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Does Deposit Insurance Promote Financial Depth? Evidence from the Postal Savings System During the 1920s

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Evidence from the Postal Savings System During the 1920s

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Abstract:

This paper tests whether deposit insurance promotes financial depth by influencing depositor behavior. To do so, we rely on two schemes operating in the U.S. during the 1920s: the Postal Savings System and the deposit insurance schemes that some states had adopted. We exploit the discontinuity in deposit insurance across state borders and compute changes in postal savings deposits in cities located along the borders of states that did and did not have deposit insurance. We examine the relative growth of postal savings deposits in pairs of border cities when bank suspensions occurred within a short radius (10, 20, and 30 miles). Our results indicate that, following a bank suspension within a 10-mile radius, deposits in postal savings offices located in the non-deposit insurance state increased by 16 percent more than deposits in the neighboring postal savings office located in the deposit insurance state. The magnitude of the effect declines with bank suspension distance. It disappears when deposit insurance is not in effect. Using county-level data, we find that deposit insurance is associated with a 56 percent increase in local banking capacity.

Keywords: bank failures; Postal Savings deposits; deposit insurance; banking capacity

JEL Classification Codes: N12, N22, E44, G21, G23

I.   Introduction

It is widely acknowledged that one of the primary purposes of deposit insurance is to prevent the contagion of bank runs by influencing depositor behavior. During periods of extreme financial distress, a "contagion of fear" can engulf depositors, resulting in an outright panic (Friedman and Schwartz, 1963; Iyer and Puri, 2012).[2] In the absence of some mechanism to arrest panics and restore confidence to the banking system, sustained deposit withdrawals destroy banking capacity and undermine economic growth.[3]

The logic of this argument has been recognized for more than a century. The debates about deposit insurance in Congress going back to at least 1886 speak about its benefits for the banking system in terms of preventing deposit runoffs (Golombe, 1960; White, 1997). This argument was again articulated during the debates over deposit insurance in the early 1930s, which culminated in the establishment of the FDIC, and again in recent times, in particular during the 2007-09 financial crisis.[4]

Despite the argument's long history, it has proven to be challenging to evaluate the hypothesis that deposit insurance promotes financial depth through its influence on depositor behavior. In this paper, we offer a unique strategy to test that hypothesis and to quantify the effects. Specifically, we utilize two schemes that were operative in the U.S. during the 1920s: the Postal Savings System, which was implemented nationwide in 1911, and the state deposit insurance schemes adopted in eight—primarily Midwestern—states beginning in 1908. Identification is attained by the discontinuity in deposit insurance across state borders. We exploit this discontinuity and examine the relative changes in postal savings deposits in cities located along the borders of states that did and did not have deposit insurance.

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[2] See Iyer and Puri (2012) for additional references.
[3] There is a large literature quantifying the systemic adverse effects of banking crises, starting with Friedman and Schwartz (1963). For a more complete list, along with historical evidence, see Kupiec and Ramirez (2013).
[4] See, for example, "A Two-Pronged Push to Aid Ailing Banks," by Binyamin Appelbaum and Carrie Johnson, *Washington Post*, October 1, 2008. http://www.washingtonpost.com/wp-dyn/content/article/2008/09/30/AR2008093000799.html

In particular, we examine the extent to which the relative growth of postal savings deposits in the two border cities responded to bank suspensions taking place within a short radius (10 miles, 20 miles, and 30 miles).

We argue that the amount of deposits in the Postal Savings System is a valid proxy for measuring "money under the mattress." Specifically, we show that, nationwide, the ratio of postal savings deposits to total bank deposits is highly correlated with the currency-deposit ratio, which is known to rise during periods of banking distress when confidence in the banking system is compromised (Boughton and Wicker, 1979; Friedman and Schwartz, 1963). In addition, we provide narrative evidence based on contemporary records.

The quasi-experimental strategy of exploiting a policy discontinuity at a state border has been shown to control much more successfully for the influence of observed and unobserved factors.[5] Turner, Haughwout, and Van Der Klaauw (2014) point out that the reliability of the test hinges on the assumption that unobserved characteristics across borders are not correlated with the policy differences being evaluated. In the context of this paper, this premise translates into unobserved characteristics across the cities straddling the state border not being correlated with the adoption of deposit insurance. We offer several arguments to justify our contention that the results are unlikely to be driven by unobserved factors. First, the adoption of deposit insurance is a statewide policy. It is difficult to claim that interests concentrated at state borders (or, for that matter, border city attributes) systematically influenced states' decisions to adopt deposit insurance at the expense of interests elsewhere in the state. Second, in nearly all states in our sample deposit insurance legislation was introduced and

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[5] This strategy has become increasingly popular, especially in recent years, as a way of analyzing the impact of regulation. Dube, Lester, and Reich (2010), for instance, use policy discontinuities at state borders to estimate the effects on employment of minimum wage regulation in the restaurant industry. Their strategy involves comparing outcomes in contiguous county pairs that abut state borders with and without the minimum wage legislation. Rocco (2008), uses pairs of contiguous counties along different state borders to evaluate the extent to which removal of bank branching restrictions at the state level had an effect on local economic growth. Rocco's article also cites earlier papers that use a similar methodology.

debated during the 1908 to 1917 period. Clearly, legislative debates took place in the "treated" sample of states since after all they adopted deposit insurance. However, we document that deposit insurance legislation was also introduced and debated in all but one of the states we use as controls. The fact that some state governments ended up adopting deposit insurance, while others did not, suggests that the process was driven largely by the political landscapes of the various states. Third, we exploit the fact that these deposit insurance schemes were discontinued at different times in different states. We use the variation in the dissolution of deposit insurance in our econometric tests to further evaluate the robustness of the results.

Our findings support of the hypothesis that deposit insurance promotes financial depth. Specifically, we find that, following a bank suspension within a 10-mile radius, deposits in post offices that accepted savings deposits (hereafter postal savings offices) located on the non-deposit insurance side of the border increased by 16 percent more than deposits in the neighboring postal savings office located on the other side of the border (in the deposit insurance state). We also find that distance mattered—bank suspensions that occurred 20 miles away also influenced relative postal savings deposit growth, but the effect was smaller—about 9 percent. And when the suspension took place 30 miles away, the effects on postal saving deposits were negligible.

While these results show that deposit insurance reduced the extent to which money went "under the mattress" (literally and metaphorically) we argue that the observed magnitude is an underestimate of the actual effect. The reason is that, as we discuss below, the Postal Savings System imposed a deposit limit of $2,500 per individual account. Narrative evidence indicates that this limitation constrained deposit intake very severely, especially in times of distress.

To get a more accurate estimate of the extent to which deposit insurance mattered, we complement our study by estimating the increase in local banking capacity when deposit insurance was in effect. Specifically, we test whether deposits at the county level for state-chartered banks were higher

in counties with deposit insurance, relative to the levels in the immediately adjacent county in the non-deposit insurance state. The results indicate that deposit insurance is associated with a 56 percent increase in county-level deposits for state-chartered banks. By contrast, no statistically significant increase is observed for deposits in national banks (which were not allowed to participate in the various state deposit insurance schemes).

