.bonds pledged to secure $50,000 bills payable here. Free commercial paper $54,000.
Estimated market value of other liquid unpledged bonds approximately $900,000.

Dataset Construction: The dataset in this paper uses many sources. For clarity, we provide details on each data source, the dates we used, and the variables we collected below.

Table A.3: Data Sources

Source	**Dates**	**Variables**
Rand McNally Bankers' Directory	December 30, 1930 thru June 30, 1933	All banks: bank location, balance sheet items, bank age, correspondents
OCC Individual Statements	December 31, 1931	National banks: treasury securities and other securities
Fed Call Reports	December 31, 1931	State Fed-Member banks: treasury securities and other securities
Fed Call Reports	December 31, 1933	All banks: reserves held with the Fed and deposits due from other banks
Atlanta Fed Archives	January 1, 1931 thru March 3, 1933	All banks: DW borrowing
NARA RFC Card Index	February 2, 1932 thru March 3, 1933	All banks: RFC borrowing
Census	1930	County-level: population, manufacturing, cropland, unemployed persons
FDIC	1931-1933	state-level: banks, suspended banks, deposits, deposits at suspended banks

6.2 Appendix: Panel Analysis

Full List of Covariates: In Table 4, we suppress many covariates in "controls" to save space in the main text. Table A.4 includes the estimates of all covariates.

Table A.4: Securities Portfolio and ROD of RFCBanks and RevealedBanks relative to DWBanks

	(1) Bonds	(2) ROD
$RFCBank \times 1\{t = List - 1\}$	-0.049**	-0.008
	(-2.04)	(-0.52)
$RFCBank \times 1\{t \geq List\}$	-0.112**	-0.055**
	(-2.60)	(-2.26)
total deposits	-0.497	-0.118
	(-1.27)	(-0.67)
total deposits at suspended banks	0.066	0.029
	(1.06)	(1.06)
no. banks	0.494	0.117
	(1.37)	(0.75)
no. banks suspended	-0.169	-0.051
	(-1.02)	(-0.76)
total population	0.408*	0.285**
	(1.78)	(2.03)
no. manufacturing firms	0.060	0.033
	(1.01)	(1.09)
amt. wholesale sales	-0.003	0.000
	(-0.62)	(0.17)
amt. retail sales	-0.138**	-0.088***
	(-2.24)	(-2.82)
amt. crop land	-0.042*	-0.001
	(-1.73)	(-0.13)
no. unemployed	-0.266	-0.205
	(-1.24)	(-1.51)
unemployment rate	4.119	4.009
	(0.91)	(1.47)
Constant	-0.226***	-0.042
	(-2.61)	(-1.08)
Bank FE	Yes	Yes
Time FE	Yes	Yes
Observations	734	734
R^2	0.7956	0.8088

Bank and time fixed effects are included. State-level and county-level controls occur when $1\{t \geq List\}$ equals 1, and are measured as of December 31, 1930. Standard errors are clustered at the bank level and t-statistics and are presented in parentheses. All continuous variables are winsorized at the 1% level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Incorporating Total Assets: As a robustness check, Table A.5 presents the results of the panel models using lagged total assets, instead of lagged deposits, as the denominator of the outcome variables. The outcome for Columns (1) is bonds-and-securities divided by lagged assets and for Columns (2) is surplus-and-profits divided by lagged assets (traditionally termed return-on-assets, ROA). These measures directly take into consideration the bank's size as opposed to the bank's funding structure.

Table A.5: The Securities Portfolio and ROA of RFCBanks in Comparison with DWBanks

	(1) Bonds	(2) ROA
$RFCBank \times 1\{t = List - 1\}$	-0.040***	-0.008
	(-2.65)	(-0.88)
$RFCBank \times 1\{t \geq List\}$	-0.076***	-0.026***
	(-3.27)	(-2.91)
Time FE	Yes	Yes
Bank FE	Yes	Yes
Controls on after list	Yes	Yes
Observations	732	732
R^2	0.8295	0.8254

The specifications are the same as those in Table 4 except here the outcome variables are scaled by lagged total assets.

From Columns (1) and (2) of the table, we see that RFCBanks reduced their securities portfolio by 7.6 percentage points and reduced their ROA by 2.6 percentage points after the publication in comparison with DWBanks. These results align with those of Table 4. The same methodological concern is present here as well, namely, that $RFCBank \times 1\{t = List - 1\}$ is statistically significant. An F-test confirms that $RFCBank \times 1\{t = List - 1\}$ and $RFCBank \times 1\{t \geq List\}$ are indeed statistically different from one another.

