Regulation and Bank Failures: New Evidence from the Agricultural Collapse of the 1920s

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Abstract

This article examines the contribution of government policies to the high number of bank failures in the United States during the 1920s. I consider the state of Kansas, which had a system of voluntary deposit insurance and where branch banking was strictly prohibited, and find that bank failure rates were highest in counties suffering the greatest agricultural distress and where deposit insurance system membership was the highest. The evidence for Kansas illustrates how prohibitions on branch banking caused unit banks to be especially susceptible to local economic shocks, and suggests that, despite regulations to limit risk-taking, deposit insurance caused more bank failures than would have occurred otherwise.

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Government policies that limit diversification and encourage risk-taking are frequently cited as contributing to the recent increase in bank and savings and loan failures in the United States.[1] Restrictions on branch banking, for example, limit the ability of depository institutions to weather local economic shocks.[2] Other regulations prevent banks from offering a variety of products and services that could potentially lower their overall risk. For example, while the Glass-Steagall Act of 1933 was intended to reduce the risk of bank failure by prohibiting commercial banks from engaging in securities-related activities, recent research has found that banks with securities operations before 1933 had a lower probability of failing than other banks.[3]

The U.S. deposit insurance system also encourages risk-taking by depository institutions. Because depositors are protected in the event of bank failure (at least to the limit of insurance coverage), they do not require banks to pay risk premia on deposit interest rates, and so a bank's cost of funds does not increase proportionately with increases in risk.[4] As long as economic activity and interest rates were stable and entry barriers limited competition, however, the consequences of deposit insurance and limits on diversification were insignificant and bank failures were few. But increased interest rate volatility and a sharp recession in 1980-81, coupled with greater competition and deregulation of deposit interest rates, weakened many banks and S&Ls and encouraged more risk-taking. The result has been a dramatic increase in the number of bank and S&L failures.[5]

This paper offers new empirical evidence on the contribution of deposit insurance and diversification-limiting regulations to bank failures by studying the performance of Kansas banks during the agricultural collapse of the early 1920s. The Kansas experience illustrates how prohibitions on branch banking caused unit banks to be especially susceptible to local economic shocks. This case is particularly interesting, however, because membership in the state deposit insurance system was voluntary, enabling comparison of the performance of insured and non-insured banks, and Kansas officials instituted relatively stringent regulations to limit risk-taking by insured banks. I find, however, that after controlling for differences in agricultural conditions, counties where membership in the state insurance system was high suffered relatively high bank failure rates as a consequence.[6]

The Causes of Kansas Bank Failures

Like most agricultural states, Kansas prospered from increased demand for farm output during World War I and immediately thereafter. The increase in output prices was accompanied by higher land prices and the expansion of agriculture into new areas. In Kansas, land value per acre increased 54% between 1910 and 1920, while in some states the increase was over 100%. In western states much new land was cultivated or grazed for the first time, and in a few improved acreage doubled from 1910 to 1920. In Kansas farm land was already widely cultivated by 1910, and so improved acreage changed little over the decade, although in some western counties improved acreage increased as much as 86%.[7]

Much of the increase in land value and cultivated acreage was financed with money borrowed from banks, and from 1910 to 1920 the

number of banks operating in Kansas rose 30%. In 1920 Kansas had 1380 banks, of which 266 had federal charters, 1096 had state charters and 18 were unincorporated "private" banks.[8] Farm mortgage debt increased 55.2% from 1910 to 1920, and the ratio of debt to value rose from 24.7% to 25.9%.[9]

The agricultural boom ended in mid-1920 when commodity prices began a sharp decline: the wholesale commodity price index peaked at 167 (1923-25=100) in June 1920, then plunged to 114 in January 1921 and to 91 in January 1922.[10] With the decline in income farmers found it increasingly difficult to repay their debts, and the consequent increase in farm loan defaults resulted in bank failures. Across the United States, areas which had enjoyed the greatest agricultural boom seemed to suffer the worst downturn, having the highest rates of farm and bank failure.[11] Rural areas and farming states endured disproportionately many failures: of the 5712 bank suspensions during the 1920s, 4515 (79%) occurred in towns of under 2500 population, and the failure rate in those towns (2.5%) was nearly twice that in larger cities (1.3%).[12] Most of the failures were in the middle west and south, while the northeast and California had very few.[13]

