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DEPOSIT INSURANCE AND THE COMPOSITION OF BANK SUSPENSIONS IN DEVELOPING ECONOMIES: LESSONS FROM THE STATE DEPOSIT INSURANCE EXPERIMENTS OF THE 1920S

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Deposit Insurance and the Composition of Bank Suspensions in Developing Economies: Lessons from the State Deposit Insurance Experiments of the 1920S
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ABSTRACT

Eight states established deposit insurance systems between 1908 and 1917. All abandoned the systems between 1921 and 1930. Scholars debate the costs and benefits of these policy experiments. New data drawn from the archives of the Federal Reserve Board of Governors demonstrate that deposit insurance influenced the composition of bank suspensions in these states. In typical years, suspensions due to runs fell. Suspensions due to mismanagement rose. During the penultimate year of each system, the bank failure rate rose to an unsustainable height and the system ceased operations.

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1. Introduction

The savings-and-loan debacle of the 1970s and 80s stimulated research on deposit insurance. Interest persists because of the institution's international diffusion during recent decades. Recently, the IMF endorsed a form of deposit insurance in its code of best practices [Demirgüç-Kunt and Detragiache 2002 pp. 1377, Demirgüç-Kunt and Kane 2001 p. 3]. The desirability of deposit insurance, however, remains controversial, particularly among economists who have studied the history of deposit insurance in the United States.

Between 1908 and 1917, eight states – Oklahoma, Texas, Kansas, Nebraska, South Dakota, Mississippi, North Dakota, and Washington – established deposit insurance systems. Within three decades, all discontinued operations. The experiences of these states influenced the bankers, scholars, politicians, and pundits who wanted to reform America's financial system after the Great Depression. They believed the state deposit insurance systems had reduced bank runs and that a similar nationwide system would protect the nation from banking panics in the future. The advocates of deposit insurance won the debate in 1934, when Congress established the Federal Deposit Insurance Corporation. Today, economic historians paint a bleaker picture of the state deposit insurance experience. The state systems encouraged risk taking, discouraged prudence, and distorted the incentives of bank owners and managers. This moral hazard weakened the financial system and raised bank suspension rates [Calomiris 1990 and 1992; Alston, Grove, Wheelock 1990; Wheelock 1993; Wheelock and Kumbhakar 1995; Wheelock and Wilson 1995; White 1981 and 1983]. The different opinions of those who study deposit insurance today and those who analyzed it in the past might arise because those who studied the issue then and now employed different methods and sources of evidence, and their particular perspectives prevented them from seeing the entire picture.

Our essay suggests this is the case. The five following sections substantiate this supposition. Section 2 reviews the relevant literature and discusses the reasons that states adopted deposit insurance. Section 3 describes the data on the causes of bank suspension drawn from the archives of the Federal Reserve Board of Governors. Section 4 presents grouped logistic regressions that show states with deposit insurance experienced banking panics in the years immediately preceding the abandonment of those systems. These crises and exogenous economic conditions accounted for almost all of the differences in average suspension rates between insured and uninsured states. Section 5 presents multinomial logistic regressions indicating that deposit insurance influenced the composition of bank suspensions. Deposit insurance reduced suspensions due to causes discouraged by deposit insurance (called *runs* throughout this essay) and increased suspensions due to causes exacerbated by the moral hazards of deposit insurance (called *mismanagement*). The magnitudes of these effects were approximately equal. Section 6 discusses the implications of our estimates.

During the 1920s, deposit insurance mitigated bank runs and engendered moral hazard. These juxtaposed effects roughly balanced each other out. Deposit insurance, in other words, altered the composition but not the quantity of bank suspensions. The exception was the penultimate year of each deposit insurance regime, when bank suspension rates rose to unsustainable levels and the system ceased operation.

2. Current Literature and Past Events

Scholarly studies of the state deposit insurance systems of the early twentieth century address two broad questions. What were the consequences of deposit insurance? Why did some states establish deposit insurance systems while others did not?

Answers to the first question are of two types. Before the Savings and Loan Crisis, the conventional wisdom was that deposit insurance had salutary effects. Insurance reduced runs on bank and enhanced the stability of financial intermediation [House Report No. 150, 73rd Congress, 1934]. Insurance encouraged individuals to maintain larger deposit balances, which increased the funds available to the financial system as a whole, expanded the amount of credit available via unit banks (particularly in rural areas), reduced interest rates, and fostered economic activity [Emerson 1934 pp. 241-2; Golembe 1960 pp. 188-9].

The Savings and Loan Crisis forced economists to reexamine this issue. Cliometricians concluded that deposit insurance subsidized risk-taking. Banks with insured deposits assumed more risk than they would have otherwise [Calomiris 1990; Grossman 1992; Wheelock and Kumbhakar 1995]. This moral hazard increased the likelihood of suspension for insured state-chartered banks [Hooks and Robinson 2002; Wheelock 1992]. Membership in deposit insurance systems was positively correlated with the rate of bank failures across states and among counties within the state of Kansas, even after controlling for factors such as differing levels of agricultural distress and aggregate characteristics of banks [Wheelock 1992; Wheelock and Wilson 1995].

These scholars also wondered why some states had established deposit insurance systems while other states did not. Carter Golembe and Eugene White, among others, argue that bankers lobbied for the establishment of deposit insurance to preserve the status quo, protect unit bankers from competition, and insulate managers and owners from the ill-effects of erroneous decisions. Bankers wanted such protection. Those whose negligence or malfeasance led to the collapse of banks faced suits from creditors and prosecution for defalcation. Owners of bank shares possessed double liability. Deposit insurance limited exposure to such claims. In other words, deposit insurance was not adopted in the 1920s to promote the public good, but to serve interests of bank owners and managers [Golembe 1960; White 1983].

White [1983 pp. 198-204] presents econometric and qualitative evidence supporting this political economy argument. States with laws favoring unit banks – such as low minimum capital requirements and laws prohibiting branch banking – were more likely to establish deposit insurance systems. Unit-banking states whose legislatures did not pass deposit insurance legislation usually considered such provisions. In several instances, proposals for deposit insurance failed by narrow margins. States with laws favoring larger banks – such as high capital requirements and permissive statutes towards branch banking – did not adopt deposit insurance and seldom seriously considered doing so.

Curiously, White's regressions reveal no correlation between the failure rate of state (or national) banks and the adoption of deposit insurance. Figure 1 reveals why. Between 1908 and 1918, the decade when adoption was popular, suspensions rates in states that did and did not adopt deposit insurance were low and similar. Statistical tests of means and variances cannot distinguish the two distributions. This is true for both state and national banks, as Figure 2 shows. The similarity of suspension rates before 1920 partially alleviates an econometric concern: that states with higher suspension rates adopted deposit insurance and that the endogeniety of the adoption decision biases upwards estimates of the effects of deposit insurance on suspension rates. The pre-insurance experiences of the various states probably did not teach legislators in some states that their banking systems were inherently vulnerable and thus needed deposit insurance and in other states that their banking systems were inherently stable and thus in no need of depositor protection.[1]

Of course, politicians may have been forward looking. Legislators in states that adopted

[1] By inherently more vulnerable, we mean that the effect of adverse economic shocks would have been larger in

deposit insurance may have believed that their financial systems were more vulnerable to shocks than the financial systems in other states. It is unlikely that they forecast the magnitude of the shocks that would strike their economies in the next decade. The Dustbowl drought, World War I, the realignment of the international financial system, the expansion of agriculture during the 1910s, and the contraction of agriculture during the 1920s surprised most people. Yet, if the banking systems in states that adopted deposit insurance were inherently more vulnerable to those shocks than were the banking systems in other states, estimates of the effect of deposit insurance on bank suspension rates might be biased upwards.

Recent research on the political economy of the agricultural frontier suggests such concerns may be misplaced.[2] Gary Libecap and Zeynap Hansen [2003] conclude that competition to attract settlers propelled politics along the western edge of settlement at the turn of the twentieth century [note that six of the eight deposit-insurance states lay along the agricultural frontier]. The western states adopted an array of fiscal and regulatory policies designed to attract migrants. One was deposit insurance, which encouraged the establishment of small banks in rural areas and facilitated settlement. Farmers could not prosper in regions lacking access to credit. These policies encouraged the expansion in the number of banks, the overexpansion of agricultural production, and eventually degraded the topsoil over wide regions, leading to the Dustbowl of the 1920s and 30s. In this vision of the past, a regression of suspension rates on deposit insurance would capture both the direct and indirect effects of the insurance systems. The direct effects included the influence of insurance on the behavior of bankers and depositors. The indirect effects included the effect of farm credit on the expansion of agriculture, the erosion of topsoil, and the ability of farmers to earn a living.

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the inherently vulnerable jurisdiction regardless of whether or not the jurisdiction adopted deposit insurance.

3. Data

Our data come from archival and published sources. The archival evidence illuminates the causes of bank suspensions. It comes from the Central Subject Files of the Federal Reserve System. This section discusses when, where, why, and how the Board of Governors collected this information; how we processed the materials; and issues important for interpreting empirical work based upon this new and unique source. The previously published information illuminates aggregate economic trends and shocks. Descriptions appear later in this section and in the appendix.

During the latter half of the 1920s, the Federal Reserve Board of Governors embarked on an ambitious project: the creation of standard statistical reports for all banks operating in the United States, both members of the Federal Reserve System and nonmembers, national and state, public and private. Different divisions tackled portions of the problem. The Committee on Branch, Group, and Chain Banking examined the issue of bank suspensions.

In 1930, the committee began a retrospective study. The goal was to discern the cause of every bank suspension in the United States during the preceding ten years. The plan was to create a form on which relevant information could be compiled. This information included the bank's identity, characteristics (national, state, member of the Federal Reserve, town, county, etc.), financial condition on the day of suspension and previous dates (assets, liabilities, surplus and profits, paid-in capital, etc.), a description of the aftermath of suspension (reopened, merged, liquidated, etc.) and financial details of the resolution, including the portion of the assets recovered and repaid to creditors of various types. A facsimile of a portion of the form appears in the data appendix. For every bank known to have suspended operations between 1 January 1921

[2] John Wallis communicated this conjecture to the authors at the 2003 Cliometrics Conference.

and 31 December 1929, the Committee filled in as much information as it could from records available at the Board of Governors. Then, it sent copies of the forms to the Federal Reserve District Banks. Accompanying memos instructed districts to check the information entered by the committee, add information available in district records, fill out new forms for any suspended banks missed by the committee, and forward the forms to the appropriate Federal Reserve branch bank. The branch banks followed the same procedure, and then forwarded the forms to state banking authorities. The state regulators repeated the process, and whenever possible, solicited opinions from examiners and receivers who handled the case at hand. The goal was to get the facts from objective individuals with intimate knowledge of each institution and to check and recheck the information as the forms traveled down to the lowest levels of the regulatory hierarchy and back up to the Board of Governors. To speed their work, clerks recopied information of interest from original documents onto large columnar pads. Each row indicated the cause of failure of an individual bank.