Our research contributes to the ongoing debate regarding the merits of deposit insurance, which generally speaking, revolves around two key aspects: (i) whether deposit insurance promotes financial stability and banking capacity by reducing the likelihood of bank runs (e.g. Diamond and Dybvig, 1983; Chari and Jagannathan, 1988; Allen and Gale, 1998; Iyer and Puri, 2012), and (ii) whether deposit insurance generates moral hazard problems since it incentivizes banks to undertake riskier projects, even when it is "actuarially fair" (Merton, 1977; Chan, Greenbaum and Thakor, 1992; Pennachi, 2006). Previous studies have shown that the deposit insurance schemes of the 1910s and 1920s generated moral hazard problems (Calomiris, 1992, 1993; Wheelock 1992, 1993; Wheelock and Wilson 1994). Nonetheless, our results are helpful in quantifying the first aspect mentioned above: the stability-enhancing component of deposit insurance.

The literature that investigates the extent to which deposit insurance prevents bank deposit runoffs is limited. For example, research on the U.S. that discusses the benefits of deposit insurance primarily relies on the assertion that after 1933, when the FDIC was created, the number of bank runs declined dramatically and that no pre-Depression era style banking panics have since taken place.[6] There are, to be sure, studies that investigate whether deposit insurance promotes financial depth (e.g. Cull, Senbet, and Sorge, 2005) or banking sector stability (e.g. Demirgüç-Kunt and Detragiache, 2002) using cross-

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[6] Friedman and Schwartz were among the first to point this out, asserting "That is why we regard federal deposit insurance as so important a change in our banking structure and as contributing so greatly to monetary stability—in practice far more than the establishment of the Federal Reserve System." (Friedman and Schwartz, 1963, pp. 439, 442). In addition, Chung and Richardson (2006) present evidence suggesting that the state deposit insurance schemes of the 1920s changed the composition of bank failures in those states. We elaborate on this finding below.

country data. But because the data those studies rely on is countrywide, the tests end up absorbing a combination of hypotheses (e.g. the potentially positive effects of greater banking capacity with the potentially negative effects of moral hazard). In addition, due to endogeneity concerns, such cross-country analyses need to control for a whole host of factors that can mediate the deposit insurance-bank (in)stability link. Thus, it is difficult to make inferences regarding the effect of deposit insurance forestalling deposit runoffs using cross-country data.

More recently, Iyer et.al. (2016) exploit an exogenously implemented reduction in the insurance limit of the deposit insurance scheme in Denmark in 2010 to study how exposed depositors reacted to this event in a time of crisis (in 2010–11). They find that depositors with balances above the imposed limit reduced their balances substantially, with a clustering taking place at the threshold. They also find that the reduction in deposits was much more pronounced in non-systemic banks, relative to systemic banks. There was a 25 to 50 percent reduction in non-systemic banks, versus an 8 to 20 percent reduction in systemically important institutions. These findings give empirical support to the notion that fear about safety can precipitate runs on banks. They also suggest that implicit guarantees influence depositor behavior.

Egan, et. al. (2015) is another recent paper that investigates the extent to which deposit insurance may lower the likelihood of a systemic banking crisis. In particular, they develop a structural model of depositors' preferences in a setting the includes competition between banks. To calibrate the model, they use a dataset that includes large U.S. banks over the 2002–2013 period. Their main findings indicate that a bank's ability to attract uninsured deposits is dependent on the bank's solvency (measured using CDS spreads and balance sheet information). Their model implies that increasing FDIC insurance could enhance the survival probabilities across banks.

Despite the historical nature of the data, our results carry valuable policymaking implications for modern times. For instance, Basel III calls for new liquidity requirements scheduled to be adopted by

2019—the Liquidity Coverage Ratio (LCR) requirements. The formula used to compute the LCR ratio is based on the assumption that during times of distress some 3 percent of "stable deposits" and 10 percent of the "less stable" deposits run off (Bank for International Settlements [BIS], 2013). Yet, as Allen (2014) and Diamond and Kashyap (2016) argue, the new requirements are not grounded on firmly established theoretical or empirical research. Our results, which show that deposit insurance increases local banking capacity by 56 percent suggests that deposit runoffs are likely higher than those assumed by the BIS during times of distress. Indeed, our results are more consistent with those of Iyer et. al. (2016), showing that deposit runoffs can be as high as 50 percent for non-systemic institutions.

The rest of this paper is organized as follows. Section II provides a brief description of the Postal Savings System in the U.S. In that section we also show that, at least during the sample period, movements in postal savings balances were correlated with "mattress" money. Section III describes the deposit insurance schemes adopted by some states. Section IV presents the empirical methodology, which relies on a difference-in-difference estimator of the growth rates in postal savings deposits from contiguous cities laying on different sides of borders of states that had and did not have deposit insurance. Section V discusses the main findings. Section VI offers some concluding remarks.

II.   The Postal Savings System: A Refuge for Depositors

In the previous section we emphasized that postal savings deposits can be used as a proxy for "mattress" money. In order to articulate that argument more clearly, we provide a brief background discussion that delineates the Postal Savings System's institutional framework. We then provide the statistical and narrative evidence showing that the system became a refuge for depositors, especially in times of banking distress.

A. Background

The Postal Savings System was instituted in the U.S. in 1911.[7] The system was intended to promote

thrift and attract savings from immigrants and other small savers, targeting money that was hidden in

mattresses and cookie jars. The emphasis on small savers was made clear by limiting the maximum

deposit for any individual to $500 (by 1918, this had been increased to $2500). In addition, no depositor

could deposit more than $100 in any one month.[8] After the Panic of 1907, there was increasing demand

and agitation for deposit insurance (or deposit guaranty as it was called at the time), and a national

deposit guaranty program became part of the Democratic platform in 1908, and was championed by

their populist candidate William Jennings Bryan. In response, Republican politicians pushed for the

Postal Savings System as a less intrusive alternative, and it was enacted by the Taft administration.[9]

Postal savings deposits were backed by the full faith and credit of the United States,[10] and so depositors

could view them as extremely safe—indeed far safer than deposits in banks.

Bankers in general disliked both postal savings and deposit guaranty systems, but in order to allay

fears of competition, the law establishing the Postal Savings System mandated that most of the money

deposited with the Post Office would be re-deposited in local banks. At the inception of the system, any

bank could qualify as a depository for postal system deposits after posting the required collateral

(acceptable government and municipal securities) and agreeing to pay the required interest rate

established by the Post Office.[11] After the creation of the Federal Reserve, in 1916 the law was changed

so that Fed member banks received preference over nonmember banks. During the 1920s, therefore,

postal savings deposits were offered first to local member banks in proportion to their capital and

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[7] For more details on the history of the U.S. Postal Savings System see Kemmerer (1917) and Sissman (1936 and 1938).