Alston, Grove and Wheelock identify agricultural distress as the most important cause of bank failures during the 1920s, and Kansas' heavy dependence on agriculture undoubtedly accounts for its relatively large number of failures.[14] Between August 1920 and August 1926, 119 state-chartered and six federally-chartered Kansas banks failed, and an additional 94 state-chartered banks liquidated voluntarily.[15] Figure 1 illustrates the distribution of state bank failures across Kansas in the early 1920s. No region was immune from failures, although some counties

had none while others suffered high failure rates. In general failure rates were highest in southeastern counties and lowest in western counties, although those with the highest failure rates--Rooks, Kiowa and Kingman--were located in the central portion of the state.

County variation in bank failure rates was likely influenced by differences in agricultural conditions. While all counties endured agricultural distress, the eastern half of Kansas seems to have suffered more than the west. Figure 2 illustrates that between 1920 and 1925 the value per acre of farm land and buildings fell more in eastern counties than in western counties.[16] This measure may understate distress in western Kansas, however, if, as seems likely, marginal land in that region was withdrawn from cultivation to a greater extent than in eastern counties. Much arid land in western Kansas was farmed for the first time during World War I, and the relatively small change in the value per acre of farm land between 1920 and 1925 in western counties might be explained by the withdrawal of these lands from cultivation. Unfortunately, the available data do not permit comparison of land under cultivation between 1920 and 1925. But Figure 3 illustrates that the largest declines in total farm land in those years were experienced by a few western counties.[17] More southeastern counties suffered significant declines in farm land, however, while several western counties had increases in total farm land between 1920 and 1925. It seems, therefore, that agricultural distress was generally greater in central and eastern Kansas, which likely explains why those regions suffered the highest rates of bank failure.

While agricultural distress was a principal cause of bank failures during the 1920s, other factors also enhanced or detracted from the

performance of banks in different states. Deposit insurance, for example, has been implicated in the failures of the 1920s. Although federal insurance did not begin until 1933, eight states, including Kansas, adopted insurance systems for their state-chartered banks after the Panic of 1907.[18] Calomiris demonstrates that banks in states with insurance systems grew faster than those of other states during the agricultural boom, but then suffered greater asset declines after farm prices fell.[19] And Alston, Grove and Wheelock show that bank failure rates were higher in deposit insurance states, holding constant the level of agricultural distress.[20]

The Kansas deposit insurance system had a number of unique features, several of which were designed to limit risk-taking. For example, in response to complaints that insurance forced conservative banks to pay for the failures of risk-taking institutions, membership in the insurance system was made voluntary. Since conservative banks could chose to remain uninsured, doubts about the credibility of the insurance fund may have limited the risk-taking of insured banks. With neither the state or conservative banks standing behind the fund, depositors of insured banks were given some incentive to monitor their banks' activities, and hence limit risk-taking.[21]

To further constrain insured banks, Kansas also capped deposit interest rates and required insured banks to maintain minimum capital to deposit ratios of .10.[22] Further, banks were required to operate for at least one year and undergo a state inspection before being admitted into the insurance system.[23] And supervision of insured banks was reputed to have been relatively tight.[24]

Insured banks were assessed annual premiums of 1/20th of 1% of their insured deposits less capital and surplus, and thus were given some incentive to maintain adequate capital. However, because premiums were so small, the assessment savings was trivial. For example, a bank with $100,000 of insured deposits would pay $45 per year if it had $10,000 of capital and surplus, or $42.50 if it had $15,000 of capital and surplus. The state could increase assessments to 1/5th of 1% if necessary to maintain the solvency of the insurance fund, and insured banks were required to deposit $500 in cash or eligible bonds with the state treasurer for each $100,000 of insured deposits. Banks were allowed to withdraw from the insurance system with six months notice, but remained liable for assessments needed to reimburse depositors of banks that failed while the withdrawing bank was in the system.

In its first year of operation, 48.9% of eligible banks, holding 45.7% of deposits in eligible banks, joined the Kansas insurance system.[25] From 1909 to 1920 there were few bank failures, depositors of failed banks were reimbursed promptly, and insurance premiums remained low. Many banks concluded that the expected benefits of membership exceeded the costs, and membership in the system increased, peaking in 1923 at 65.6% of eligible banks.