Our data comes from those spreadsheets. The source has advantages. The spreadsheets formed the foundation for a series of tables appearing in the committee's report *Bank Suspensions in the United States*, and thus, are consistent with the data often used by economic historians to study this issue. Our source also has disadvantages. The summary spreadsheets indicate only the state, legal status, date of suspension, and cause of suspension. Lack of bank-specific explanatory variables, obviously, influences our analysis. The extant explanatory variables are aggregated at the state and national level.

To overcome this mismatch and prepare the evidence for analysis, we aggregate the data on the causes of suspension to the state level. We lose no information in this process. Our dependent variable (cause of suspension) is measured at the individual level (i.e. for each bank).

But, the independent variables are measured at the group level (i.e. for each state). In these circumstances, the logit and multinomial logit models appropriate for the study of individual bank suspensions are mathematically equivalent to grouped logit and multinomial models used to study state-level suspension rates where the observations are weighted by the number of banks in each state suspending operations due to each cause.

We aggregate the dependent variable in the following manner. We categorized suspensions into three classes. The first is suspensions due to reasons discouraged by deposit insurance, which we often refer to as runs. The second is suspensions due to reasons encouraged by deposit insurance, which we often refer to as mismanagement. The third is suspensions due to neither reason. Summing for each state and year the number of suspensions in each class yields our dependent variables. The computation is complicated by one consideration. A single suspension could be attributed to multiple causes. Attributions occasionally include multiple primary and multiple secondary causes. We weight all primary causes equally. We weight all secondary causes equally. We place more weight on primary than secondary causes. The weights sum to one. The results reported in this paper weigh primary causes four times as much as secondary causes. We check the robustness of that assumption by varying the weight of the secondary causes from zero to equality with primary causes. The variation does not change our results.

The definitions above clarify the dependent variable that we employ in Section 5. The dependent variable that we employ in Section 4 is the log odds ratio of the aggregate state bank suspension rate. We take this information from the Report of the Comptroller of the Currency. Figure 1 displays state-bank suspension rates averaged for states with (DI) and without deposit insurance (Non DI). It also indicates the years that states adopted and departed deposit insurance.

Our explanatory variables also come from published sources. Details appear in the data appendix.

A categorical variable indicates whether states possessed deposit insurance. Between 1907 and 1917, Oklahoma, Kansas, Texas, Nebraska, Mississippi, South Dakota, North Dakota, and Washington established such systems. All abandoned these regulatory regimes between 1921 and 1930. The systems were similar. All were funded via small assessments imposed on covered deposits. Most imposed additional capital requirements on participating financial institutions. A significant difference existed in only one dimension. The systems in Kansas, South Dakota, and Washington were voluntary. Banks could choose whether to join. The systems in the other states were compulsory.[3]

The national-bank suspension rate proxies for economic forces influencing the fates of state banks. The national-bank suspension rate is useful for several reasons. First, national banks neither participated in statewide deposit-insurance schemes nor operated under state banking regulations. Changes in national banking laws did not coincide with changes in state deposit-insurance legislation. Second, interstate branch banking did not exist. National bank suspensions were discrete events located in particular states. Third, national banks operated under a nationwide regulatory system with a single, national currency. Identical rules applied in all states. This common regulatory regime insures that differences in national-bank suspension rates across states reflect differences in the economic forces that influenced banks' fates. Fourth, the economic forces that affected the fates of national banks also affected the fates of state banks.

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[3] In Texas, banks had to choose between two compulsory systems. Banks could either join the Depositors Guaranty Fund, where they paid in annually 1 percent of their average daily deposits, or the Bond Security System, where they posted a bond of indemnity equal to their capital with a surety company. Even though banks had the freedom to choose one of the two plans, they do not have a choice between joining and not joining the system. Hence, the classification of Texas could go either way.

Neither type could survive sizeable losses on loans or incessant withdrawals of deposits. Both types had to earn profits. Revenues depended on interest earned on investments and rates of loan repayments. Costs depended on rents, wages, and interest paid to depositors. Fluctuations in those factors influenced the bottom line of all banks. So, fluctuations in suspension rates of national banks reveal a great deal about changes in economic conditions affecting state banks. Fifth, direct information on general economic conditions does not exist. National income accounts begin in 1929. Estimates for earlier periods are in dispute. Only scattered data exists on income, investment, employment, consumption, and business conditions at the state level. Most extant evidence comes from highly volatile sectors that surely interacted endogenously with bank behavior. Even that information is sparse and imprecise. The national-bank suspension rate serves as a substitute for that information. It is a useful measure of state-specific conditions, provides a base line for interstate comparisons, and reflects the magnitude of shocks affecting the financial system in each state.

The national-bank suspension rate also enters the regression directly. Our data reveals that failures of national banks often directly affected state banks in their communities. National banks served as correspondents of state banks. The suspension of national bank correspondents, particularly when unexpected, caused difficulties for downstream state institutions. The state banks lost their links to the wider financial system and portions of their legal reserves. They had to suspend operations. In addition, the suspension of national banks appears on some occasions to have sparked withdrawals from and even runs on state banks in the vicinity. The failure of national banks may have signaled to depositors the possibility of problems affecting the entire banking system.

Figure 2 displays the national-bank suspension rates averaged for states with (DI) and without (Non DI) deposit insurance. Comparing Figures 1 and 2 reveals important patterns. State-bank suspension rates in insured states exceeded those in uninsured states. National-bank suspension rates in insured states also exceed those in uninsured states. So did other measures of business and agricultural distress. These patterns suggest that differences in the fates of state banks between insured and uninsured states were due in part or in whole to differences in economic conditions.

The national-bank suspension rate may understate one significant shock afflicting the grain-growing regions of Middle America where there were many insured states. State banks tended to have close links to local communities. Many loaned large portions of their portfolios to agricultural interests. Farmers were the predominant holders of loans. National banks had closer links to the business and financial communities. Their portfolios contained more industrial loans, interbank deposits, and financial securities. Fluctuations in agricultural conditions probably had a greater impact on state banks.

To account for the differential impact of agricultural shocks, we employ two types of evidence. First, the price of grain reveals returns from sales of crops. International grain markets developed at the end of the 19th century. Supply and demand in the world as a whole determined the prices of popular cereals such as maize, oats, and wheat. Aggregate supply depended upon planting decisions of farmers throughout the world as well as the vagaries of the weather all around the globe. Demand fluctuated along with demographic trends and tariff barriers. Those fluctuations were exogenous to the banking systems of individual states. The data appendix describes our sources for the prices of maize, oats, and wheat, the crops that comprised the preponderance of produce in the grain-growing regions of the United States.

Second, climatic conditions influenced yields of fields. Yields influenced farmers' profits, repayment rates of agricultural loans, and the solvency of state banks. Previous scholars measure yields directly, since data is abundant. We do not follow in their footsteps because yields were not exogenous. Yields per acre, per worker, and on aggregate depended upon choices of what and how much to plant on what type of land. Those choices varied according to credit conditions, the willingness of bankers to extend loans on certain types of crops, and the ability of farmers to diversify against risks. All of those factors depended upon decisions of financial institutions. The component of yields that was undoubtedly exogenous to such decisions was climatic conditions. An excellent indicator of the relevant information is the Palmer Drought Index. The Department of Agriculture compiled the index from data on temperature and precipitation at land stations scattered throughout each state. The Department of Agriculture uses it as an indicator of conditions influencing yields of grain fields. We employ it because it is the longest running consistently calculated series available. Details appear in the data appendix.

4. Grouped Logistic Methods and Results

A natural way of analyzing the impact of deposit insurance systems exists. It is to compare rates of bank suspensions in states that adopted deposit insurance and states that did not. States that adopted deposit insurance are treatment states. States that did not are control states. The empirical task is to compare suspension rates in treatment and control states, before and after shifts in policy regimes, while controlling for exogenous forces that influenced suspension rates and the endogeneity of policy changes. This section undertakes that task.

Since the phenomena of interest are bank suspensions, which are discreet events, and the independent variables are measured at the state level, the appropriate analytical framework is a grouped logit model where the groups are the states.[4] In this framework, the following formula describes state-bank suspension rates:

$$(1) \qquad SSR_{it} = F\left(Y_{it}\phi_{SSR} + NSR_{it}\psi + DI_{it}\gamma + \mathbf{Z}_{it}\boldsymbol{\lambda} + \sum A_{its}\varphi_s + \sum D_{its}\delta_s + \varepsilon_{SSR,it}\right)$$

where SSR_{it} is the state-bank suspension rate in state i in year t. Y_{it} is an index of all exogenous variables that influence state-bank suspension rates.[5] NSR_{it} is the national-bank suspension rate in state i in year t. Note that some specifications also include the square of the national-bank suspension rate. DI_{it} is a dummy variable indicating the existence of deposit insurance in state i in year t. The symbols ϕ_{SSR}, ψ, and γ represent coefficients on Y_{it}, NSR_{it}, and DI_{it} respectively. All of our regressions include constant terms, which for brevity we exclude from the formulas above and below. $\mathbf{Z}_{it}$ is a vector of additional explanatory variables, principally agricultural prices, climatic conditions, state bank reserve requirements, state branch banking laws, and region, state, and year fixed effects. $\boldsymbol{\lambda}$ is a vector of coefficients for those variables.

A_{its} = 1 if deposit insurance is adopted in year $t - s$
= 0 otherwise

D_{its} = 1 if deposit insurance is abandoned in year $t - s$
= 0 otherwise

s = policy lead and lag indicator
= {-3, -2, -1, 0, 1, 2, 3}

The set of effects φ_s and δ_s controls for shocks occurring around the time of policy changes and the endogeneity of regulatory decisions. This control is a crucial consideration because states may have adopted deposit insurance during economic expansions and/or abandoned deposit insurance after experiencing higher than normal suspension rates. Both

4 In the absence of bank specific right-hand side variables, logits run on individual observations are mathematically equivalent to logits run on the grouped data.

5 Assuming Y_{it} as an index rather than a vector of all exogenous variables influencing state-bank suspension rates simplifies the algebra without altering the analysis.

situations may generate spurious correlations between policy regimes and suspension rates. So can all other circumstances when temporary shocks to suspension rates influenced policy decisions concerning deposit insurance. The set of effects $\square_s$ and $\square_s$ reveals these correlations and distinguishes them from the typical impact of deposit insurance. The dummy variables that determine these effects, A_{its} and D_{its} (for adoption of deposit insurance and departure from deposit insurance respectively), extend three years before changes in deposit insurance regimes and lag three years thereafter. Three years should have been long enough for shocks to induce legislatures to change laws or for legal changes to take effect.[6]

The national-bank suspension rate enters the regression directly as an exogenous explanatory variable, and indirectly, as a substitute for the unobserved index of exogenous explanatory variables. The national-bank suspension rate is itself a function of those variables.

$$(2) \qquad NSR_{it} = F\left(Y_{it}\phi_{NSR} + \varepsilon_{NSR,it}\right)$$

where ϕ_{NSR} represents the influence of the unobserved variable on the national-bank suspension rate. Inverting (2), solving for Y, substituting the result into (1), and simplifying yields (3).

$$(3) \qquad SSR_{it} = F\left(F^{-1}(NSR_{it})\phi + NSR_{it}\varphi + DI_{it}\gamma + \mathbf{Z}_{it}\boldsymbol{\lambda} + \sum A_{its}\varphi_s + \sum D_{its}\delta_s + \varepsilon_{it}\right)$$

where $\phi \equiv \phi_{SSR} / \phi_{NSR}$ and $\varepsilon_{it} = \varepsilon_{SSR,it} - \phi\varepsilon_{NSR,it}$. The formula for ε_{it} indicates that correlations could exist between the error term and the independent variables. Estimates of coefficients could be biased and inconsistent. A methodological appendix examines this issue. It employs econometric theory and historical information about unestimable variances to show that our regressions might slightly overestimate the impact of deposit insurance. Corrections to the problem based on instrumental variables and the method of group averages indicate that the bias,

[6] Our method of controlling for shocks around the time of policy changes is based on the method of DiNardo and

which appears to be positive as theory suggests, is small and insignificant in practice.[7]

Now, denote all of the explanatory variables with the matrix $\boldsymbol{X}_{it}$. Denote all of the corresponding coefficients with the vector β. Substituting these denotations into equation (3) yields a shorthand that will be useful later.