Depositor Consequences: Anbil (2018) shows that banks named in the *New York Times* experienced immediate deposit withdrawals. The withdrawals were likely a consequence of bank stigma, where depositors observed that their bank received emergency assistance and took this information as a signal of financial weakness. Another explanation for withdrawals is the concept of effective subordination (Mason, 2001b; Calomiris and Mason, 2003). When a bank offered collateral and received RFC assistance, the RFC became senior to depositors in a claim on the assets given as collateral. Whether it be bank stigma or effective subordination, we should observe changes in revealed bank deposits before and after the revelation, and no changes for DWBanks and RFCBanks. DWBanks and RFCBanks were never revealed to the public, so their depositors could not have interpreted financial weakness or felt effectively subordinated.

We consider the panel specification in Equation (1) and Table 4, but change Y_{it} to be deposits divided by lagged assets and now include the revealed bank sample. Table A.6 presents the results, which show that RFCBanks are not statistically different from DWBanks (before or after the list publication). However, revealed banks had lower deposits, which aligns with the concepts of bank stigma and effective subordination. It is essential for our analysis that RFCBanks and DWBanks are not different from one another with regard to deposits. In studying facility stigma and understanding why banks would approach a stigmatized facility, neither of these groups should face consequences from depositors since their names remained confidential.

Table A.6: Deposits of RFCBanks and RevealedBanks relative to DWBanks.

	Deposits
$RFCBank \times 1\{t = List - 1\}$	-0.063
	(-1.50)
$RFCBank \times 1\{t \geq List\}$	-0.041
	(-0.84)
$RevealedBank \times 1\{t = List - 1\}$	-0.084*
	(-1.82)
$RevealedBank \times 1\{t \geq List\}$	-0.116**
	(-2.18)
Time FE	Yes
Bank FE	Yes
Controls on after list	Yes
R^2	0.7186

The specifications are the same as those in Table 4 except here the outcome variable is deposits divided by lagged assets and revealed banks are included in the specification. *RevealedBank* takes the value 1 for banks named as recipients of RFC assistance in the New York Times.

Bank Lending: We present the results of our panel specification that examines banks' loans portfolios. Specifically we ask, did DWBanks maintain larger liquidity buffers by reducing their lending? If yes, perhaps the LOLR would reconsider lending to these banks because they were liquidity hoarders at the expense of lending to households and businesses. The translation of LOLR lending to bank lending is an important outcome for facility effectiveness (Alves et al., 2016; Sumit et al., 2015; Benmelech et al., 2017). Table A.7 presents the panel results, where the specification is the same as Table 4 except the outcome variables is loans-and-discounts divided by lagged deposits. We find no statistical differences in lending between RFCBanks and DWBanks before or after the list publication. Thus, the liquidity buffer of DWBanks was not coming at the expense of lending to the real economy.

Table A.7: The Loan Portfolio of RFCBanks and RevealedBanks in comparison with DWBanks

	(1) loans and discounts
$RFCBank \times 1\{t = List - 1\}$	-0.073 (-0.91)
$RFCBank \times 1\{t \geq List\}$	-0.067 (-0.64)
Time FE	Yes
Bank FE	Yes
Controls on after list	Yes
Observations	733
R^2	0.5822

The specification is the same as those in Table 4 except here the outcome variable is loans-and-discounts scaled by lagged deposits.

Beginning Panel Analysis on December 31, 1931: A concern about our panel specification in Tables 4 and 5 is that two of the time periods are before the RFC's establishment, which may over-emphasize the DW's influence in the panel. In this section, we re-run our main panel models, but start our analysis at December 31, 1931 (omitting December 30, 1930 and June 30, 1931) to address this concern. Tables A.8 and A.9 present our robustness results.

Table A.8: The Securities Portfolio and ROD of RFCBanks in comparison with DWBanks

	(1) Bonds	(2) ROD
$RFCBank \times 1\{t = List - 1\}$	-0.037*	-0.009
	(-1.67)	(-0.71)
$RFCBank \times 1\{t \geq List\}$	-0.107**	-0.057**
	(-2.42)	(-2.50)
Time FE	Yes	Yes
Bank FE	Yes	Yes
Controls on after list	Yes	Yes
Observations	535	535
R^2	0.8195	0.8597

The specifications are the same as those in Table 4 except here our panel only includes four balance sheet dates: December 31, 1931; June 30, 1932; December 31, 1932; and June 30, 1933. The original specifications in Table 4 use six balance sheet dates in the panel analysis and begin at December 31, 1930.