Ultimately, however, the insurance system proved a failure. Between 1920 and 1926 insured banks had the highest rate of failure of any class of banks in the state: 4.6%, versus 2.3% for non-insured state banks, and 0.8% for national banks.[26] The insurance fund also failed to fully reimburse the depositors of failed banks. Depositors of only 29 failed banks were reimbursed in full, while no fund payments were made to depositors of 88 failed institutions. Fully 28.6% of insured

deposits were not recovered, either through asset liquidation or payment from the insurance fund.[27] Following the failure of the American State Bank of Wichita, the state's largest insured bank, in 1923, other banks began to abandon the insurance system as the prospect of higher premiums became apparent. In 1926 the state supreme court ruled that banks could leave without liability for further assessments simply by forfeiting the cash or bonds they had deposited with the state as a guarantee of assessment payment. Many banks then dropped out, and although the system was not closed until 1929, the insurance of bank deposits in Kansas effectively ended.

The relatively high rate of failure among insured banks suggests that the regulations intended to limit excessive risk-taking were not entirely effective. Insured Kansas banks had significantly lower capital to asset ratios than non-insured banks, and insured banks seem to have taken greater risks as they approached failure.[28] References in the state bank commissioner's reports also indicate that some banks circumvented deposit interest rate ceilings, and that loopholes in the insurance law permitted banks to attract "brokered" deposits, much like those offered by S&Ls in the 1980s:[29]

> By many banks the law has been held out as an inducement to obtain money on time certificates, and which transactions are really not deposits in the proper sense of the term, but rather money borrowed by the bank. A provision that the payment of the deposit should be guaranteed only to the person, firm or corporation who originally made it, and not to any assignee or transferee, has been suggested.[30]

The apparent abuse of the insurance system and relative riskiness of insured banks suggests that counties where a high percentage of banks were insured likely had higher bank failure rates as a consequence. Figure 4 illustrates that membership in the deposit insurance system was

generally higher in eastern counties, including many of those suffering the worst farm distress and highest bank failure rates. Once agricultural conditions began to deteriorate and farm loan defaults rose, inadequately capitalized banks were the most likely to fail. Not only did the typical insured bank have a lower capital to asset ratio, but as its capital was eroded the insured bank had an incentive to take on still greater risk. In the absence of economic recovery, this led to even more failures.

While farm distress and deposit insurance are among the most frequently cited causes of bank failures during the 1920s, a number of other contributors have been suggested. Excess competition, or "overbanking," is often put forward as an important cause.[31] Ex ante, it is difficult to identify (or define) excess competition, but that failures occurred suggests that there were too many banks. As economic activity declined the demand for banking services fell and banks were forced to retrench or close. The principal cause of the economic slowdown in Kansas was farm distress, although other factors could have affected the demand for banking services. Useful indicators of the demand for banking services in a county are measures of economic activity. Since comprehensive county-level data on economic activity is unavailable for the 1920s, however, I use the change in county population as a proxy. Presumably, the faster a county's population grew, the greater was the demand for banking services, and the less likely were bank failures. A declining or slowly growing population might reflect a weak economy, and therefore a higher bank failure rate.

One argument often made against branch banking is that it leads to consolidation of the industry and reduces competition. In fact,

however, barriers to branching may check competition by protecting local banks from outside competitors. Competition is not limited by branching restrictions per se, but in conjunction with minimum capital requirements or other entry barriers, such restrictions can hinder competition. Eugene White found that branching restrictions and minimum capital requirements had significant effects on rural banking markets during the early twentieth century:

> In rural areas ... low population density required numerous, widely dispersed banking offices. Many banks were needed to serve the growing demand for bank services in the presence of the strict limits placed on branching, and the number of these banks was constrained by the legal minimum capital requirements.[32]

Like most midwestern states, Kansas was a unit-banking state during the 1920s, with over 1000 small independent banks in operation. The number of banks might have been even higher in the absence of a minimum capital requirement of $10,000 on state-chartered banks.[33] In general, however, rural counties had the highest number of banks per capita.[34] Had branching restrictions been removed, these counties would have likely experienced the greatest banking consolidation, either through mergers or failures.