(3′) $SSR_{it} = F(\mathbf{X}_{it}\beta + \varepsilon_{it})$

F is the logistic function,

$$F(\cdot\cdot) = \frac{\exp(\cdot\cdot)}{1+\exp(\cdot\cdot)}$$

Thus, equation (3) represents a standard logit model estimated on grouped data. Its linear form is:

$$\ln\left(\frac{SSR_{it}}{1-SSR_{it}}\right) = \ln\left(\frac{NSR_{it}}{1-NSR_{it}}\right)\phi + NSR_{it}\psi + DI_{it}\gamma + \sum A_{its}\varphi_s + \sum D_{its}\delta_s + \mathbf{Z}_{it}\boldsymbol{\lambda} + \varepsilon_{it}$$

We estimate the linear form with weighted least squares. The weights equal $N_{it} * SSR_{it}(1-SSR_{it})$, where N_{it} is the number of state banks in state *i* in year *t*.[8]

Table 1 presents grouped logit estimations for the period 1909 to 1929. Column (1) reveals the basic correlation between deposit insurance and the log odds of state-bank suspension rates. On average, more banks suspended operations in places with deposit insurance than places without those policies. Predicted values of the dependent variable clearly reveal this. The predicted suspension rate in states with deposit insurance is 5.34 percent. The predicted suspension rate in states without deposit insurance is 3.72 percent. Column (2) shows that business conditions account for much of that difference. The log odds of the national-bank

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Lemieux [1992].

7 Here, our methods and results resemble those of Mitchener [2002].

8 The standard errors that we report have been calculated using the Huber-White sandwich estimator of variance. An appendix discusses the methods that we used to control for shocks common to groups and/or across time.

suspension rate is practically and statistically significant. The coefficient on deposit insurance falls by four-fifths and ceases to be statistically significant. The difference in predicted suspension rates falls to a similar extent. This makes sense. National-bank suspension rates tended to be higher in places with deposit insurance. Fluctuations in national-bank suspension rates coincided with fluctuations in state-bank suspension rates. The correlation accounts for a large portion of interstate differences in suspension rates. Together, columns (1) and (2) replicate the conventional academic wisdom. They show that on average, state-bank suspension rates in places with deposit insurance exceeded those in places without deposit insurance and most of the difference was due to economic conditions.

Column (3) includes variables that alter the conventional conclusion. The dummy variables A_{its} and D_{its} yield the effects $\square_{its}$ and $\square_{its}$. All of the former are statistically insignificant, except for $\square_{it,0}$ and $\square_{it,1}$. These are usually positive and significant. This pattern indicates that state bank suspension rates did not differ between states before the adoption of deposit insurance, and thus, that the decision to establish an insurance system was probably not based on historical experience. State bank suspension rates rose briefly when states established insurance systems and then returned to pre-insurance levels, perhaps because moral hazard altered the incentives of marginal banks and induced them to fail. All of the later are statistically insignificant, except for $\square_{it,-1}$ and $\square_{it,1}$, which reveal that state-bank suspensions surged the year before states abandoned deposit insurance and the crisis continued at an abated level until the following year. The coefficient on $\square_{it,-1}$ explains the correlation between deposit insurance and suspension rates observed by previous scholars. The correlation exists because states abandoned deposit insurance after experiencing higher-than-normal suspension rates. This result is robust. Changes in the specification do not alter it. The same is not true for the coefficient $\square_{it,1}$. Its standard error rises rapidly under different assumptions, such as altering starting and ending dates (this is apparent in the next table). The coefficient on deposit insurance itself yields the key conclusion. Its standard error is large relative to the coefficient. Standard statistical tests cannot distinguish it from zero. Its sign is negative, suggesting deposit insurance reduced state-bank suspension rates during normal years, if it had any effect.

Columns (4) and (5) test various aspects of our specification. All control for excluded explanatory variables. Column (4) includes crop prices, climatic conditions, year and region fixed effects, and interactions between the presence of deposit insurance and measures of macroeconomic distress (e.g. the national bank suspension rate). We do not report the coefficients on these control variables, since their magnitudes do not alter our conclusions, and their size and significance varies depending on the specification. They do add information to the regression. They reduce the standard errors of other variables including NSR_{it}, probably because the former contains information lacking in the latter. Agricultural conditions had differential impacts on state and national banks. The F-statistic on the inclusion of agricultural and climatic variables always exceeds the significant level with one revealing exception. When the regressions are restricted to agricultural states, they become insignificant in statistical and practical terms. The deposit insurance – macroeconomic distress interaction terms are positive, suggesting that economic downturns raised bank suspension rates more in insured than uninsured states, which Alston *et al* interpret as a symptom of moral hazard at work, but are statistically insignificant in this (and most other) specifications.[9]

Column (5) restricts attention to states with deposit insurance and their immediate neighbors. This exercise fits well with our quasi-experimental framework. The economies of

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9 These variables resemble those pioneered by Alston, Grove, Wheelock 1994.

deposit insurance states closely resembled those of their neighbors. Agriculture and unit banks dominated both. Column (5) also refines the indicator for geographic fixed effects. Dummy variables are now included for each state. These dummies capture state-specific economic conditions as well as design features of deposit-insurance systems unique to each state. These changes have little influence on the result. The null hypothesis that the coefficient on deposit insurance equals zero cannot be rejected. Difference-in-difference estimates (for brevity not reported) yield similar results. They control for state-level fixed effects and reveal patterns that substantiate our suppositions. Changes in economic conditions were highly correlated with changes in bank suspension rates. Changes in deposit insurance regimes were not.

Column (6) substitutes an instrumental variable for the log odds of the national bank suspension rate. The instrument equals 1 for observations where the log odds exceeds its median and –1 for all other observations. The inclusion of the instrument does not alter the signs and significance levels of the key variables. This invariance indicates that correlations among shocks to national- and state-bank suspension rates do not distort our estimates. Additional regressions employing the method of group averages on the top and bottom thirds and top and bottom quartiles of the national bank suspension rate support this supposition. So do regressions also employing instruments for the national bank suspension rate and its square.

Column (7) accounts for the endogeniety of deposit insurance via two stage least squares. The first stage estimates the likelihood that each state possessed deposit insurance. The independent variables in this probit are the log of the national bank suspension rate, the Palmer drought index and its square, and an array of state characteristics such as farm size and proximity to the agricultural frontier that influenced the types the patterns of legislation in those states (see Libecap and Hansen 2003 for details). The second stage employs the predicted values from the first stage in place of the actual values. The results are consistent with our other estimates. So are the results of similar regressions employing as the first stage White's models of states' decisions to adopt deposit insurance [White 1983 pp. 197-204]. Thus, controlling for endogeneity of the policy regime in this manner does not alter our conclusions.

Our results seem robust to the inclusion of endogenous variables, such as the deposit-base of the average bank, or the average capital-asset ratio, or the average size of agricultural loans, which appeared in previous papers on this topic. We have included such measures in various versions of our regressions. They reduce the coefficient on deposit insurance, which one should expect and which is consistent with our claims. We do not include those regressions in our tables because they do not change our conclusions.

Our results do not change when one considers characteristics of the various deposit-insurance regimes. We have rerun all of our regressions with dummies distinguishing voluntary and compulsory systems. That was the principal difference among the different schemes. In every regression, the dummies for voluntary and compulsory insurance have the same signs and significance levels.[10] Tests for equality of coefficients never reject the null hypothesis that the coefficients are the same. Tests for the equality of predicted suspension rates yield the same result.

Table 2 replicates these results for the period 1921 to 1929. This exercise is essential. It provides a baseline to which we can compare the multinomial estimates in the next section, where we must restrict our analysis to the 1920s, because data on the causes of bank suspensions

10 In our regressions, the voluntary and involuntary systems appear identical. There are several possible reasons why. First, all systems were voluntary in a sense. State banks could opt out of deposit insurance by changing to a national charter. Second, the voluntary systems ceased operating before the involuntary systems. Thus, time dummy variables (and all other variables correlated with time) may obscure differences between the two types of systems. Third, dividing the DI systems into voluntary and involuntary groups reduces the number of

exists only for that period. Column (1) reveals the basic correlation between deposit insurance and state-bank suspension rates. Suspension rates in states with deposit insurance averaged 6.40 percent. Suspension rates in states without deposit insurance averaged 3.81percent. The difference, 2.59 percent, is greater than for the longer period (in Table 1) because the crises that induced departures from deposit insurance occurred during the 1920s. Columns (2) through (7) show the correlation between deposit insurance and state bank suspension rates diminishes or disappears after accounting for economic conditions and the endogeniety of policy decisions. These estimates can be compared to our multinomial estimates, which cover the same period.

Tables 1 and 2 substantiate a simple but significant supposition. The stylized fact emphasized by earlier authors - that states with deposit insurance had higher suspension rates than states without – only applies to the penultimate years of each deposit insurance system. In typical years, suspension rates in insured and uninsured states were statistically indistinguishable, after controlling for differences in economic conditions. In the year before each state abandoned its deposit insurance system, which we often refer to as the 'crisis' year, however, suspension rates significantly exceeded average levels. This suggests that deposit insurance had little effect on aggregate bank suspension rates during good times. Aggregate effects are apparent only during crises so severe that states abandoned deposit insurance in the subsequent year.

Table 3 reinforces this result. The top half of the table examines our 1909 to 1929 estimates. The rows report average predicted state-bank suspension rates. The columns refer to specifications (3) through (6) from the tables above. For each specification, the result is the same. The insured-state suspension rate resembles the uninsured-state rate except during the year

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observations in each by roughly half and raises the standard errors accordingly. The sample sizes may be too preceding departure. A two-sample test of means fails to reject the null hypothesis that the insured and uninsured rates are identical. A two-sample test of means rejects the hypothesis that the uninsured rate equals the suspension rate in insured states during years preceding departure. The bottom half of the table examines 1921 to 1929. The results remain the same. The suspension rate for insured states during normal years resembles the suspension rate in uninsured states. But, the suspension rate in insured states exceeds the suspension rate in uninsured states during crisis years. Specification (5), which is our most robust regression, illuminates this point. The insured and uninsured suspension rates are statistically indistinguishable and much smaller than the suspension rate during the crises preceding the collapse of deposit insurance.