[8] O'Hara and Easley (1979), 744.

[9] O'Hara and Easley (1979), 742-43.

[10] See 36 Stat. 819 (1910), Sec. 16, which states "the faith of the United States is solemnly pledged to the payment of the deposits made in postal savings depository offices."

[11] This collateral meant that in the event of a bank's failure, the Postal Savings System would not suffer any loss in making good its deposit liabilities.

surplus; only after no member bank wanted the deposits would they be offered to qualifying local nonmember banks. Given that there were relatively few state member banks, most banks accepting postal deposits were national banks. If no local bank wanted the deposits, the Post Office was to try to place them in other banks within the state; if no such bank was available, the Postal Savings System itself would invest the deposits in federal government securities.[12]

B. *Postal savings and the currency-deposit ratio*

Postal savings became a refuge during times of financial distress. One way of demonstrating this claim is by showing how it correlated with the currency-deposit ratio. Previous research has established that during periods of banking distress the currency-deposit ratio rises as depositors convert their bank funds into currency (Boughton and Wicker, 1979; Friedman and Schwartz, 1963). To the extent that postal savings was perceived to be a safe alternative to those funds, the rise in the currency-deposit ratio should also be associated with a rise in the ratio of postal savings balances to bank deposits.

Figure 1 displays two time series: (i) the ratio of postal savings balances to bank deposits, and (ii) the currency-deposit ratio.[13] Visual inspection suggests that both time series are indeed highly correlated. Formal tests (i.e. Johansen cointegration test) indicate that both series are cointegrated with rank 1, corroborating what the figure suggests.

C. *Narrative Evidence*

The time series evidence discussed above shows that there is a tight correlation between postal savings deposits and the currency-deposit ratio. Cointegration suggests that movements in the currency-

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[12] From 1921-23, the amounts redeposited in banks were unusually low (32%, 32% and 47%), but for the rest of the decade the amounts redeposited ranged from 72 to 82 percent. See Sissman (1938), 347.

[13] Monthly figures for postal saving balances are from the Annual Report of the Postal Service Commissioner, various years. Monthly data on bank deposits as well as the currency-deposit ratio are from the St. Louis FRED database.

deposit ratio and movements in the postal saving deposits shared a similar reason—panicked depositors withdrawing money from the banking system in times of bank distress.

Contemporary accounts from reports from various postal savings offices confirm this argument. To illustrate, we present in Exhibits 1 and 2 some of the narratives published in the 1915 *Congressional Record*. The narratives are self-explanatory. It is worth noticing the extent to which the limitations on postal deposits constrained the intake of funds, particularly in times of distress. We address the effect of this limitation on our empirical results further below.

III.   State Deposit Insurance

Between 1908 and 1929, eight states instituted some form of deposit insurance.[14] But widespread bank failures taking place during the early to mid 1920s proved to be too onerous for the states' insurance funds. By 1930 all state deposit insurance schemes were repealed.

The wave of suspensions that overwhelmed the banking system during the 1920s affected primarily small banks. Prior research has highlighted a variety of causes for these suspensions including agricultural shocks (Alston, Grove, and Wheelock 1994), overbanking (O'Hara 1983), lax supervision by state banking authorities (Gambs 1977; White, 1983), and the increasing use of the automobile allowed customers to bank at other financial institutions farther from home (Alston, Grove, and Wheelock 1994). There were also several local panics that ended up amplifying the incidence of suspensions during this period (Davison and Ramirez, 2014).

But deposit insurance itself has also been highlighted as a cause explaining the incidence of bank failures (Calomiris, 1992, 1993; Wheelock 1992, 1993; Wheelock and Wilson 1994). Numerous studies have investigated the mechanisms through which these deposit insurance schemes influenced bank failures. Most of them point out to the moral hazard problem it generated (Calomiris, 2000; Wheelock,

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[14] Table 1 lists the states that adopted deposit insurance, the year in which each scheme was enacted, key features, and the year in which they were dissolved.

1992; Wheelock and Wilson, 1994). Evidence also suggests that banks also reduced their capital to asset ratio, and relaxed their lending standards (Calomiris, 1990; Calomiris, 2000). In addition, deposit insurance may have increased the exposure of banks to economic conditions (Kupiec and Ramirez, 2013).

Nonetheless, recent research suggests that these deposit insurance schemes may have had some beneficial aspects for depositors. Chung and Richardson (2006) report that in states with deposit insurance, failures due to bank runs declined even though failures due to mismanagement rose. Thus, they find that deposit insurance changed the composition of bank failures, but not the total incidence. Accordingly, their evidence suggests that these deposit insurance schemes may have reduced the number of depositors "running" from the banking system during times of distress.[15]

IV.   Identification strategy

As mentioned in the introduction, our identification strategy exploits the policy discontinuity generated by some states having adopted deposit insurance, while others did not. In order to isolate the effect of deposit insurance from confounding or unobserved factors, the discontinuity test rests on a comparison of the growth rate of postal deposits taking place within a narrow geographical area with postal savings offices lying on opposite sides of state borders with the different policies. Specifically, we identified all postal savings offices that were positioned within 30 miles of each other, straddling deposit insurance (DI) and non-deposit insurance (NDI) state borders. This quasi-experimental methodology has proven to be more successful in identifying an effect than has the traditional regression methodology typically subject to the influence of omitted variables.

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[15] See Ramirez (2009) for additional evidence.

The DI states included were: North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, Texas, and Mississippi.[16] The NDI states included were: Minnesota, Iowa, Missouri, Arkansas, Louisiana, Tennessee, and Alabama. We identified 74 city pairs in these 14 states.[17] Figure 2 displays a map of all 74 city pairs.

The computation of the relative deposits is as follows:

$$RPS_{k,t} \equiv \log\left(\frac{1 + ps_{ndi,k,t}}{1 + ps_{di,k,t}}\right)$$

Where $ps_{di,k,t}$ and $ps_{ndi,k,t}$ are the total amount of postal savings deposits located in either the state with deposit insurance (*di* state) or the one without it (*ndi* state) for the city-pair k and at time t. Our justification for this choice of the computation is straightforward. The ratio controls for time-invariant city-level differences.[18] The relative growth of the postal savings deposits for city-pair k is thus:

$$\Delta RPS_{k,t} = RPS_{k,t} - RPS_{k,t-1}$$

Our regression specification is:

$$\Delta RPS_{k,t} = \alpha + \beta \Delta BS_{R,k,t} + \gamma_k + \phi_t + \varepsilon_{k,t} \tag{1}$$

Where $\Delta BS_{R,k,t}$ is the change in the number of bank suspensions taking place within R miles (R=10, 20, 30) of each of the two cities in city-pair k at time t. The regression is estimated with OLS, using robust standard errors (clustered at the *ndi* city level)[19] with city-pair fixed effects as well as time fixed effects.