Kansas remained a unit-banking state throughout the 1920s, but other changes that reduced the need for numerous banking offices in rural areas may have caused bank failure rates to be high in some counties. For example, it is often argued that as rural roads were improved and automobiles and trucks became prevalent on farms during the 1910s and early 1920s, the number of bank failures increased because banks serving formerly distinct geographic markets were thrown into competition with one another.[35] Small, rural banks became vulnerable as

farmers found it easier to bank in larger commercial centers where terms might have been better or where they had other business to transact. The automobile and improved roads also meant that bankers could more easily monitor borrowers, and thus profitably service larger areas. Because of economies of scale, larger banks could force out previously isolated small rural lenders. Transportation improvements thus reduced the need for "numerous, widely dispersed banking offices," and their impact should have been greatest in rural counties, where the number of banks per person was the highest.

National banks provided another source of competition for state chartered banks. National banks were generally perceived as safer, more tightly regulated and better supervised. The low failure rate of national banks during the early 1920s probably drew deposits away from state chartered institutions. Thus, counties with relatively more national banks probably had higher state chartered bank failures as a result.

Kansas Bank Failures: Econometric Evidence

To test the alternative hypotheses about why bank failure rates differed across Kansas counties during the early 1920s, I estimate a TOBIT regression model of the following form:

Failure Rate = β_0 + β_1 Agricultural Distress + β_2 Deposit Insurance Rate + β_3 ΔPopulation + β_4 Banks Per Person + β_5 National Bank Rate + e.

Failure Rate is taken to be the total number of state bank failures in a county from September 1, 1920 to August 31, 1926, divided by the total number of state chartered banks operating on August 31, 1920, adjusted

for new entrants and voluntary liquidations between 1920 and 1926 (STFRATE).[36]

I also model an alternative variable, the sum of bank failures and voluntary liquidations, divided by state banks operating on August 31, 1920 plus new entrants between 1920 and 1926 (SUSRATE). Banks classified as voluntary liquidations include those closing voluntarily and reimbursing depositors in full, those merging with another bank, and those switching to federal charters. I suspect banks closed voluntarily for the same reason that banks failed: insufficient rate of return.[37] Loan losses and declining loan demand reduced profitability and probably led stockholders of some banks to liquidate or merge with another bank. Other banks likely found it advantageous to switch to national charters to maintain depositor confidence as state chartered bank failures rose. Moreover, as the failures of insured banks increased, so too did the assessments that member banks were required to pay for insurance. Switching to a federal charter was one way a bank could withdraw from the system.[38]

Of the 94 banks liquidating voluntarily from 1920 to 1926, 10 switched to national charters. Six of those had been members of the deposit insurance system, including five of the six switching charters between 1922 and 1926. Twenty-five banks closed voluntarily between 1920 and 1926, including nine insured banks. Merging banks accounted for 59 of the voluntary liquidations, and 37 had been insurance system members. Overall, 52 (55%) of the banks liquidating voluntarily were insured, which was somewhat less than the percent of all eligible banks that were insured in 1920 (61.5%).[39] Of those switching to a national charter or merging with another bank, however, 62.3% were insured.

Thus, relative to the population as a whole, there does not seem to have been a bias toward or away from insurance system membership among banks liquidating voluntarily between 1920 and 1926.

I use two variables to measure agricultural distress, the percent change in the value per acre of farm land and buildings (ΔLBVAL) and the percent change in total farm acreage (ΔLAND) from 1920 to 1925. I expect that a county's bank failure rate was higher, the greater its decline in farm land and building value or in farm acreage. If risk-taking banks were more likely to join the insurance system than other banks, or if insurance enabled banks to take more risks, then it is likely that failure rates were higher in counties where a high portion of the banks were insured, all else equal. Thus I include the ratio of insured to total state banks (DIRATIO) as an independent variable. The impact of deposit insurance might interact, however, with economic distress. As economic distress leads to an erosion of bank capital, the incentive for insured banks to take risks increases. In the absence of economic recovery, the increase in risk taking will likely cause even more failures. To capture this "moral hazard" effect, I include ΔLBVAL*DI, the interaction of ΔLBVAL and DIRATIO, and ΔLAND*DI, the interaction of ΔLAND and DIRATIO, as additional independent variables.