Figures 3 and 4 summarize our grouped logistic regressions. Figure 3 presents average state bank suspension rates (as in Figure 1) with one difference. The deposit insurance average no longer includes the observation for the year before each state abandoned deposit insurance. For example, since Washington abandoned deposit insurance in 1921, the deposit insurance average for 1920 no longer includes the observation for Washington. Excluding these 'crisis' years illuminates a pattern. In insured states, suspension rates of state and national banks in the insured states fluctuated in tandem (e.g. compare Figure 3 to Figure 2). Figure 4 controls for those patterns as well as for differences in agricultural conditions and for the 'crisis' preceding the demise of each deposit insurance system. The figure plots predicted values from regression (4) in Table 2 for deposit insurance states after for each state setting the values of their agricultural prices, drought index, and national bank suspension rates equal to their eastern neighbors and after setting the dummy variables for leads and lags of departures from deposit insurance equal to zero. These predictions lie close to the average of suspension rates for

small to distinguish subtle differences between the two types of systems.

uninsured states. The hypothesis that the means and standard deviations of the two series are identical cannot be rejected at the 5percent or 1percent confidence levels. The peaks and troughs differ slightly. The difference arises because the group of uninsured states contains observations from dozens of states on the eastern and western seaboards, where the pattern of suspensions differed from those in the cattle and grain economies in the center of the United States.

5. Multinomial Logistic Methods and Results

The grouped logistic framework has a natural extension to data concerning the causes of bank suspensions. The causes fall into three categories: those discouraged by deposit insurance, abbreviated runs; those encouraged by deposit insurance, abbreviated mismanagement; and those orthogonal to deposit insurance, abbreviated neither. We begin our analysis by specifying a system of equations whose coefficients ^{neither}, ^{runs}, and ^{mismanagement} correspond to those categories.

$$(3a) \qquad SSR_{it}^{neither} = e^{\mathbf{X}_{it}\mathbf{B}^{neither}} \Big/ \left(e^{\mathbf{X}_{it}\mathbf{B}^{neither}} + e^{\mathbf{X}_{it}\mathbf{B}^{runs}} + e^{\mathbf{X}_{it}\mathbf{B}^{mismanagement}} \right)$$

$$(3b) \qquad SSR_{it}^{runs} = e^{\mathbf{X}_{it}\mathbf{B}^{runs}} \Big/ \left(e^{\mathbf{X}_{it}\mathbf{B}^{neither}} + e^{\mathbf{X}_{it}\mathbf{B}^{runs}} + e^{\mathbf{X}_{it}\mathbf{B}^{mismanagement}} \right)$$

$$(3c) \qquad SSR_{it}^{mismanagement} = e^{\mathbf{X}_{it}\mathbf{B}^{mismanagement}} \Big/ \left(e^{\mathbf{X}_{it}\mathbf{B}^{neither}} + e^{\mathbf{X}_{it}\mathbf{B}^{runs}} + e^{\mathbf{X}_{it}\mathbf{B}^{mismanagement}} \right)$$

The system is unidentified. It lacks enough information to simultaneously estimate the three vectors of coefficients. Solving this problem requires an identifying assumption. We employ the typical assumption, that $^{neither} = \boldsymbol{0}$. Then, system (3) becomes system (3□)

$$(3a') \qquad SSR_{it}^{neither} = 1 \Big/ \left(1 + e^{\mathbf{X}_{it}\mathbf{B}^{runs}} + e^{\mathbf{X}_{it}\mathbf{B}^{mismanagement}} \right)$$

$$(3b') \qquad SSR_{it}^{runs} = e^{\mathbf{X}_{it}\mathbf{B}^{runs}} \Big/ \left(1 + e^{\mathbf{X}_{it}\mathbf{B}^{runs}} + e^{\mathbf{X}_{it}\mathbf{B}^{mismanagement}} \right)$$

$$(3c') \qquad SSR_{it}^{mismanagement} = e^{\mathbf{X}_{it}\mathbf{B}^{mismanagement}} \Big/ \left(1 + e^{\mathbf{X}_{it}\mathbf{B}^{runs}} + e^{\mathbf{X}_{it}\mathbf{B}^{mismanagement}} \right)$$

Dividing *(3b')* and *(3c')* by *(3a')* and taking natural logarithms yields the log-odds ratios

(4*a*) $$\ln\left[SSR_{it}^{runs} / SSR_{it}^{neither}\right] = \mathbf{X}_{it}\mathbf{B}^{runs}$$

(4*b*) $$\ln\left[SSR_{it}^{mismanagement} / SSR_{it}^{neither}\right] = \mathbf{X}_{it}\mathbf{B}^{mismanagement}$$

In (4), the coefficients ^{runs} and ^{mismanagement} capture the relationship between the explanatory variables and the composition of bank suspensions. We estimate these coefficients with maximum likelihood via the Newton-Raphson method.

Table 4 presents our estimates. Column (1) contains the basic correlations. The share of bank suspensions due to runs was lower in states with deposit insurance than in states without such systems. The share of suspensions due to mismanagement was higher in states with deposit insurance than in states without such systems. When national-bank suspension rates rose, the share of state-bank suspensions due to runs increased.[11] When national-bank suspension rates rose, the share of state-bank suspensions attributed to mismanagement fell. The latter correlation stems from three facts. During good times, mismanagement was the preponderant cause of state-bank suspensions. During bad times, banks failed for reasons other then their own incompetence, although mismanagement remained a common contributing cause. Our index weights contributing causes less than principal causes. The sign of the coefficient merely reflects that fact. The first two correlations have implications that are clearer. Deposit insurance increased suspensions due to mismanagement. This increase suggests the moral hazard induced by deposit insurance weakened the foundations of the financial system. Deposit insurance reduced runs on banks. This reduction indicates deposit insurance protected the financial system from panics, although the protection may have been limited, as the remaining columns suggest.

[11] We know from Table 2 that a coinciding aggregate effect existed. Thus, when national-bank suspension rates rose, the number as well as the proportion of state banks suspended due to runs rose. In other words, the

Column (2) improves the precision of our estimates by controlling for shocks to the agricultural economy and crises occurring around the years when states abandoned deposit insurance. The results are illuminating. In states with deposit insurance, the share of suspensions due to runs fell, and the share of suspensions due to mismanagement rose during most years. But, in the penultimate year of each system, the share of suspensions due to runs increased. A panic, in other words, engulfed each system just before it collapsed. In the years thereafter, the share of suspensions due to mismanagement declined. The decline probably occurred for two reasons. The banking crises weeded out institutions with the weak managements, and the disappearance of deposit insurance increased incentives for careful management.

Columns (3) through (6) control for excluded endogenous variables. Column (3) adds two new explanatory variables. One is the share of national bank suspensions due to runs. The other is the share of national bank suspensions due to mismanagement. The inclusion of these variables has little influence on the signs and magnitudes of the key coefficients. Column (4) adds dummy variables distinguishing calendar years. Their inclusion and interaction with other variables has little influence on the results. The coefficients, standard errors, and predictions remain roughly the same. Column (5) restricts attention to the eight states with deposit insurance and their immediate neighbors. Again, the results remain roughly the same. Additional regressions including dummy variables for regions and states (which we do not report) corroborate these claims. All reveal coefficients with magnitudes and directions similar to our previous work. Column (6) employs an instrumental variable for the log odds of the national suspension rate. The instrument is the same as in the preceding section. The result is also the same. The instrument neither alters the signs, magnitudes, nor significance levels of the other

suspension of national banks coincided with and may have triggered runs on state banks.

explanatory variables. This invariance indicates that correlations among shocks to the national and state bank suspension rates do not bias our estimates.

Table 5 summarizes our multinomial analysis. The columns correspond to the regressions reported in Table 4. The entries are average predicted probabilities from the system of equations (3´). Rows (b) and (c) correspond to the equations (3b´) and (3c´). The sub-rows (b.1) to (b.3) and (c.1) to (c.3) parse the predicted values into those for states without deposit insurance, for states with deposit insurance in all years except for the year preceding departure, and for states with deposit insurance in the 'crisis' year preceding departure. Sub-rows (b.1) and (c.1) reveal the composition of suspensions for the control group. Sub-rows (b.2) and (c.2) reveal the composition of suspensions for the treatment group. The contrast between the control and treatment groups reveals the impact of deposit insurance. First consider runs. In states without deposit insurance, runs caused approximately 9.1 percent of all suspensions. In states with deposit insurance, runs caused approximately 5.0 percent of all suspensions. Our approximations are the average of the predictions from specifications (2) through (6). Thus, deposit insurance reduced the share of suspensions due to runs by approximately 4.1 percent. The number of suspensions due to runs, in other words, declined by slightly more than 45 percent. Now consider mismanagement. In states without deposit insurance, mismanagement caused approximately 43.9 percent of all suspensions. In states with deposit insurance, the share due to mismanagement rose to 46.7 percent. Thus, deposit insurance increased the share of suspensions due to mismanagement by roughly 3 percent. The number of suspensions due to mismanagement, in other words, increased by slightly more than 7 percent. For specifications, the magnitudes of these two effects were similar or statistically indistinguishable. That is why the grouped logit estimates in the previous section find that deposit insurance had little impact on net bank suspension rates, even though the multinomial logit estimates in this section find that deposit insurance had a great impact on the composition of suspension.

Figure 5, which plots predicted values from Equation (2) of Table 4, illustrates how the composition of bank suspensions changed before and after states abandoned deposit insurance. In the years preceding departure, agricultural conditions soured in each state. National bank suspension rates rose. State banks failed in large numbers. Suspensions due to runs rose, as did suspensions due to insolvency (the omitted category). Anecdotal evidence indicates that panic swept the banking systems in each state, as depositors foresaw the demise of the deposit insurance system and rushed to withdraw funds. A few years after states abandoned deposit insurance, the share of suspensions due to runs rose to a new level, higher than it had been under deposit insurance. The share suspensions due to mismanagement fell to a new level, lower than it had been under deposit insurance. The composition of suspensions converged towards that of states that never possessed deposit insurance.

6. Discussion

Deposit insurance clearly influenced the pattern of bank suspension during the 1920s. Insurance reduced the share of suspensions due to runs and raised the share of suspensions due to mismanagement and other manifestations of moral hazard. The effects were roughly equal. Thus, the overall rate of bank suspensions differed little between insured and uninsured states after controlling for exogenous economic conditions. In the penultimate year of each deposit insurance system, however, the suspension rate surged, as did the share of suspensions due to runs and real shocks, such as declines in asset values. Several factors apparently contributed to the onset of these crises. Court decisions weakened the legal foundations of deposit insurance during the late 1920s. Small banks proliferated in states with deposit insurance. Many of those banks operated in towns where the economy depended upon a single crop or industry. Droughts reduced crop yields. Inflows of crops from abroad reduced market prices of produce. Land values fell.