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[16] Although Washington adopted deposit insurance, we exclude it because its deposit insurance system was discontinued in 1921, the first year of our dataset of individual bank suspensions. Therefore, we are unable to conduct a DI-NDI comparison test using this state.

[17] Although North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, Texas also share a border with the western states of Montana, Wyoming, Colorado, and New Mexico, the postal savings offices were much more scattered on the western side, so very few DI-NDI pairs (in fact, by our count, only two) could be formed.

[18] The log transformation is done to facilitate the computation of the growth rate. A "1" is added to both the numerator and denominator of the ratio to ensure that the variable is well-defined even when zero postal savings deposits are reported in the city.

[19] Due to the topology of the area, our pairing algorithm resulted in some postal savings offices (in DI states) being paired with the same postal savings office (in the NDI state). Clustering the standard errors at the NDI city level corrects for the mechanical reduction in variance that the repetition introduces. See Dube, Lester, and Reich (2010) for more details.

The reliability of our test rests on the premise that differences in unobserved factors across the state border are not correlated with the adoption of deposit insurance. We offer several arguments to defend this premise. First, as mentioned in the introduction, deposit insurance legislation took place at the state level. It is implausible that interests concentrated at state borders (including city-level attributes) systematically influenced states' legislative decisions on deposit insurance at the expense of interests elsewhere in the state. Second, it should be noted that six out of the seven NDI states actually introduced deposit insurance legislation between 1908 and 1917 (Minnesota, Iowa, Missouri, Arkansas, Louisiana, and Tennessee).[20] Those bills were ultimately defeated in state legislatures. This is worth emphasizing because it points to the "exogeneity" of deposit insurance legislation—virtually all states in the sample considered it, but for political reasons (Democrats, on the whole, favored it, while Republicans were against it), ended up passing in some states but not others.

Our third argument hinges on time series variation of the adoption and dissolution of deposit insurance. Specifically, our hypothesis should only be valid during the period deposit insurance is in effect. If the city-pair comparison test is driven by unobserved characteristics, they ought to be driving the results even when deposit insurance is not in effect.[21] Finally, as we elaborate in the following section, a systematic comparison of county-level characteristics for the city pairs reveals that the adjacent neighbors are indeed very similar in observable attributes, which suggests that the city pairs may be equally similar in unobservable ones.

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[20] MN: *The Pioneer* (Bemidji, MN), March 2, 1909, p.1; MO: *La Plata Home Press* (La Plata, MO), February 4, 1909, p.2; TN: *The Tennessean* (Nashville, TN), March 8, 1909, p.3; LA: *The Times Democrat* (New Orleans, LA), May 17, 1912, p.2; AR: *Arkansas Democrat* (Little Rock, AR), March 30, 1909, p.4; IA: *The Humeston New Era* (Humeston, IA), February 1, 1911, p.3.

[21] This argument implicitly assumes that changes in those characteristics are not correlated with changes in deposit insurance status.

V.   Data

As indicated above, the geographic pairing of the postal savings offices is designed to reduce the influence of extraneous variables or unobservable attributes. However, due to data limitations, we are unable to formally compare attributes and characteristics at the city level for the paired cities. Nonetheless, the 1910 Census provides population and basic economic characteristics at the county level.[22] To ensure that our pairing algorithm is yielding comparable localities, we provide some basic economic characteristics for the counties in which the city pairs were located. Table 2 presents the summary statistics for these variables. The list includes: (1) population density, (2) the total number of farms in the relative to the county's population, (3) the percent of the county area used as agricultural land, (4) the illiteracy rate, (5) home density, (6) the number of properties in the county with some mortgage debt divided by the total number of properties in the county, and (7) the total value of all crops in the county divided by the county's population. Undoubtedly, this list of characteristics is not comprehensive but is determined by data availability. Nonetheless, it is helpful for comparative purposes. What is most important here is that for all seven ratios, the average is statistically the same for the DI and NDI counties.

The data underlying the regression specification described above are deposits at various postal savings offices, as well as individual bank suspensions. The *Annual Report of the Postmaster General on the Operations of the Postal Savings System* lists the location as well as deposit information for all postal savings depositories in the U.S. From that source, we obtained deposit data for the postal savings offices that satisfied our selection criteria, as delineated in the previous section. The location-specific postal deposit data are annual in frequency, starting in 1921 and ending in 1929.[23]

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[22] We use county-level data from the 1910 Census (as opposed to the 1920 Census) since the state deposit insurance schemes and the postal savings system were adopted around that time. Source: Minnesota Population Center (2011).

[23] The start year is constrained by our bank suspension dataset. Nonetheless, it is worth pointing out that far fewer bank suspensions took place between 1911 (the year the Postal Savings system was implemented) and 1920.

Our bank suspension data for the years 1921–1929 are drawn from a manuscript list of bank suspensions compiled during the 1930s and held by the FDIC. These lists were contained in papers kept by Clark Warburton, an FDIC economist at the time. The lists contain each suspended bank's name, state, city, and charter type. The lists also provide the date of each bank's suspension and (if any) the date of each bank's reopening.[24]

Postal savings and bank suspension summary statistics for the matched city pairs are presented in Table 3. The table reveals that, on average, there were more deposits in postal savings offices located in the NDI states, relative to deposits in postal savings offices in the DI states. These postal savings offices were located approximately 18 miles from each other. In terms of the number of bank suspensions, the table indicates that on average, there were fewer suspensions taking place within 10, 20, and 30 miles of the postal savings offices in the DI states, relative to the same figures in the NDI states. However, because of the relatively high standard errors, none of the averages computed for the DI states is statistically different from those computed for the NDI ones. Evidently, the relatively high variance masks important differences that exist across city pairs in the sample. The econometric model delineated above is intended to facilitate a more careful analysis of the data.

VI.   Results

Tables 4, 5, and 6 present the key findings of our study. These tables report a variety of regressions testing the effect of deposit insurance at various radii (Table 4), whether the effects were persistent (Table 5), and whether deposit insurance affected local banking capacity (Table 6).

Specifically, the average annual bank suspension rate between 1911 and 1920 was approximately 0.3%, while the average annual rate for the 1921 to 1929 period was 2.22% (Kupiec and Ramirez, 2013). Thus, it is unlikely that pre-1921 data would add a significant number of observations.
[24] A more detailed description of this dataset is provided in Davison and Ramirez (2014).

A. Table 4: Main Results

Table 4 presents the estimates of regression (1). The results indicate that bank suspensions taking place within a radius of 10 or even 20 miles had a disproportionate effect on the deposits of postal savings offices located in the *NDI* state, relative to deposits in postal savings offices located in the *DI* state. Specifically, the reported coefficient of 0.162 (10-mile radius, *DI* in effect) indicates that deposits in the *NDI* postal savings cities grew 16 percent more than deposits in the *DI* postal savings cities following a bank suspension taking place within 10 miles. For the 20-mile radius, the effect is still positive and statistically significant, but smaller—about 9 percent. For the 30-mile radius, the effect is no longer statistically distinguishable from zero. The fact that the magnitude of the coefficient dwindles with distance suggests that the effects were localized.