To capture alternative sources of changes in economic activity I include the percent change in population from 1920 to 1930 as an independent variable (ΔPOP).[40] If this variable adequately measures relative changes in economic activity or the demand for banking services, I expect that bank failure rates were higher in counties experiencing relatively larger declines (or slower growth) in population.[41]

Competition effects are modeled with two variables. The number of banks per person (BANKPOP) is used to test the impact of transportation improvements on bank failures. If the adoption of the automobile and improved roads contributed to bank failures, their impact should have been greatest in counties where the number of banks per person was highest. I also expect that the higher a county's ratio of national to total banks in 1920 (NATRATIO), the higher the rate of state-chartered bank failure from 1920 to 1926. The lower failure rate of national banks, coupled with the delays and possibility of not being fully reimbursed in the event of bank failure, might have led depositors of state banks to move their funds to national banks once economic activity declined and failures rose. Thus state banks in counties with a relatively large number of national banks might have experienced greater losses and higher failure rates than those located where there were few national banks.

Regression estimates for STFRATE are reported in Table 1, and those for SUSRATE in Table 2.[42] Equations 1.1 and 1.2, and 2.1 and 2.2, were estimated using all 105 counties, while Equations 1.3 and 1.4, and 2.3 and 2.4, were estimated after omitting the 23 counties that had fewer than five state banks. Only three of these counties had any bank failures from 1920 to 1926, but in counties with few banks the impact of even a single failure on the dependent variable is large. This is also true of the ratio of insured to total banks. Three counties had only one bank. In two, the bank was not insured, and hence the value of DIRATIO is 0. In the third county, the bank was insured, making the value of DIRATIO equal to 1. Because a single bank has such a large

influence, it seems reasonable to omit counties which had few banks.[43]
As is evident, the results are affected by doing so.

When no counties are omitted, the impact of agricultural distress
on bank failures is most apparent. Counties where the value per acre of
farm land and buildings fell the most from 1920 to 1925 suffered the
highest bank failure rates. As illustrated in Figure 2, the declines
tended to be largest in eastern counties, where the bank failure rates
were the highest. The coefficient on the percent change in total farm
land is neither economically or statistically significant, however,
perhaps because it is an inadequate proxy for the change in land under
cultivation.

Deposit insurance is most useful for explaining differences in
failure rates in counties with five or more state banks, although its
coefficient is also marginally significant in Equations 1.1 and 1.2.
That the point estimates of the deposit insurance coefficient are more
precise when counties with fewer than five banks are omitted is not
surprising. Counties with few banks tended to be sparsely populated and
located in the western part of the state. The average ratio of insured
to total banks in these counties was lower than that of counties with
five or more banks, but the dispersion of DIRATIO was higher since the
influence of a single bank's membership status on the ratio in counties
with few banks is large.[44]

While the results indicate that county bank failure rates were
related positively to the ratio of insured to total banks, I do not find
that the interaction of farm distress and deposit insurance
significantly affected failure rates. It does not seem that the effect

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of farm distress was higher where deposit insurance membership was more prevalent.

The coefficient on ΔPOP has the anticipated sign and, in Equations 1.1 and 1.2, is economically and statistically significant.[45] Counties with relatively fast growing populations experienced lower bank failure rates, all else equal. The coefficient on BANKPOP is small and insignificant, however. If transportation improvements significantly affected bank failure rates in Kansas during the 1920s, they seem not to have had a greater impact in counties with relatively many banks per person.

A particularly important variable for explaining differences in county bank failure rates is the ratio of national to total banks (NATRATIO). Counties where state banks faced relatively greater competition from national banks had significantly higher state bank failure rates as a consequence. Indeed in Equation 1.1 the impact of a one standard deviation change in NATRATIO on STFRATE is as large as a one standard deviation change in ΔLBVAL.