Similar economic shocks afflicted the neighbors of the eight insured states. Yet, banking panics either did not occur or were much less pronounced in those places, suggesting that deposit insurance either caused or exacerbated the crises. Perhaps, panics occurred when people began to suspect the imminent demise of the deposit insurance systems. Possibly, the crises resulted from a buildup of bad debt in insured banks. The link between deposit insurance and the onset and propagation of financial shocks is unclear at this point in our research. Our data and methods, which illuminate both the influence of deposit insurance on the composition of bank suspensions and the correlation between deposit insurance and financial panics, are not suited towards answering questions concerning the causes of these crises. One possibility that we would like to examine is whether regulatory forbearance caused the clustering of bank suspensions during the last year of the system. Our essay yields more concrete conclusions on a number of important points.

First, deposit insurance had positive and negative effects. The magnitude of the salutary effect that we measure – a decline in runs by nearly half during non-crisis years – resembles that claimed by our pro-insurance predecessors. The magnitude of the harmful effect that we measure – an increase in the share of suspensions due to mismanagement by one tenth – resembles that of the other studies. Our own findings as well as theirs, however, may be understated. Our category *mismanagement* consists of banks that suspended operations due to the real world manifestations of moral hazard, such as risk-taking, malfeasance, and incompetence. Our category *mismanagement* does not include banks whose portfolio decisions raised the risks that they faced without rising to a level that examiners deemed ill advised or incompetent. Including such cases (if they existed) would increase our estimates. While the data do not exist, we can indirectly estimate an upper bound based on events that were more readily identifiable and thus less likely to have been undercounted. Runs were easier to observe. Examiners determined if banks suffered runs by examining deposit losses before bank suspensions. Our multinomial regressions reveal that suspensions due to runs fell at most by 5 percent of aggregate suspensions.[12] Our grouped logit regressions reveal that deposit insurance did not alter overall suspension rates, or in other words, that the decline in suspensions due to runs offset the rise in suspensions due to moral hazard. So, the upper bound for the rise in suspensions due to moral hazard in states with deposit insurance is equal to the upper bound for the decline in suspensions due to runs, which is 5 percent.

Second, deposit insurance influenced the composition of bank suspensions much more than it influenced the aggregate suspension rate. This revelation underscores an issue emphasized in the theoretical literature: the credibility of the insurance regime. When the regime is credible, the incentives of depositors and managers change, which reduces runs while inducing moral hazard. When the regime is not credible, neither group alters their behavior. Thus, the magnitudes of deposit insurance's beneficial and detrimental effects should shift in unison. The net effect should remain near zero. That is what we find in our estimates.

Third, during the 1920s, the principal causes of bank suspensions were mismanagement and losses due to unforeseen economic circumstances, such as dramatic declines in crop prices and land values after World War I. Our data sources contain innumerable examples of mismanagement. Some banks failed to keep accurate accounts. Some failed to balance their

[12] This percentage is the upper bound of the 95 percent confidence interval for the average difference between

books. Others loaned the bulk of their assets to single firms, friends of the management, or businesses with little prospect of repayment. Many lacked profitable business plans. Frivolous expenses exceeded sustainable levels. Revenues fell far below the threshold for profits. Runs caused only a small proportion of bank suspensions, even during the worst downturns. Depositors seldom withdrew funds from solvent institutions so quickly that the institution could not liquidate assets, rebalance their books, and remain open to the public. Six banks failed due to mismanagement for every one bank that failed due to a run. Deposit insurance did not direct regulatory resources toward that principal problem.

These findings reinforce the cautionary conclusions drawn from the state deposit-insurance experiments. Deposit insurance did not address the principal problems of the United States banking system during the first third of the twentieth century. Lack of managerial capital was a principal problem. Managers of small banks in rural areas seldom possessed extensive training in technical topics. Some knew neither how to nurture their institutions during good times nor how to protect their institutions from economic shocks. Runs were a second order concern. Even if the state deposit insurance systems had eliminated all bank runs without generating moral hazard, the overall rate of suspension would have fallen by no more than one tenth.

A similar situation exists in developing nations today, which is one reason that the policy experiments of grain-growing states during the 1920s remains a valuable analogy for scholars seeking to understand the costs and benefits of deposit insurance. In developing nations, the costs of deposit insurance may be large. The benefits in terms of reducing bank runs may be small. Policy makers should carefully calibrate these benefits and costs when deciding whether to

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insured and uninsured states in predicted probabilities for runs in Table 5 rounded to the nearest whole number establish deposit insurance systems.

Methodological Appendix

The accuracy of estimators is always a concern. Violations of standard assumptions may yield estimators with undesirable properties. This appendix discusses four such issues about estimators.

The first issue is the use of national bank suspension rate as a proxy for economic conditions influencing state banks. The national bank suspension rate is itself a function of those variables and a random error term. This error enters into the estimating equation for state banks and may affect the consistency of our estimators. Consider the equations whose estimate we report in Column 2 of Table 2.

(A.1) $$\ln\left(\frac{SSR_{it}}{1-SSR_{it}}\right) = \ln\left(\frac{NSR_{it}}{1-NSR_{it}}\right)\phi + DI_{it}\gamma + \varepsilon_{it}$$

where $\ln(NSR_{it}/(1-NSR_{it})) = Y_{it}\phi_{NSR} + \varepsilon_{NSR,it}$ and $\phi \equiv \phi_{SSR}/\phi_{NSR}$ and $\varepsilon_{it} = \varepsilon_{SSR,it} - \phi\varepsilon_{NSR,it}$. The asymptotic properties of the estimators for ϕ and γ can be calculated. To simplify the notation, label in the typical manner the dependent variable as **y**, the independent variables as **X**, the coefficients as **β**, and the error term as **ε** (our notation follows Green 2000 pp. 375-381). The matrix of independent variables is the sum of two components. The first consists of two vectors: $\mathbf{X}^* = \left[Y \cdot \phi_{NSR}, DI\right]$. The second, which is stochastic, consists of a vector of random variables and a vector of zeroes: $\mathbf{U} = \left[\varepsilon_{NSR}, 0\right]$. Thus, $\mathbf{X} = \mathbf{X}^* + \mathbf{U}$.

This notation allows (A.1) above to be rewritten in the familiar form

(A.2) $$\mathbf{y} = \mathbf{X}\boldsymbol{\beta} + \boldsymbol{\varepsilon}$$

The estimator of **β**, denoted **b**, is

(A.3) $\mathbf{b} = (\mathbf{X}'\mathbf{X})^{-1}\mathbf{X}'\mathbf{y}$

The probability limits of this estimators is

$$\begin{aligned}
\text{plim}\,\mathbf{b} &= \text{plim}\,(\mathbf{X}'\mathbf{X})^{-1}\mathbf{X}'\mathbf{y} \\
&= \left[\text{plim}\left[(1/n)(\mathbf{X}'\mathbf{X})\right]\right]^{-1}\text{plim}\left[(1/n)\mathbf{X}'\mathbf{y}\right] \\
&= \left[\text{plim}\left[(1/n)(\mathbf{X}'\mathbf{X})\right]\right]^{-1}\left[\text{plim}\left[(1/n)\mathbf{X}'\mathbf{X}\boldsymbol{\beta}\right] + \text{plim}\left[(1/n)\mathbf{X}'\boldsymbol{\varepsilon}\right]\right] \\
&= \left[\mathbf{Q}^* + \Sigma_{uu}\right]^{-1}\left[\mathbf{Q}^*\boldsymbol{\beta} + \Sigma_{\mathbf{u}\boldsymbol{\varepsilon}}\right]
\end{aligned} \quad \text{(A.4)}$$

where

$$\begin{aligned}
\text{plim}\left[(1/n)(\mathbf{X}'\mathbf{X})\right] &= \text{plim}\left[(1/n)\left(\mathbf{X}^* + \mathbf{U}\right)'\left(\mathbf{X}^* + \mathbf{U}\right)\right] &= \mathbf{Q}^* + \Sigma_{uu} \\
\text{plim}\left[(1/n)\mathbf{X}'\mathbf{y}\right] &= \text{plim}\left[(1/\text{n})\left(\mathbf{X}^* + \mathbf{U}\right)'\left(\mathbf{X}^*\boldsymbol{\beta} + \varepsilon_{SSR}\right)\right] &= \mathbf{Q}^*\boldsymbol{\beta} + \Sigma_{\mathbf{u}\boldsymbol{\varepsilon}} \\
\mathbf{Q}^* &= \text{plim}\left[(1/n)(\mathbf{X}^{*'}\mathbf{X}^*)\right] \\
\Sigma_{uu} &= \text{plim}\left[(1/n)(\mathbf{U}'\mathbf{U})\right] \\
\Sigma_{\mathbf{u}\boldsymbol{\varepsilon}} &= \text{plim}\left[(1/n)(\mathbf{U}'\varepsilon_{SSR})\right]
\end{aligned}$$

The matrices Σ_{uu} and $\Sigma_{u\varepsilon}$ represent the correlations of concern. Elements of the first are the variances and covariances of the random elements among the independent variables. In this case, the sole source of randomness is the error term for national banks, ε_{NSR}. The variance of this error term, denoted σ^2_{NSR}, is the only non-zero element in Σ_{uu}. Elements of $\Sigma_{u\varepsilon}$ are the covariances between the random elements of the explanatory variables and the error term of the dependent variable, ε_{SSR}. The covariance of ε_{NSR} and ε_{SSR}, denoted $\sigma_{SSR,NSR}$ is the only non-zero element.

Writing out the two elements of **b** from (A.4) illuminates the problem. The probability limit on our estimate of the coefficient on the log odds of the national bank suspension rate equals

(A.5) $$\text{plim}\,\hat{\phi} = \frac{\phi \text{q}^{*11} + \sigma_{SSR,NSR}}{\text{q}^{*11} + \sigma^2_{NSR}}$$

where q^{*11} is the $(1,1)^{th}$ element in $(Q^*)^{-1}$. (A.5) indicates $\hat{\phi}$ is consistent if $\phi = \sigma_{SSR,NSR} / \sigma^2_{NSR}$. Attenuation bias exists if $\phi > \sigma_{SSR,NSR} / \sigma^2_{NSR}$ and thus $\text{plim}\, \hat{\phi} < \phi$. Overestimation occurs if $\phi < \sigma_{SSR,NSR} / \sigma^2_{NSR}$ and thus $\text{plim}\, \hat{\phi} > \phi$. While these ratios and variances are unknown and inestimable, economic theory and historical circumstances suggest overestimation is the likely case. ϕ is the ratio of ϕ_{SSR} and ϕ_{NSR}, which should be close to or less than unity, since state banks failed on average at higher (and higher varying) rates than national banks, suggesting the former were more sensitive to changes in underlying economic conditions than the latter. $\sigma_{SSR,NSR}$ is the covariance of random shocks affecting suspension rates of state and national banks. σ^2_{NSR} is the variance of random shocks affecting suspension rates of national banks. Shocks affecting state and national banks are likely to have been similar, if not the same, and thus highly correlated. The magnitude of the shocks affecting state banks must have been at least as high as the magnitude of shocks affecting national banks, since state-bank suspension rates varied much more than national-bank suspension rates. These facts suggest that $\sigma_{SSR,NSR}$ equaled or exceeded σ^2_{NSR}, and thus, that we overestimate ϕ.