The table also reports regressions for the same sample of city pairs, but estimated after deposit insurance was discontinued. In contrast to the results when deposit insurance was in effect, the effect of a bank suspension at any of the radii considered is estimated to be statistically nil. As noted above, this result is noteworthy because it suggests that the observed findings under deposit insurance are not being driven by an omitted factor.

B. Table 5: Persistence

Many studies have shown that depositors (and, in particular, uninsured depositors) discipline banks by withdrawing their funds when the institutions are performing poorly or when the financial system is in distress (Iyer, Puri, and Ryan, forthcoming; Martinez Peria and Schmukler, 2001; Berger and Turk-Ariss, 2015; Maechler and McDill, 2006; Egan, Hortacsu, and Matvos, 2015). Complementing this research, several studies relying on episodes of bank runs, as well as U.S. historical evidence have shown that once depositors exercise that discipline, they are very slow to return their funds to the banking system at all, even after the crisis has passed (Iyer and Puri, 2012; Ramirez, 2009; Ramirez and Zandbergen, 2014). Thus, the disciplining effect of depositors appears to be asymmetric—deposits run

fast when leaving the banking system, but come back in a slow and subdued fashion. This pattern suggests that the dynamic effect of depositors is persistent.

To examine the degree of persistence in the context of this study, we investigate the dynamic effects of bank suspensions on postal savings deposits. If the effects are persistent, the disintermediation that bank suspensions cause in terms of deposit runoffs would be long-lasting.

A straightforward way of testing for dynamic effects is to include a lagged dependent variable in the regression.[25] Table 5 presents the regression results.[26] The table indicates that the coefficient in the lagged dependent variable is negative (and statistically significant), suggesting that the effect of bank suspensions on relative deposit growth tends to decline over time. But perhaps more importantly, the coefficients on the bank suspension variables (for the 10 and 20 mile regressions) are robust to the inclusion of the lagged dependent variable.

The bottom part of the table reports some quantitative estimates of the cumulative effects. The results indicate that the effects are clearly persistent. For the 10 and 20 mile radii equations in particular, bank suspensions result in an increase in postal savings deposits that is sustained over time. This result suggests that disintermediation effects of bank suspensions are long-lasting.

C. Table 6: Banking Capacity

Another issue worth addressing is the extent to which the state deposit insurance schemes, despite their moral hazard drawbacks, were able to stimulate local banking capacity. In theory, we would not expect to observe an effect with a "fully operative" postal savings system. The reason is that, as indicated earlier, postal savings deposits were re-deposited in local banks. So even if depositors "ran" more under an uninsured banking system, thereby making relatively more use of postal savings, local

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[25] See Enders (2004) for a description for modeling dynamic effects.
[26] Since our city-pair data are longitudinal in nature, the inclusion of a lagged dependent variable may affect the consistency of the regression coefficients (Holtz-Eakin, Newey and Rosen, 1986). For that reason these regressions are estimated using the Arellano and Bond (1991) GMM procedure.

banking capacity would not necessarily be compromised. In practice, however, this effect was heavily

constrained by the imposed deposit limit of $2,500 per individual postal savings account. The narrative

evidence we presented earlier suggests that in many occasions, and in particular during times of

distress, this deposit limitation ended up constraining deposit intake quite severely. In addition, as

pointed out in the background section above, due to institutional constraints the re-depositing rate from

the postal savings system to local banks was not 100 percent. Because of these reasons, the Postal

Savings System cannot be considered to have been "fully operative." It is worth stressing that these

limitations do not invalidate the results reported in Table 4, showing that postal savings deposits grew

faster in *NDI* states. However, they do indicate that the estimated coefficients in those regressions are

an underestimate of the true effects of deposit insurance.

To get a more accurate estimate of those effects, we investigate whether the level of deposits at the

county (which we take as our measure of the local banking market) differs with deposit insurance. For

the same reasons discussed earlier, we concentrate our analysis using pairs of counties straddling the

DI-NDI state borders. Thus, for each county we obtained deposits held by state banks as well as deposits

held by national banks.[27]

Formally, our regression specification is:

$$\log\left[\frac{1+cd_{di,j,k,t}}{1+cd_{ndi,j,k,t}}\right] = \alpha + \beta(DI_t) + \gamma_k + \phi_t + \eta_{k,t} \tag{2}$$

Where *cd* represents county deposits at either the *DI* or *NDI* state, for county-pair *k*, at time *t*. Subscript *j*

identifies the charter type (either state or national). The independent variable of interest is "*DI*" which

takes the value of 1 if deposit insurance was in effect (for the relevant state) at time *t*, and 0 otherwise.

We also include county fixed effects as well as time fixed effects. Note that since different states

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[27] Our source for these data is the Federal Deposit Insurance Corporation dataset of bank deposits held and maintained by ICPSR, Federal Deposit Insurance Corporation (2001). That dataset set reports aggregate (county-level) deposits for all banks, as well as national banks. The portion of county deposits held by state banks is estimated by subtracting national bank deposits from total deposits.

discontinued their deposit insurance schemes at different times there is sufficient "within county" variation to estimate the *DI* coefficient even after including time fixed effects.

The results from estimating regression (2) are presented in Table 6. The first two specifications are for county deposits in state-chartered banks, while the last two are for county deposits in national banks. Overall, the results indicate that county level deposits at state banks were approximately 56% higher with deposit insurance. To ensure robustness, one of the specifications does not include time fixed effects. But the magnitude of the coefficient is hardly affected. By contrast, the results for county deposits at national banks (which were disallowed by the OCC from participating in state deposit insurance schemes) are not statistically affected by deposit insurance. While the coefficient is positive, the standard errors are large enough to render the coefficient statistically insignificant at the usual levels. This set of results is consistent with the contention that deposit insurance promoted banking capacity.

VII.   Concluding Remarks

One of the most harmful consequences of banking crises is the loss of depositors' confidence in the banking system. In the absence of some mechanism—such as deposit insurance—aimed at maintain confidence, depositors' mistrust can amplify the incidence of bank failures and the adverse systemic consequences for the real economy.

While this argument has been understood for more than a century, validating it empirically has been challenging. In this paper we rigorously test whether deposit insurance was able to arrest the outflow of deposits away from the banking system during periods of bank distress. We do so by comparing the experience of postal savings deposits located in contiguous cities on different sides of the borders of states that did and did not have deposit insurance. Our findings indicate that deposits in postal savings offices located on the non-deposit insurance side of the border increased by 16 percent more than

deposits in the neighboring postal savings office located on the other side of the border (in the deposit insurance state) following a bank suspension within a 10-mile radius. The magnitude declines with distance—the effect is about 9 percent when bank suspensions occur within a 20-mile radius, and it is statistically insignificant when bank suspensions occur in a 30-mile radius. Using county level data, we find that deposit insurance is associated with a 56 percent increase in local banking capacity.