The TOBIT estimates for SUSRATE (Table 2) indicate that agricultural distress, deposit insurance, and the ratio of national to total banks were also important determinants of state bank failures and voluntary liquidations in Kansas from 1920-26. There are some apparent differences, however, between these estimates and those for bank failure rates (STFRATE). For example, the coefficient on ΔLAND is significant when all counties are included in the regressions. It becomes insignificant, however, while those on the other variables are little changed, if the three counties with the largest declines in farm land are omitted.[46]

The impact of deposit insurance appears somewhat less important in explaining the sum of bank failures and voluntary liquidations than simply bank failures alone. The coefficient on DIRATIO is smaller, both absolutely and relative to that on ΔLBVAL (although not to ΔPOP) in the SUSRATE model estimates. This is not particularly surprising, however, since just nine of 25 banks closing voluntarily were insurance system members, while banks merging with other banks or switching to national charters were probably not affected by the deposit insurance status of their local competitors.[47]

Conclusion

Many economists argue that the stability of the U.S. banking system would be enhanced by permitting banks greater freedoms to branch and offer new kinds of services. Many also argue that the deposit insurance system must be overhauled to limit excessive risk taking by depository institutions.

This paper reports historical evidence supporting those conclusions. During the 1920s the United States experienced a severe agricultural shock, but not disruptions to other sectors of the economy.[48] Because banks were not permitted to branch across state lines, farm-state banks were unable to adequately diversify their loans into other sectors. Consequently farm states suffered high numbers of bank failures, while other states had few or none. Ironically, branch banking tended to be most limited in farm states. In Kansas, as in many other states, no branching was permitted at all. Because variation in agricultural distress across counties accounted for much of the differences in county bank failure rates, it is likely that branch banking within the state could have lessened bank failures.

It is also ironic that states where small unit banks were the rule, were the most likely to adopt a system of deposit insurance.[49] This, apparently, was their second mistake. Even Kansas, where voluntary membership and relatively strict regulation and supervision probably lessened risk-taking, deposit insurance seems to have exacerbated bank failures. Holding constant the level of agricultural distress, counties with a relatively high proportion of insured banks tended to have higher bank failure rates than other counties. The results of this paper add further weight, therefore, to the view that banking system instability could be reduced by removing regulations that limit diversification opportunities and by adopting reforms that constrain risk-taking by insured institutions.

FOOTNOTES

[1] See, for example, Clair and O'Driscoll, "Learning from One Another."

[2] Clair and O'Driscoll, "Learning from One Another," write, "The 470 Texas bank failures during the 1980s are classic examples of the cost of an undiversified portfolio. By hindering their expansion into markets outside of their home state, geographical restrictions led Texas banks to concentrate heavily in energy lending and commercial real estate lending," pp. 5-6.

[3] See White, "Before the Glass-Steagall Act," and Benston, *The Separation of Commercial and Investment Banking*.

[4] Merton, "An Analytic Derivation," and Kareken and Wallace, "Deposit Insurance," present theoretical analysis of the incentive effects of deposit insurance. One proposal to eliminate this incentive is to link the premiums that banks pay for insurance to their risk-taking. To date, however, premiums remain unrelated to failure risk.

[5] If bank capital declines, perhaps because of an increase in loan defaults as occurred in the early 1980s, the incentive for risk-taking created by deposit insurance becomes stronger. See Furlong and Keeley, "Capital Regulation and Bank Risk-Taking." Indeed, many insolvent S&Ls that were permitted by regulators to remain open took extreme risks that ultimately added greatly to the cost incurred by the insurance fund. See Kane, *The S&L Insurance Mess*.

[6] Previous studies, such as White, "A Reinterpretation of the Banking Crisis of 1930," have argued that restrictions on branch banking contributed to the disproportionately high number of banks and bank failures in the United States during the 1920s and early 1930s. Others,

such as Thies and Gerlowski, "Deposit Insurance: A History of Failure,"
Calomiris, "Deposit Insurance: Lessons from the Record," and Alston,
Grove, and Wheelock, "Why do Banks Fail?" have found that deposit
insurance increased banking instability. None, however, has examined
banking system performance at the county-level, nor focused specifically
on a voluntary deposit insurance state.

[7] U.S. Bureau of the Census, *Fourteenth Census of the United States,
Agriculture* (Washington, DC, 1920), vol. 6, part 1, pp. 723-24.

[8] Kansas, *Biennial Report of the Bank Commissioner* (1920) (state and
private bank data); Bankers Encyclopedia Company, *The Bankers
Encyclopedia* (March 1921) (national bank data). These totals do not
include the small number of savings banks and trust companies operating
in the state.

[9] U.S. Bureau of the Census, *Fourteenth Census of the United States,
Agriculture* (Washington, DC, 1920), vol. 6, part 1, p. 725.