We find the estimates presented in Table A.8 to be nearly identical to Table 4. From Column (1), we find that RFCBanks reduced their securities portfolio by 10.7 percentage points relative to DWBanks after the publication (the coefficient in Table 4 Column (1) is -11.2 percentage points). Moreover, the coefficient on $RFCBank \times 1\{t = List - 1\}$ is less statistically significant than in Table 4 indicating that the shorter sample makes our results more robust. From Column (2), we find that RFCBanks experienced a drop of 5.7 percentage points in their ROD relative to DWBanks after the publication (the coefficient in Table 4 Column (2) is -5.5 percentage points).

Next, we find the estimates presented in Table A.9 to be nearly identical to those presented in Table 5. Again, with our shorter time series, we find no statistical differences between early and late borrowers. This result suggests that the timing of borrowing was not important; early borrowers were not necessarily more prepared for the crisis and not better banks to begin with.

Table A.9: The Securities Portfolio and ROD of Early Borrowers in Comparison with Late Borrowers

	(1) Bonds	(2) ROD
$EarlyBorrower \times 1\{t = List - 1\}$	-0.037	-0.005
	(-1.14)	(-0.38)
$EarlyBorrower \times 1\{t \geq List\}$	-0.063	0.000
	(-1.07)	(0.01)
Time FE	Yes	Yes
Bank FE	Yes	Yes
Controls on after list	Yes	Yes
Observations	535	535
R^2	0.8182	0.8556

The specification is the same as Table 5 except here our panel only includes four balance sheet dates: December 31, 1931; June 30, 1932; December 31, 1932; and June 30, 1933. The original specification in Table 5 uses six balance sheet dates in the panel analysis and begins at December 31, 1930.

6.3 Appendix: Joint Model

Multivariate models like the one employed in Section 5 are often not employed because of estimation complications. The likelihood function for our system of three equations is analytically intractable, which is due to the discrete outcomes in the first two equations and the endogenous covariates. Estimation is further complicated because of the normalizations in the variance-covariance matrix $\boldsymbol{\Omega}$, which are standard in any binary or ordered data setting (Jeliazkov et al., 2008). We circumvent the intractability of the likelihood function by employing a simulation-based Bayesian estimation framework. It is assumed that $\boldsymbol{\beta}$ has a joint normal distribution with mean $\boldsymbol{b}_0$ and variance $\boldsymbol{B}_0$ and (independently) $\boldsymbol{\omega} \sim N(\boldsymbol{\rho}_0, \boldsymbol{R}_0)1\{\boldsymbol{\omega} \in S\}$, where S is the set of parameters that produce the positive definite matrix $\boldsymbol{\Omega}$.

If we rewrite the model in terms of latent data, z_i, we get:

$$
\begin{aligned}
z_{i1} &= \boldsymbol{x}'_{i1}\boldsymbol{\beta}_1 + \varepsilon_{i1} && (5)\\
z_{i2} &= \boldsymbol{x}'_{i2}\boldsymbol{\beta}_{21} + +x_{i2,endog}\beta_{22} + \varepsilon_{i2} && (6)\\
z_{i3} &= \boldsymbol{x}'_{i3}\boldsymbol{\beta}_{31} + \boldsymbol{x}'_{i3,endog}\boldsymbol{\beta}_{32} + \varepsilon_{i3} && (7)\\
y_{i1} &= 1\{z_{i1} > 0\} && (8)\\
y_{i2} &= 1\{z_{i2} > 0\} && (9)\\
y_{i3} &= z_{i3} && (10)
\end{aligned}
$$

The complete-data posterior is then given by:

$$
\pi(\boldsymbol{\beta}, \boldsymbol{\Omega}, \boldsymbol{z}|\boldsymbol{y}) \propto \left(\prod_{i=1}^{n} \left[\prod_{j=1}^{2} 1\{z_{ij} > 0\} \right] N(\boldsymbol{z}_i|\boldsymbol{X}_i\boldsymbol{\beta}, \boldsymbol{\Omega}) \right) \times N(\boldsymbol{\beta}|\boldsymbol{b}_0, \boldsymbol{B}_0) N(\boldsymbol{\omega}|\boldsymbol{\rho}_0, \boldsymbol{R}_0) 1\{\boldsymbol{\omega} \in S\}.
$$

The above posterior gives rise to a Markov chain Monte Carlo (MCMC) estimation algorithm. The algorithm is designed particularly for this application and is inspired by other work on multivariate discrete data models (Jeliazkov et al., 2008) and models with restricted covariance matrices (Chan and Jeliazkov, 2009). Furthermore, the algorithm features data augmentation for the sampling of $\boldsymbol{z}$, which follows from Tanner and Wong (1987) and Albert and Chib (1993).