Undoubtedly, the deposit insurance schemes that states adopted after 1907 were faulty. Previous research has shown that they encouraged moral hazard and risk-shifting. Nonetheless, our estimates are useful for quantifying the liquidity-enhancing features of deposit insurance.

Although our data are historical in nature, our results can be helpful for policymaking in modern times. To illustrate this point, consider the recently implemented Basel III reforms regarding the Liquidity Coverage Ratio (LCR) requirements, which are scheduled to be fully implemented by 2019. This new set of regulations is motivated by the illiquidity problems that engulfed financial institutions during the recent financial crisis (Allen, 2014). But as Diamond and Kashyap (2016) points out, there is currently insufficient theoretical and empirical research on which to firmly ground the justification for the LCR requirements. For example, the LCR requirements operate on the assumption that during times of distress some 3 percent of "stable deposits" run off, while the "less stable" deposits runoff rate is assumed to be 10 percent (Bank for International Settlements, 2013). Our results showing that deposit insurance increase local banking capacity by 56 percent suggests that deposit runoffs are likely higher than those assumed by the BIS during times of distress. Indeed, our estimates are closer to those observed in other studies using modern data.

Figure 1
Currency-Deposit Ratio and Postal Savings
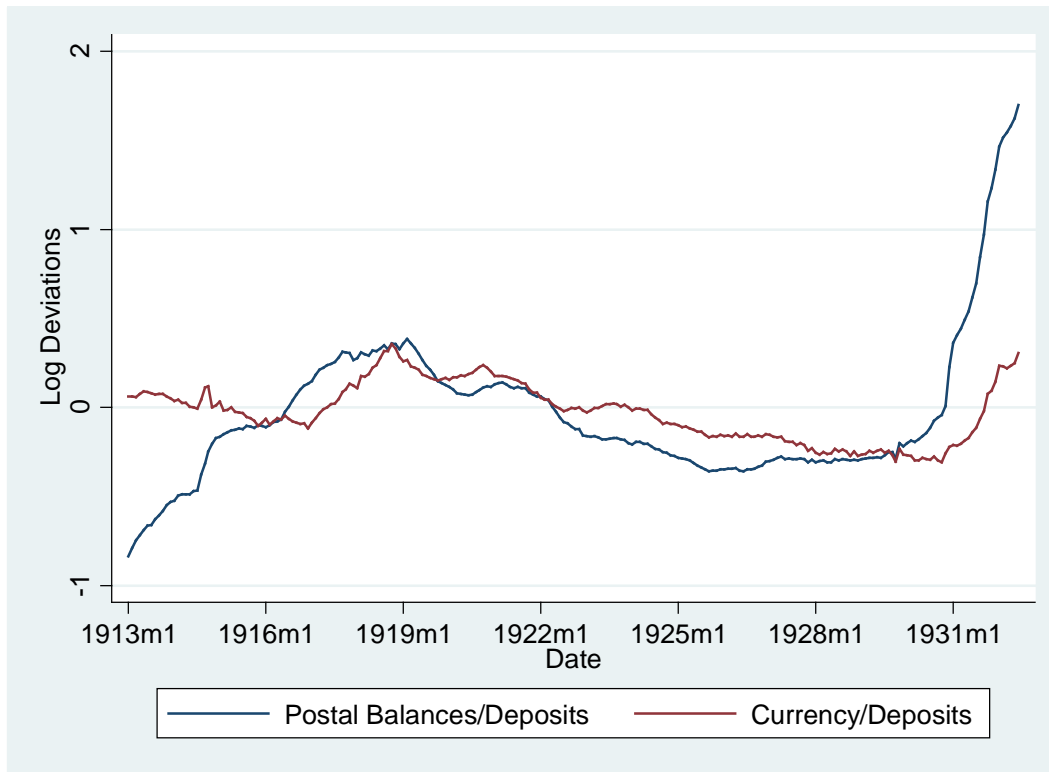
Note: "Postal Balances/Deposits" is the log of the ratio of balances in postal savings deposits to total deposits in all commercial banks per month minus the log of the average postal savings balances to total bank deposits over the entire sample period. "Currency/Deposits" is the log of the currency deposit ratio per month minus the log of the average currency to deposit ratio over the entire sample period. Sources: *Annual Reports of the Postal Savings Commissioner*, various years and St. Louis FRED database.

Exhibit 1

" The postal savings system is a balance wheel in times of financial disturbances and can be made a much more effective agency in this respect by removing the restrictions now placed on deposits. A few illustrations on the point follow:

" On July 31 postal savings deposits at Youngstown, Ohio, were $13,556. The average monthly receipts for the preceding three months had been less than $800. On August 5 the receipts for the day jumped to $3,526, and in the nine days ending August 15 they were $11,958, as compared with a little over $13,000 taken in during the preceding two years. This sudden increase was due to a two days' run on the local bank. The following is from the postmaster's letter dated August 8:

" ' These foreigners brought from $100 to $1,400 each for postal savings, and when told they could deposit but $100 in any one month they, some of them, bought money orders on foreign countries, in amount $10,000, in three days. * * * We turned away close to $30,000 in real cash because of postal savings rules on deposits.'

" Ironwood, Mich., with about 12,000 population, was made a savings depository in May, 1911. A bank failure occurred there in June, 1912. The postal savings at Ironwood now aggregate nearly $150,000, a larger amount than many cities accumulate of ten times the population.

Exhibit 2

" He again wrote the Post Office Department on November 26, in part as follows:

" ' I beg to report that the postal saving system in Pittsburgh is no longer an experiment, nor is it neglected by either the people or this office. From the date of its organization here on September 9, 1911, to July 5, 1913, the total deposits were $134,271. Yesterday the total was $400,310, a gain of $266,039 from July 5 to November 25.

" ' This increase began with the closing of the First-Second National Bank. The large amount of local advertising given the postal savings system in connection with this closing brought as patrons many persons in no way connected with the First-Second National Bank, many of them who had never before had a deposit.

" ' If the limit of deposit was taken off, this office would have $2,000,000 on deposit in six months. Every day sums in excess of $100 are offered, and almost every day patrons who have reached the maximum for one month attempt to make additional deposits. To-day three persons tried to deposit $500 each. One of them was induced to open an account at $100, the other two would not deposit anything when not permitted to deposit all of it. Yesterday a woman appeared with $2,000, and it was with difficulty that she was induced to take it away with her. These are daily occurrences.'

Source: *Congressional Record* 1915-House of Representatives, pp.926–27.