Similar logic suggests that we also overestimate the coefficient on deposit insurance. The second element of **b** from (A.4) illuminates the problem. The probability limit of $\hat{\gamma}$ equals

$$\text{(A.6)} \quad \text{plim}\, \hat{\gamma} = \gamma - \phi\left(\frac{q^{*21}\sigma^2_{NSR}}{1+q^{*11}\sigma^2_{NSR}}\right) + q^{*21}\sigma_{SSR,NSR} + \left(\frac{q^{*21}\sigma_{SSR,NSR}q^{*21}\sigma^2_{NSR}}{1+q^{*11}\sigma^2_{NSR}}\right)$$

where $q^{*i,1}$ is the $(i,1)^{th}$ element in $(Q^*)^{-1}$. (A.6) indicates that $\text{plim}\, \hat{\gamma} = \gamma$ if $\phi = (\sigma_{SSR,NSR} / \sigma^2_{NSR}) + 2q^{*21}\sigma_{SSR,NSR}$. Overestimation occurs if $\phi < (\sigma_{SSR,NSR} / \sigma^2_{NSR}) + 2q^{*21}\sigma_{SSR,NSR}$. Comparing this condition to the inequality that determines the consistency of $\hat{\phi}$ strongly suggests that $\hat{\gamma}$ overestimates γ. We overestimate γ in all cases where we overestimate ϕ and in many more, since $2q^{*21}\sigma_{SSR,NSR} > 0$.

Similar algebra can be used to derive the conditions for the consistency of estimators in all other specifications estimated in this essay. In each case, the consistency conditions will be similar. The balance between over and underestimation will depend upon the relative magnitudes of $\sigma_{SSR,NSR}$ and σ^2_{NSR}. Since this bias generally goes against the argument advanced in this essay, correcting it is not a necessity, although the correction should favor our argument by lowering our estimate γ or leaving it relatively unchanged. Correcting for the bias using instrumental variables and the method of group averages indicates that the later is, in fact, the case (see Tables 3, column 6 and Table 5, column 6).

The second issue concerns the possibility that our error terms may not be independent across space and time. Common shocks could bias our estimated coefficients. To alleviate that concern, we include state, region, and time dummy variables in several specifications and/or limit our analysis to states adjoining, and therefore similar to, the insured states. Common shocks could also cause downward bias in our standard errors. We have examined this issue. The story is what one would expect and what typically happens in studies of this sort. The nature of the common shocks is not known. Assumptions must be made concerning temporal and spatial clustering. Under some sets of plausible assumptions, our standard errors appear accurate and our hypothesis tests correct after having been adjusting using the Huber-White and Newey-West methods. Under other sets of plausible assumptions, the standard errors grow and many variables that once appeared to be ‘statistically significant’ no longer appear to be so.

In neither case do our key conclusions change. In our grouped logit regressions, the novel finding was that deposit insurance was uncorrelated with suspension rates, except during the penultimate year of the deposit insurance system. Correcting (i.e. enlarging) our standard errors reinforces that result. In our multinomial logit regressions, our key conclusions concerning the magnitude and signs of the marginal effects, which indicate that deposit insurance reduced suspensions due to runs and increased suspensions due to moral hazard, are not affected by changes in the standard errors.

Data Appendix

The Committee on Branch, Group, and Chain Banking collected data on the causes of bank suspension using a preprinted four-page form. A reproduction of the portion pertaining to the information available in our database appears below.

We calculate the dependent variables for section 3, causal state-bank suspension rates, using the following formulas.

$$SSR_{it}^{run} = \frac{1}{n}\left[\alpha\sum_{k=1}^{K}\sum_{j=1}^{J}\lambda_j P_{kj} + (1-\alpha)\sum_{k=1}^{K}\sum_{j=1}^{J}\eta_j C_{kj}\right] \text{ for all } k \in \{runs\ on\ banks\}$$

$$SSR_{it}^{mismanagement} = \frac{1}{n}\left[\alpha\sum_{k=1}^{K}\sum_{j=1}^{J}\lambda_j P_{kj} + (1-\alpha)\sum_{k=1}^{K}\sum_{j=1}^{J}\eta_j C_{kj}\right] \text{ for all } k \in \{mismangement\}$$

$$SSR_{it}^{neither} = \frac{1}{n}\left[\alpha\sum_{k=1}^{K}\sum_{j=1}^{J}\lambda_j P_{kj} + (1-\alpha)\sum_{k=1}^{K}\sum_{j=1}^{J}\eta_j C_{kj}\right] \text{ for all } k \in \{neither\}$$

where n equals the number of state banks in state i in year t. J equals the number of state banks that suspended operations in state i in year t. K equals the number of potential causes. P_{kj} equals 1 if cause k was a primary cause of bank j's suspension, 0 otherwise. C_{kj} equals 1 if cause k was a contributing cause of bank j's suspension, 0 otherwise. λ_j equals 1 divided by the number of primary causes for the failure of bank j. η_j equals 1 divided by the number of contributing causes to the failure of bank j. $\alpha = 0.8$. The set {runs on banks} consists of heavy withdrawals, contagion, idle gossip, loss of confidence. The first of those causes appears on row 6 of the form above. The remainder appears in row 10 under the heading "other causes." The set {mismanagement} consists of incompetent management, defalcation, dishonesty, carelessness and neglect, exploitation, forgery of notes, lax supervision, suicides. The first and second of those causes appear on rows 4 and 5 of the form above. The remainders appear in row 10 under the heading "other causes." The set {neither} equals all causes other than those in the sets {runs} and {mismanagement}.

To check the robustness of this categorization, we reran all regressions after redefining the variables in broader terms. To the first category, we added suspension of affiliate, suspension of correspondent, suspension of banks in vicinity, inability to borrow, and inability to liquidate. To the second category, we added forgery of notes, lax supervision, loss in investment, misuse of fund, outside investment, political loans, security speculation, and suicides of bank presidents. The third category included all banks closing due to other causes.

While many of the terms above seem self-explanatory, their variety reflects the lack of a standard lexicon for the interwar banking industry. This lexical lacuna sometimes caused confusion, because definitions of banking terms varied across jurisdictions, year, and region. Each state-banking bureau published its own report and defined terms as it saw fit. Explicit definitions seldom appeared. Multiple definitions often existed. Some varied according to context. To minimize confusion, analysts at the Board of Governors strove to standardize the definitions of the words with which they worked and design forms that were easy to use and elicited accurate information. The design process was interactive and ongoing. The Board circulated forms to agents around the country and asked them to suggest improvements. Correspondence between the Board of Governors and the district banks announced up-andcoming modifications and important decisions concerning the coding of ambiguous cases. A series of memos defined key terms and explained how to fill out the forms. The survey that we use was conducted at a time when the Federal Reserves lexicon was approaching its final form. Many definitions had solidified.

Definitions of key terms that differ from modern parlance appear below. The definitions come from an internal memo on the topic entitled "Bank Changes - Definition of Terms [Federal Reserve Committee on Branch, Group, and Chain Banking, 5 November 1930, file 421.113-1]." A *bank suspension* occurred when a bank closed its doors "to the public either temporarily or permanently by supervisory authorities or by the bank's board of directors on account of financial difficulties, regardless of whether or not the bank is ultimately classed as a suspension by the supervisory authorities [memo, 18 November 1929]." The term sprang from the phrase the 'suspension of payment of deposits.' In lay terms, a bank suspended payments when a depositor asked to withdraw funds, and a bank refused the request. Banks could halt payments for short periods without officially entering suspended status. According to the official definition of the Federal Reserve, banks suspended payments only if they closed their doors overnight. A bank that closed its doors during the morning but resumed payments before the end of the business day was not classified as a suspended bank. A bank that closed its door at three in the afternoon and reopened the next morning shortly after its appointed opening time was classified as a suspended bank. This in-house definition resembled several vernacular terms. Suspension and closure sometimes served as equivalents, although the equivalence was loose. The terms were not synonymous. Writers used them in various senses and seldom stated explicit definitions. Sometimes closure meant suspension. Sometimes it meant suspension followed by bankruptcy. *Defalcation* meant a fraudulent deficiency in money matters or a monetary deficiency through breach of trust by one who has the management or charge of funds. The breach of trust must have been a violation of the law. The most common example was embezzlement. *Correspondents* were banks with ongoing relationships facilitated by deposits of funds. A common situation involved a small bank outside a financial center (called a country bank) that deposited funds in a bank in a reserve city (called a city bank) and received services such as check clearing in return. Such deposits often formed a portion of country banks' legal reserves. In many cases, the suspension of the city bank precipitated the suspension of the country bank, because the latter lost its legal reserves and linkages to the national financial system. Another potential cause of bank suspensions was unusually *heavy withdrawals*. This often meant a run on a bank. Rumors of financial difficulties spread among depositors. Fearing for the safety of their savings, they rushed to empty their accounts. Their banks lacked enough cash on hand to satisfy immediate demands. So, the banks suspended payments on deposits. In some instances, the term *heavy withdrawals* referred to dramatic events of this type. But, a Federal Reserve study, "Deposit Losses Before Suspension" by Thomas Kroll, concluded that long queues of despondent depositors were a symptom, rather than a cause, of most banks' demise. The significant deposit losses occurred before ordinary men and women rushed to empty their accounts. Businesses, banks, and wealthy individuals - who possessed better-than-average information about financial events, multiple bank accounts, and the ability to transfer funds quickly via wire or check - often transferred large amounts out of banks in the weeks or months before ordinary individuals panicked over their accounts. Thus, the term heavy withdrawals usually indicated that a bank suffered the loss of many large depositors in the weeks prior to the suspension of payments. Researchers at the Federal Reserve called these events *invisible runs*.

Our dependent variable for the estimates in Section 4, the state-bank suspension rate, comes from the annual reports of the Office of Comptroller of Currency. These reports indicate the number of bank suspensions in each year in each state. The Comptroller of Currency gathered data on state bank suspensions from the regulatory reports of each state and via correspondence with state banking authorities. Our key independent variable, the national bank suspension rate also comes from the annual reports of the Office of Comptroller of Currency.

We draw information about bank regulations from White [1983]. Data on legal reserve requirements comes from Table 3.3. Data on branch banking restrictions comes from Table 3.5.

The U.S. Palmer Drought index was downloaded in April 2000 from the National Climatic Data Center data file number ds885.1. The Palmer drought index is a monthly data compile by Tom R. Karl and Red Ezell that reports monthly average temperature and precipitation by land stations in each state. The index ranges from -4 to +4. A -4 indicates extreme aridity and +4 indicates extreme moisture. Both extremes are bad for agricultural growth. Values near zero are good for growth. To obtain the value of our independent variable, we average the monthly values for all of the weather stations in a state. Then, we square that amount, creating an index ranging from 0 to 16 where low values indicates good growing conditions and high values indicate bad growing conditions.

Prices of agricultural products come from the Department of Agriculture's *Yearbook of Agriculture*, *1899 to 1940*. The table below provides explicit citations.