Details on the MCMC estimation algorithm are presented below, where as a matter of notation, we use "$\backslash k$" to represent all elements in a set except the kth one.

Algorithm 1 *MCMC Estimation Algorithm*

1. *Sample* $[\boldsymbol{\beta}|\boldsymbol{z}, \boldsymbol{\Omega}] \sim N\left(\hat{\boldsymbol{b}}, \hat{\boldsymbol{B}}\right)$, *where* $\hat{\boldsymbol{b}}$ *and* $\hat{\boldsymbol{B}}$ *are given by*

$$\hat{\boldsymbol{b}} = \hat{\boldsymbol{B}}\left(\boldsymbol{B}_0^{-1}\boldsymbol{b}_0 + \sum_{i=1}^{n} \boldsymbol{X}_i'\boldsymbol{\Omega}^{-1}\mathbf{z}_i\right) \quad \textit{and} \quad \hat{\boldsymbol{B}} = \left(\boldsymbol{B}_0^{-1} + \sum_{i=1}^{n} \boldsymbol{X}_i'\boldsymbol{\Omega}^{-1}\boldsymbol{X}_i\right)^{-1}.$$

2. *Sample* $\boldsymbol{\Omega}|\mathbf{y}, \boldsymbol{\beta}, \mathbf{z}$ *using the Metropolis-Hastings algorithm (use* $\boldsymbol{\omega}$ *to produce* $\boldsymbol{\Omega}$*)*

3. *For equations* $k = 1, 2$, *sample* $\mathbf{z}_{ik}|\mathbf{y}, \boldsymbol{\beta}, \boldsymbol{\Omega}, \mathbf{z}_{\backslash k} \sim \mathcal{TN}_{\mathcal{A}_i}(\mu_{k|\backslash k}, V_{k|\backslash k})$ *where* $\mu_{k|\backslash k}$ *and* $V_{k|\backslash k}$ *are the usual conditional mean and conditional variance, respectively. If* $y_{ik} = 0$, $\mathcal{A}_i$ *is* $(-\infty, 0)$, *and if* $y_{ik} = 1$, $\mathcal{A}_i$ *is* $(0, \infty)$.

Variance-Covariance Results: Table A.10 presents the posterior means, standard deviations, and implied correlation form for the estimates of $\mathbf{\Omega}$ (from the specification in Table 6). ω_{12} represents the covariance between the errors of applying for DW and RFC funding. The implied correlation is positive at 0.261 with a standard deviation of 0.133. This implies a high correlation between the choices from the unobservable dimension. Since many banks approached both facilities, the positive sign is not surprising. The result supports the notion that these facilities were not substitutes and, indeed, the joint model is capturing the overlap between the facilities. Ignoring such a correlation form by assuming independence of facility choice and liquidity could lead to misspecification biases and inconsistencies across all model parameter estimates.

Table A.10: Results for $\mathbf{\Omega}$ in the Joint Model.

$\mathbf{\Omega}$	ω_{11}	ω_{12}	ω_{22}	ω_{13}	ω_{23}	ω_{33}
Mean	1	0.260	1	-0.028	-0.010	0.017
Standard Deviation	.	0.134	.	0.012	0.012	0.001
Implied Correlation	1	0.261	1	-0.215	-0.077	1

Posterior means, standard deviations, and implied correlation form for the estimates of $\mathbf{\Omega}$. Posterior means and standard deviations are based on 11,000 MCMC draws with a burn-in of 1,000. ω_{12} is the covariance between the errors of the choice of RFC assistance and DW assistance. ω_{13} is the covariance between the errors of the choice of DW assistance and the bank's subsequent ROD. ω_{23} is the covariance between the errors of the choice of RFC assistance and the bank's subsequent ROD.

Full results for other liquidity variables: Table 7 presents the results for the endogenous covariates in the joint model when Equation (4)'s outcome variable is reserves held with the Fed divided by lagged deposits and deposits due from banks divided by lagged assets. We suppressed the full results to save space in the main text. Tables A.11 and A.12 present the full results for each specification.