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Table 1
State Deposit Insurance Schemes of the 1920s

State	Year Enacted/Amended	Deposits Insured	State Banks Participating	Year Discontinued
OK	1908/ 1909,1911,1913	All deposits not otherwise secured and on which rate of interest was within limits specified by law	Compulsory for all state banks and trust companies	1923
KS	1909/ 1911,1921,1923	All deposits not otherwise secured and on which rate of interest was within limits specified by law	Voluntary for all incorporated state banks. Trust companies and private banks excluded. Banks organized after passage eligible to apply after one year	1929
NE	1909/ 1911	All deposits except money deposited on a collateral agreement or condition other than an agreement for length of time to maturity and rate of interest	Compulsory for all incorporated state banks	1930
TX	1909/ 1921, 1923	Non-interest-bearing deposits not otherwise secured. Excluded public deposits, secured deposits, certificates of deposit, deposits made for the purpose of converting a loan into a deposit covered by the fund, certificates of deposit converted to non-interest-bearing deposits within 90 days of failure	All state-chartered banks required to choose between guaranty fund system or bond security system	1927
MS	1914	All deposits not otherwise secured nor bearing interest exceeding 4% per annum	Voluntary until May 15, 1915. Thereafter compulsory for all banks operating under state law including trust companies and savings banks	1930
SD	1915/ 1921	All deposits not otherwise secured. Deposits could not pay interest in excess of 5% unless authorized by depositors guaranty fund commission and in no case more than 5.5% per annum	Compulsory for all state and private banks	1927
ND	1917/ 1923	All deposits not otherwise secured and on which interest was within limits specified by law	Compulsory for every corporation in business of receiving deposits or buying and selling exchange except national banks	1929
WA	1917/ 1921	Deposits subject to check or other forms of withdrawal and not otherwise secured. Payment of interest at rates higher than authorized by guaranty fund board subjected bank to loss of insurance	Voluntary for all state banks including trust companies but excluding mutual savings banks	1922

Source: FDIC, *Annual Report for the Year Ended December 31, 1952*, 68; *Annual Report for the Year Ended December 31, 1956*, 54–60.

Figure 2
Map of Postal Savings Offices Contiguous Cities
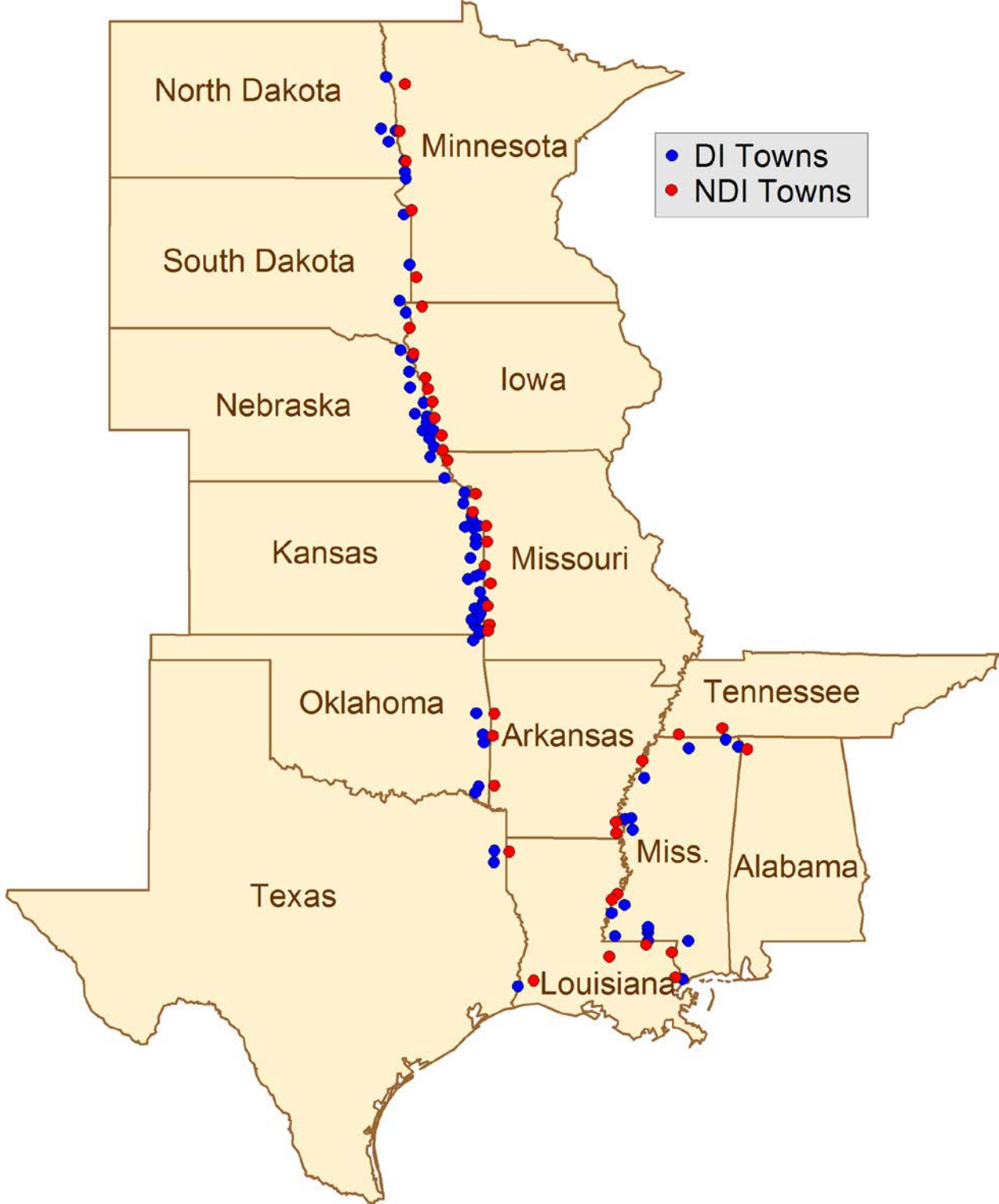
Notes: Deposit Insurance states are: Mississippi, North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, and Texas. Non-deposit insurance states are: Alabama, Minnesota, Iowa, Missouri, Arkansas, Louisiana, and Tennessee.

Table 2
Comparing County Characteristics of City-Pairs

Variable		NDI	DI
Pop. Dens.	Average	60.89	60.24
	Std. Dev	(86.38)	(120.36)
Farms /Pop	Average	0.10	0.11
	Std. Dev	(0.04)	(0.04)
Perc Ag	Average	0.72	0.75
	Std. Dev	(0.23)	(0.25)
Ill Rate	Average	0.08	0.07
	Std. Dev	(0.10)	(0.08)
Home Dens.	Average	13.77	13.48
	Std. Dev	(20.45)	(27.75)
Perc Prop Debt	Average	0.41	0.38
	Std. Dev	(0.19)	(0.15)
Crops/Pop	Average	117.73	127.38
	Std. Dev	(80.04)	(91.90)

Notes: This table presents summary statistics of the counties where the city pairs are located. NDI is for the counties of the postal savings offices located in the non-deposit insurance states. DI is for the counties of the postal savings in the deposit insurance stated. "Pop. Dens." Is population density, defined as total population divided by the county area (in squared miles). "Farms/Pop" is the total number of farms in the county divided by the county's population. "Perc Ag." is the percent of the county area used as agricultural land. "Ill Rate" is the illiteracy rate, defined as the number of persons 10 years and older who are illiterate divided by the county's population. "Home Dens." is home density, and it is defined as the number of homes divided by the county area. "Perc Prop Debt" is the number of properties in the county with some mortgage debt divided by the total number of properties in the county. "Crops/Pop" is the total value of all crops in the county divided by the county's population. Standard Deviations are reported with parentheses under the averages.