Crop	Years	Source / Table Title
Maize	1899-1908	Average farm price of wheat per bushel in the United States 1899-1908. Vol. 1908 pp. 602-3.
	1909-1924	Table 71 -- Corn: Farm price per bushel, Dec 1, 1909-1924, and value per acre, 1924. Vol. 1924 p.611

Crop	Years	Source / Table Title
	1925-1930	Table 53 -- Corn: Yield per acre, average 1919-1928 and annual 1925-1930, and estimated price per bushel Dec 1, by States, averages 1924-1928, and annual 1925-1930. Vol. 1931 p.620
Oats	1899-1908	Average farm price of wheat per bushel in the United States 1899-1908. Vol. 1908 pp.624-5
	1909-1924	Table 93 -- Oats: Farm price per bushel, Dec 1, 1909-1924, and value per acre, 1924. Vol. 1924 p.627.
	1924-1928	Table 73 -- Oats: Yield per acre, average 1919-1928 and annual 1925-1930, and estimated price per bushel Dec 1, by States, averages 1924-1928, and annual 1925-1930. Vol.1931 p.632.
Wheat	1901-1909	Average farm price of wheat per bushel in the United States 1901-1909. Vol. 1910 p.518
	1910-1912	Table 16 -- Wheat: Yield per acre and price per bushel of wheat, by States. Yield 1910-1913, price 1910-1912. Vol. 1913 p.382.
	1911-1915	Table 19 -- Wheat: Yield per acre, price per bushel, Dec 1, and value per acre, by States Yield 1905-1914, Price 1911-1915. Vol. 1914 p.527
	1914-1925	Table 29 -- Wheat: Estimated price per bushel, received by producers, Dec 1, average 1909-1913, annual 1914-1925. Vol. 1925 p.764
	1926-1931	Table 7 -- Wheat: Yield per acre and estimated price per bushel Dec 1, by States, averages, and annual 1926-1931. Vol. 1932 p.583. The 1929 value for Mississippi is missing from this data source. We replaced it with the $1.07, which is the average of the values for the preceding and following years.

Table 1
Grouped logit estimates 1909-1929

	Dependent variable: Log odds of state bank suspension rate						
	Coefficient (standard error)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept	**-3.25**	**-2.37**	**-2.42**	**-4.73**	**-7.38**	**-4.79**	**-3.74**
	(0.05)	(0.06)	(0.07)	(0.45)	(0.99)	(0.43)	(1.31)
Log odds of national bank suspension rate		**0.12**	**0.11**	0.00	**0.04**		-0.01
		(0.01)	(0.01)	(0.01)	(0.01)		(0.02)
National bank suspension rate %				**19.42**	**13.71**	**20.26**	**23.44**
				(2.19)	(2.79)	(2.02)	(3.24)
National bank suspension rate % squared				**-38.18**	**-24.50**	**-41.12**	**-55.58**
				(9.36)	(11.26)	(9.01)	(14.85)
Deposit insurance	**0.38**	0.11	**-0.23**	-0.04	-0.20	0.02	0.05
	(0.09)	(0.08)	(0.10)	(0.20)	(0.33)	(0.21)	(0.23)
1 year before adopting deposit insurance			-0.93	0.47	0.71	0.46	
			(1.21)	(0.81)	(0.80)	(0.81)	
Year of adoption			-0.08	**1.47**	**1.54**	**1.48**	
			(0.56)	(0.40)	(0.43)	(0.40)	
1 year after adopting deposit insurance			0.55	**1.46**	**1.84**	**1.46**	
			(0.76)	(0.53)	(0.54)	(0.53)	
1 year before departing deposit insurance			**0.79**	**0.70**	**1.04**	**0.70**	
			(0.16)	(0.12)	(0.15)	(0.12)	
Year of departure			0.30	-0.28	0.05	-0.28	
			(0.22)	(0.16)	(0.17)	(0.16)	
1 year after departing deposit insurance			**0.58**	**0.59**	**0.77**	**0.59**	
			(0.26)	(0.19)	(0.25)	(0.19)	
Instrumental variable						-0.01	
						(0.04)	
Leads and lags for adoption of deposit insurance			x	x	x	x	
Agricultural and climatic control variables				x	x	x	x
Year and region fixed effects				x	x	x	x
State fixed effects					x	x	x
State capital requirements and branch banking laws					x	x	
DI & national bank suspension rate interaction				x	x	x	
Predicted suspension rate	4.14%	2.84%	2.75%	2.52%	2.53%	2.60%	1.24%
Adjusted R squared	0.02	0.26	0.3	0.73	0.86	0.73	0.02
Number of observations	1008	1008	1008	1008	462	1008	1008

Notes: Bold face indicates significant at 0.05 level. Columns (1) to (4), (6), and (7) examine all 48 states. Column (5) focuses on the deposit insurance states and their neighbors: AL, AR, CO, IA, ID, KS, LA, MN, MO, MS, MT, ND, NE, NM, OK, OR, SD, TN, TX, WA, and WY.

Figure 1

Average state bank suspension rate

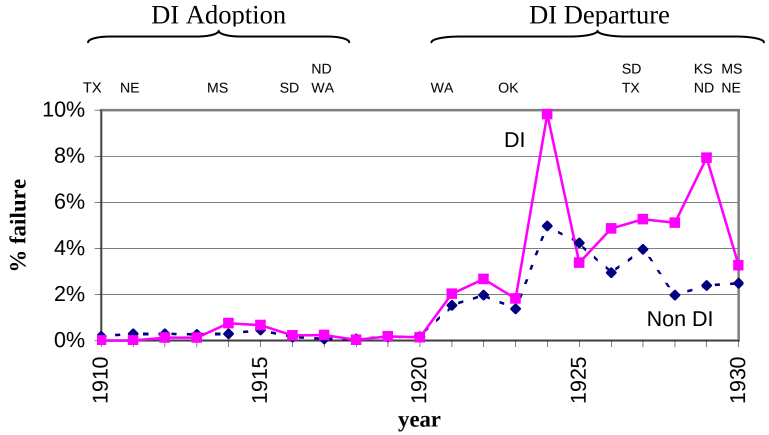


Figure 3

Average state bank suspension rate excluding crisis years

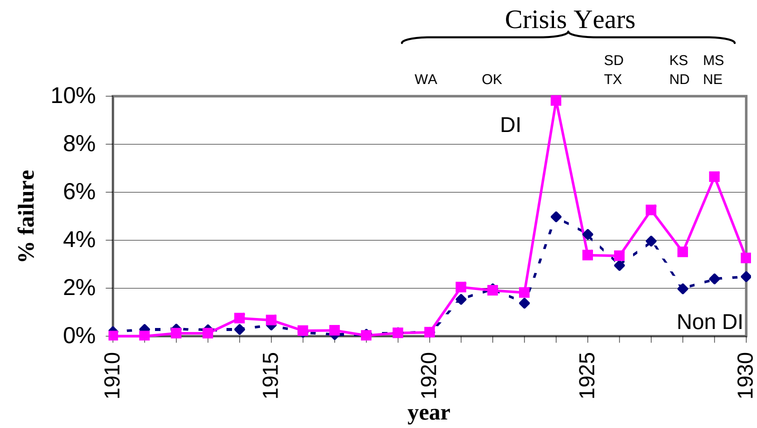


Figure 2

Average national bank suspension rate

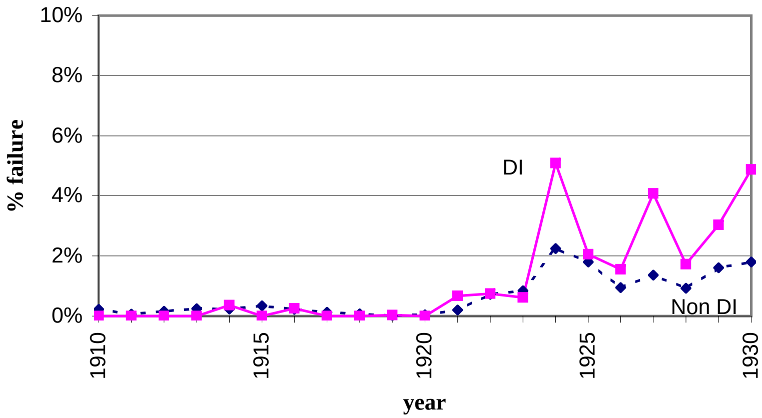


Figure 4

Average state bank suspension rate controlling for crises and econ conditions

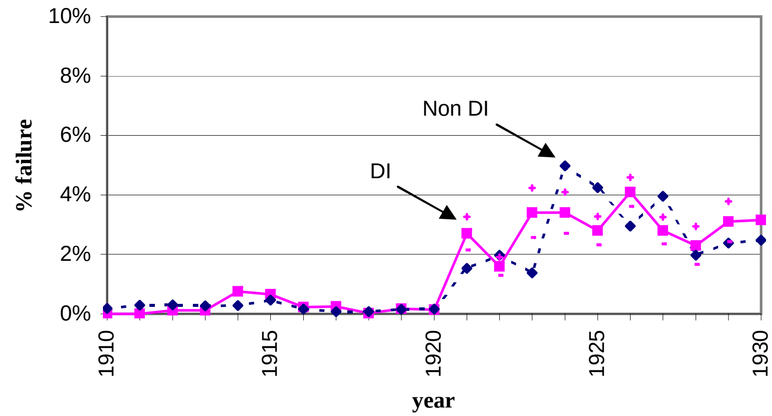
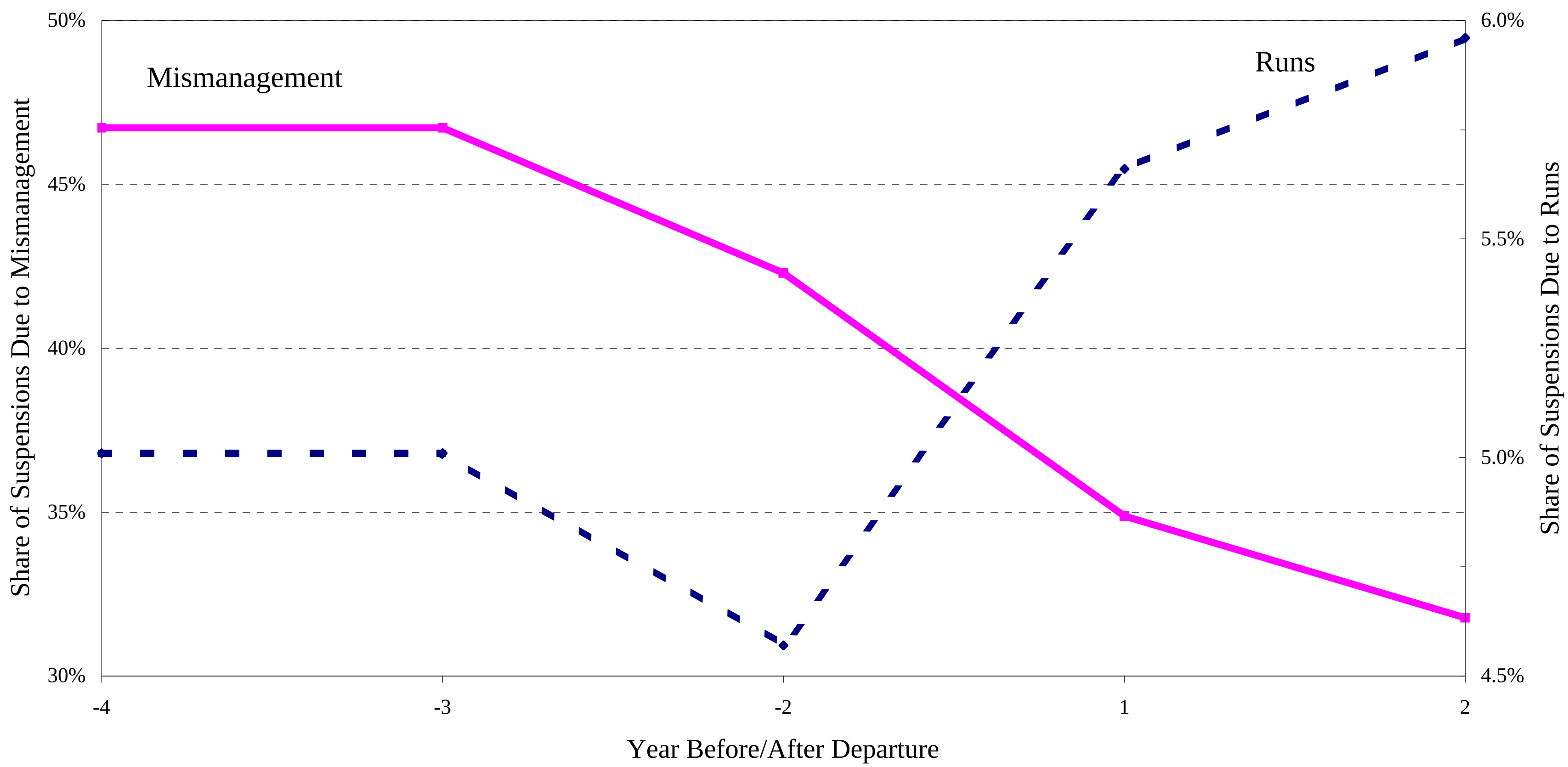