Table A.11: Results for the Joint Model with Reserves at Fed

	DW	RFC	ReservesFed
Intercept	0.211 (1.058)	-2.154 (1.185)	0.119 (0.020)
Loans-and-Discounts / Assets	3.526 (1.097)	3.184 (1.131)	
Treasury Securities / Assets	1.918 (1.247)	-0.064 (1.371)	-0.036 (0.033)
Other Securities / Assets	1.350 (1.312)	3.105 (1.381)	-0.047 (0.038)
Deposits / Liabilities	-2.878 (0.789)	-1.336 (0.795)	
No. Correspondents	0.017 (0.044)		
Bank Age			-0.026 (0.021)
County Population		0.371 (0.242)	
Manufact. Est.		-0.005 (0.002)	
Cropland		-0.212 (0.137)	
Unemployment rate			-0.078 (0.203)
Number of months since 1st loan			-0.001 (0.001)
Endog: DW, Pre-RFC		0.748 (0.301)	
Endog: RFCBank			-0.020 (0.010)
Endog: Nonapplicant			-0.009 (0.017)

Posterior means and standard deviations (in parentheses) are based on 11,000 MCMC draws with a burn-in of 1,000. The priors are centered at 0 with a variance of 25. Column DW reflects the results for equation (2), where $y_{i1} = 1$ if the bank borrowed from the DW and 0 otherwise (between January 1931 and March 1933). Column RFC reflects the results for equation (3), where $y_{i2} = 1$ if the bank borrowed from the RFC and 0 otherwise (between February 1932 and March 1933). Column ReservesFed reflects the results for equation (4), where y_{i3} is the Reserves held with the Fed, measured in December 1933, divided by lagged deposits. Endog: DW, Pre-RFC is the estimate for the endogenous covariate $x_{i2,endog}$ in equation (3), an indicator if the bank borrowed from the DW before the RFC's establishment. Endog: RFCBank and Endog: Nonapplicant are the estimates for the endogenous covariates in equation (4), an indicator for RFCBanks and an indicator for nonapplicant banks. The omitted group is DWBanks, so these results are relative to DWBanks. The balance sheet covariates in the DW, RFC, and ReservesFed columns are from December 1931. The county covariates are from the 1930 Census of Population, Manufacturing, and Agriculture.

Table A.12: Results for the Joint Model with Deposits Due from Banks

	DW	RFC	DepositsDue
Intercept	0.024 (1.036)	-2.182 (1.164)	0.210 (0.042)
Loans-and-Discounts / Assets	3.799 (1.113)	3.423 (1.142)	
Treasury Securities / Assets	2.176 (1.227)	0.099 (1.366)	-0.055 (0.067)
Other Securities / Assets	1.665 (1.325)	3.272 (1.411)	-0.017 (0.078)
Deposits / Liabilities	-2.910 (0.746)	-1.450 (0.782)	
No. Correspondents	0.015 (0.044)		
Bank Age			-0.073 (0.044)
County Population		-0.375 (0.238)	
Manufact. Est.		-0.005 (0.002)	
Cropland		-0.223 (0.136)	
Unemployment rate			0.120 (0.419)
Number of months since 1st loan			-0.004 (0.002)
Endog: DW, Pre-RFC		0.697 (0.288)	
Endog: RFCBank			-0.030 (0.015)
Endog: Nonapplicant			0.018 (0.035)

Posterior means and standard deviations (in parentheses) are based on 11,000 MCMC draws with a burn-in of 1,000. The priors are centered at 0 with a variance of 25. Column DW reflects the results for equation (2), where $y_{i1} = 1$ if the bank borrowed from the DW and 0 otherwise (between January 1931 and March 1933). Column RFC reflects the results for equation (3), where $y_{i2} = 1$ if the bank borrowed from the RFC and 0 otherwise (between February 1932 and March 1933). Column DepositsDue reflects the results for equation (4), where y_{i3} is the deposits due from banks, measured in December 1933, divided by lagged assets. Endog: DW, Pre-RFC is the estimate for the endogenous covariate $x_{i2,endog}$ in equation (3), an indicator if the bank borrowed from the DW before the RFC's establishment. Endog: RFCBank and Endog: Nonapplicant are the estimates for the endogenous covariates in equation (4), an indicator for RFCBanks and an indicator for nonapplicant banks. The omitted group is DWBanks, so these results are relative to DWBanks. The balance sheet covariates in the DW, RFC, and DepositsDue columns are from December 1931. The county covariates are from the 1930 Census of Population, Manufacturing, and Agriculture.