Table 3
Summary statistics for city-pairs, all years

		DI	NDI
Deposits in PS	Average	28,718	111,707
	Std Dev.	103,316	861,874
Suspensions 10	Average	0.182	0.416
	Std Dev.	0.547	1.327
Suspensions 20	Average	0.591	1.387
	Std Dev.	1.199	2.826
Suspensions 30	Average	1.329	3.269
	Std Dev.	2.127	5.524
Distance	Average	18.008	
	Std Dev.	6.956	

Notes: This table presents summary statistics for matched city pairs between DI states (states with deposit insurance) and NDI states (states without deposit insurance). "Deposits in PS" is defined as total deposits held in the city's postal savings depository. "Suspensions 10" is the number of bank suspensions taking place within 10 miles of the postal savings office, averaged over all city pairs, and all years. "Suspensions 20" is the number of bank suspensions taking place within 20 miles of the postal savings office, averaged over all city pairs, and all years. "Suspensions 30" is the number of bank suspensions taking place within 30 miles of the postal savings office, averaged over all city pairs, and all years. "Distance" is the average distance between the two matched postal savings offices.

Table 4
City-Pairs Regressions:
Relative Postal Savings Deposit Growth and Bank Suspensions

VARIABLES	10 mile radius		20 mile radius		30 mile radius	
	DI=YES	DI=NO	DI=YES	DI=NO	DI=YES	DI=NO
$\Delta bs_{10,t}$	0.162**	-0.0724				
	(0.0784)	(0.235)				
$\Delta bs_{20,t}$			0.0933**	0.0985		
			(0.0407)	(0.156)		
$\Delta bs_{30,t}$					0.0223	0.132
					(0.0175)	(0.0996)
Constant	0.0997	0.124	0.133	2.852***	0.149	2.975***
	(0.236)	(0.149)	(0.232)	(0.593)	(0.239)	(0.454)
Observations	524	66	524	66	524	66
R-squared	0.058	0.170	0.059	0.176	0.044	0.199

Notes: This table presents regression results of the relative growth of postal savings deposits for each city pair on the increase in the number of local bank suspensions at various radii. Relative growth of postal savings deposits for each city pair is defined as $\Delta RPS_{k,t}$, where $RPS_{k,t} = \log\left[\left(1 + ps_{ndi,k,t}\right)/\left(1 + ps_{di,k,t}\right)\right]$, and where $ps_{ndi,k,t}$ is total deposits in the postal savings office located in the side of city-pair k at time t that did not have deposit insurance, and $ps_{di,k,t}$ is total deposits in the postal savings office located in the side of city-pair k at time t that had deposit insurance. $\Delta bs_{R,t}$ is the change in the number of bank suspensions taking place within R miles (R=10, 20, 30) of each of the two cities in city-pair k at time t. "DI=YES" means that deposit insurance was in effect. "DI=NO" deposit insurance was not in effect (repealed). All regressions include city-pair fixed effects, as well as year fixed effects. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 5
Dynamic Effect on an Increase in Bank Suspensions

	(1)	(2)	(3)
$\Delta RPS_{k,t-1}$	-0.205***	-0.188***	-0.201***
	(0.0546)	(0.0548)	(0.0554)
$\Delta bs_{10,k,t}$	0.182***		
	(0.0596)		
$\Delta bs_{20,k,t}$		0.119***	
		(0.0343)	
$\Delta bs_{30,k,t}$			0.0284
			(0.0196)
Constant	0.157	-0.707**	0.212
	(0.342)	(0.341)	(0.354)
Dynamic Effects:			
Year 1	0.145***	0.096***	0.023
	(0.048)	(0.029)	(0.016)
Year 2	0.152***	0.100***	0.024
	(0.050)	(0.030)	(0.016)
Implied long term	0.151***	0.100***	0.024
	(0.050)	(0.030)	(0.016)
Observations	380	380	380

Notes: This table presents Arellano-Bond dynamic panel-data regressions of the relative growth of postal savings deposits for each city-pair k at time t, $\Delta RPS_{k,t}$, on its first lag, $\Delta RPS_{k,t-1}$, and on the increase in the number of local bank suspensions at various radii. $RPS_{k,t}$ is defined as $\log\left[\left(1 + ps_{ndi,k,t}\right)/\left(1 + ps_{di,k,t}\right)\right]$, where $ps_{ndi,k,t}$ is total deposits in the postal savings office located in the side of city-pair k at time t that did not have deposit insurance, and $ps_{di,k,t}$ is total deposits in the postal savings office located in the side of city-pair k at time t that had deposit insurance. $\Delta bs_{R,k,t}$ is the change in the number of bank suspensions taking place within R miles (R=10, 20, 30) of each of the two cities in city-pair k at time t. Dynamic Effects in Year i (=1,2) measures the impact of an additional bank suspension on relative postal savings deposit growth after i years. The implied long-term effects from the additional suspension are also presented. Instruments for the difference equation: lags 2 through 6 of the dependent variable, and the first difference of $\Delta bs_{R,k,t}$. All regressions include city-pair fixed effects, as well as year fixed effects. Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 6
State Deposit Insurance and Local Banking Capacity

	(1)	(2)	(3)	(4)
	State Banks	State Banks	National Banks	National Banks
DI Active	0.574**	0.557**	0.165	0.267
	(0.259)	(0.260)	(0.108)	(0.190)
Constant	-1.009***	-1.007***	-0.454***	-0.441***
	(0.234)	(0.243)	(0.0980)	(0.126)
Year Effects	NO	YES	NO	YES
Observations	410	410	414	414
R-squared	0.062	0.065	0.002	0.031

Notes: Depended variable: $\log\left[\left(1+\mathrm{cd}_{di,j,k,t}\right)\big/\left(1+\mathrm{cd}_{ndi,j,k,t}\right)\right]$, where *cd* represents deposits at the county level where the city-pairs *k* are located. The remaining subscripts are *di* or *ndi* (deposit insurance or not), bank charter category *j* (state banks or national banks), and year *t*. "DI Active" is an indicator variable equal to 1 if deposit insurance was in effect in the state where the county is located, 0 otherwise. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

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