Figure 5
Composition of State Bank Suspensions
Preceeding and Following the Abandonment of Deposit Insurance



Source: Observations are fitted values from Table 5, Column (2)

Table 2
Grouped logit estimates 1921-1929

	Dependent variable: Log odds of state bank suspension rate						
	Coefficient (standard error)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept	**-3.23**	**-2.68**	**-2.71**	**-3.27**	**-24.69**	**-3.68**	0.33
	(0.06)	(0.08)	(0.08)	(0.46)	(6.59)	(0.45)	(1.68)
Log odds of national bank suspension		**0.08**	**0.07**	**0.04**	**0.05**		0.01
		(0.01)	(0.01)	(0.01)	(0.01)		(0.02)
National bank suspension rate %				4.05	-0.07	**5.40**	**15.72**
				(2.09)	(2.60)	(1.99)	(2.01)
National bank suspension rate % squared				7.56	25.45	4.63	**-33.43**
				(11.63)	(13.72)	(11.58)	(15.33)
Deposit insurance	**0.55**	**0.38**	0.02	-0.03	-0.86	0.00	-0.17
	(0.10)	(0.09)	(0.13)	(0.20)	(0.50)	(0.20)	(0.40)
3 years before departing deposit insurance			**0.50**	-0.08	0.19	-0.11	
			(0.23)	(0.18)	(0.20)	(0.18)	
2 years before departing deposit insurance			**0.46**	0.26	**0.65**	0.25	
			(0.22)	(0.17)	(0.21)	(0.17)	
1 year before departing deposit insurance			**0.95**	**0.69**	**1.19**	**0.69**	
			(0.20)	(0.16)	(0.22)	(0.16)	
Year of departure			0.29	0.10	0.35	0.08	
			(0.26)	(0.20)	(0.26)	(0.20)	
1 year after departing deposit insurance			0.16	**0.59**	0.34	**0.61**	
			(0.35)	(0.27)	(0.39)	(0.27)	
2 years after departing deposit insurance			-0.08	0.19	-0.04	0.19	
			(0.41)	(0.29)	(0.42)	(0.29)	
3 years after departing deposit insurance			-0.33	-0.16	-0.63	-0.10	
			(0.60)	(0.44)	(0.50)	(0.44)	
Instrumental variable						**0.19**	
						(0.05)	
Agricultural and climatic control variables				x	x	x	x
Year and region fixed effects				x	x	x	x
State fixed effects					x		
State capital requirements and branch banking laws				x	x	x	
DI & national bank suspension rate interaction				x	x	x	
Predicted suspension rate	4.51%	4.23%	4.20%	4.32%	4.34%	4.30%	3.73%
Adjusted R square	0.07	0.21	0.25	0.69	0.79	0.69	0.07
Number of observations	432	432	432	432	198	432	432

Notes: Bold face indicates significant at 0.05 level. Columns (1) to (4), (6), and (7) examine all 48 states. Column (5) focuses on the deposit insurance states and their neighbors: AL, AR, CO, IA, ID, KS, LA, MN, MO, MS, MT, ND, NE, NM, OK, OR, SD, TN, TX, WA, and WY.

Table 3
Grouped logit predictions

	(3)	(4)	(5)
	Average Annual Suspension Rate (Standard Error)		
1909 to 1929			
(a) States without deposit insurance	2.64	2.44	2.53
	(0.10)	(0.22)	(0.24)
(b) States with DI all years but below	2.69	2.39	2.49
	(0.24)	(0.37)	(0.38)
(c) States with DI year before departure	8.05	7.90	7.26
	(1.12)	(1.75)	(1.54)
1921 to 1929			
(a) States without deposit insurance	3.58	3.87	3.92
	(0.12)	(0.26)	(0.30)
(b) States with DI all years but below	4.96	4.13	4.58
	(0.29)	(0.53)	(0.59)
(c) States with DI year before departure	11.70	11.48	10.30
	(0.32)	(3.42)	(3.26)

Notes: DI indicates deposit insurance. Entries are average fitted values for the corresponding equation and model. Columns report values obtained from columns (3) through (5) of Tables 1 and 2. Rows (a) through (c) pertain to Table 1. Rows (d) through (f) pertain to Table 2.

Table 4
Multinomial logit estimates 1921-1929

	(1)	(2)	(3)	(4)	(5)	(6)
	State Bank Suspensions Due to Runs (log odds) Coefficient (Standard Error)					
Log odds of national bank suspension rate	**0.08**	**0.07**	-0.07	0.06	0.05	
	(0.03)	(0.03)	(0.05)	(0.03)	(0.08)	
og odds of share of nat. bank suspension rate due to runs			0.02			
			(0.02)			
Log odds of share of nat. bank suspension rate due to mismanagement			0.08			
			(0.02)			
Deposit insurance	**-0.37**	**-0.82**	**-0.85**	**-0.61**	**-2.72**	**-0.82**
	(0.13)	(0.24)	(0.23)	(0.25)	(1.06)	(0.24)
1 year before departing deposit insurance		**0.66**	**0.72**	0.34	-0.11	**0.68**
		(0.29)	(0.28)	(0.31)	(0.47)	(0.29)
Year of departure		0.38	0.41	-0.12	**-1.58**	0.40
		(0.42)	(0.42)	(0.43)	(0.58)	(0.42)
1 year after departing deposit insurance		-0.68	-0.82	-0.17	**2.06**	-0.71
		(0.53)	(0.53)	(0.54)	(0.89)	(0.53)
	State Bank Suspensions Due to Mismanagement (log odds)					
Log odds of national bank suspension rate	**-0.09**	**-0.09**	**-0.05**	**-0.08**	0.01	
	(0.01)	(0.02)	(0.02)	(0.02)	(0.03)	
og odds of share of nat. bank suspension rate due to runs			**-0.04**			
			(0.01)			
og odds of share of nat. bank suspension rate due to mismanagement			0.003			
			(0.01)			
Deposit insurance	0.06	**0.21**	0.24	**0.35**	0.83	**0.22**
	(0.07)	(0.10)	(0.10)	(0.11)	(0.52)	(0.10)
1 year before departing deposit insurance		**-0.30**	-0.38	**-0.48**	**-0.51**	**-0.32**
		(0.15)	(0.15)	(0.16)	(0.24)	(0.15)
Year of departure		0.03	-0.05	-0.20	0.45	0.01
		(0.19)	(0.20)	(0.20)	(0.30)	(0.19)
1 year after departing deposit insurance		-0.45	**-0.41**	-0.33	-0.06	-0.39
		(0.26)	(0.27)	(0.27)	(0.45)	(0.26)
2nd and 3rd years before and after departing deposit insurance		x	x	x	x	x
Agricultural and climatic control variables		x	x	x	x	x
Year Fixed Effect				x	x	x
Instrumental Variable						x

Notes: Bold face type indicates significant at 0.05 level. Number of observations is 432 per outcome. Columns (1) to (3), (5), and (6) examine all 48 states. Column (4) focuses on the deposit insurance states and their neighbors: AL, AR, CO, IA, ID, KS, LA, MN, MO, MS, MT, ND, NE, NM, OK, OR, SD, TN, TX, WA, and WY.

Table 5
Multinomial logit predictions

	Percent of Suspensions Due to …	(2)	(3)	(4)	(5)	(6)
(b)	Runs	7.95	8.13	8.52	9.70	8.22
		(0.86)	(0.10)	(0.12)	(0.70)	(0.09)
(b.1)	In states without deposit insurance	8.29	8.50	8.93	11.35	8.57
		(0.09)	(0.10)	(0.13)	(0.95)	(0.10)
(b.2)	In states with DI all years but below	5.01	5.07	5.20	4.82	5.20
		(0.26)	(0.30)	(0.29)	(0.40)	(0.29)
(b.3)	In states with DI year before departure	9.35	8.69	8.90	8.68	8.90
		(0.24)	(0.55)	(0.74)	(0.64)	(0.74)
	b.2 minus b.1	-3.28	-3.43	-3.73	-6.53	-3.37
(c)	Mismanagement	44.38	44.47	46.01	41.79	44.46
		(0.33)	(0.33)	(0.35)	(0.92)	(0.36)
(c.1)	In states without deposit insurance	44.28	44.35	45.99	40.64	44.40
		(0.36)	(0.36)	(0.39)	(1.02)	(0.39)
(c.2)	In states with DI all years but below	46.73	47.14	46.79	46.25	46.66
		(0.64)	(0.68)	(0.75)	(2.15)	(0.71)
(c.3)	In states with DI year before departure	33.54	33.45	33.60	35.50	33.60
		(1.03)	(1.29)	(0.99)	(4.85)	(0.99)
	c.2 minus c.1	2.45	2.79	0.8	5.61	2.26

Note: Entries are average fitted values for the corresponding equation and model. Columns report values obtained from corresponding columns of Table 4. Rows (b) and (c) pertain to equation (3b′) and (3c′). Rows (b.1) and (c.1) indicate average fitted values for equations (3b′) and (3c′) for all observations for which the indicator for deposit insurance equals zero. Rows (b.2) and (c.2) indicate average fitted values for equations (3b′) and (3c′) for all observations for which the indicator for deposit insurance equals one except those for which the indicator for the year before departure equals one. Rows (b.3) and (c.3) indicate average fitted values for equations (3b′) and (3c′) for all observations for which the indicator for deposit insurance equals one and the indicator for the year before departure equals one. Elasticities evaluated at the means of the independent variables yield similar results.

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