[10] Board of Governors of the Federal Reserve System, *Annual Report*
(1937), p. 174.

[11] Alston, "Farm Foreclosures," shows that states with the highest
percentage increases in farm land value and improved acreage during the
teens suffered the highest rates of farm failure during the 1920s. And
Alston, Grove and Wheelock, "Why Do Banks Fail?" find that these states
also had the highest bank failure rates.

[12] These figures are based on data given in Board of Governors of the
Federal Reserve System, *Bulletin* (Sept. 1937), pp. 901-906. Failures
for 1921-29 are divided by total incorporated banks in 1920.

[13] For example, there were only 14 bank suspensions in New England from
1921 to 1929, and just 31 in California. By contrast, 2652 suspensions

occurred in the north central states of Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska and Kansas, including 220 in Kansas. Board of Governors of the Federal Reserve System, *Banking and Monetary Statistics* (Washington, DC, 1943), pp. 284-85.

[14] Alston, Grove, and Wheelock, "Why Do Banks Fail?"

[15] These data overstate the extent of banking distress, however, because 73 new state-chartered banks began operation in these years and 10 of the voluntary liquidations involved state banks switching to national charters.

[16] Interestingly, those counties suffering the sharpest declines in the value of land and buildings between 1920 and 1925 had enjoyed the largest increases in farm land values between 1910 and 1920, and had the highest ratios of debt to land value in 1920. The correlation coefficients between the percent change in land and building value (1920-25) and the percent change in land value (1910-20) and the ratio of debt to value in 1920 are -.40 and -.42, both of which are statistically significant at the .01 level.

[17] Total farm land includes not only cultivated acreage, but pasture land, and some woodland and other unimproved farm land. It excludes isolated tracts of woodland and other land not connected with farms. Total farm land in Kansas fell 3.8% between 1920 and 1925, and then increased 7.2% to 1930. U.S. Bureau of the Census, *United States Census, Agriculture*, (Washington, DC, 1930), vol. 2, p. 1290.

[18] The eight were Oklahoma, Kansas, Texas, Nebraska, North Dakota, South Dakota, Mississippi and Washington. Calomiris, "Deposit Insurance," compares the systems, as well as those adopted by some states in the 19th century.

[19] Calomiris, "Do Vulnerable Economies Need Deposit Insurance?"

[20] Alston, Grove, and Wheelock, "Why Do Banks Fail?"

[21] I have seen no evidence, however, that depositors of insured banks monitored banks or enforced conservative behavior. One contemporary, Charles Harger, "An Experiment that Failed," wrote that depositors were "Serene in the confidence that they could not lose, depositors trusted in the guaranteed bank," p. 278. And analysis of individual bank data by Wheelock, "Deposit Insurance and Bank Failure," finds that insurance enabled banks to take greater risks.

[22] Deposit interest rate ceilings constrain banks from attracting deposits by offering high interest rates. After rate deregulation in the 1980s, risk-prone banks and S&Ls were able to grow rapidly by offering high rates and the safety of federal deposit insurance. See Kane, *The S&L Insurance Mess*, pp. 85-87.

[23] The one year requirement was waived if there was no other insured bank in the applicant's town. For further detail about the Kansas system see Cooke, "The Insurance of Bank Deposits in the West;" Robb, *The Guaranty of Bank Deposits*; Federal Deposit Insurance Corporation, *Annual Report* (1956); and Wheelock, Deposit Insurance and Bank Failures."

[24] Calomiris, "Deposit Insurance: Lessons from the Record," pp. 21-23.

[25] Banks ineligible for membership included federally-chartered banks, unincorporated banks, trust companies and state-chartered banks not meeting the other membership requirements. Membership in the system represented 38.9% of all banks, and 24% of all bank deposits. Federal Deposit Insurance Corporation, *Annual Report* (1956), p. 89.

[26] American Bankers Association, *The Guaranty of Bank Deposits*, p. 34.

[27] Federal Deposit Insurance Corporation, *Annual Report* (1956), pp. 57-61.

[28] See Wheelock, "Deposit Insurance and Bank Failures," for balance sheet analysis of a sample of Kansas banks.

[29] Brokered deposits are issued by depository institutions through a broker, typically in $100,000 lots or smaller so as to be fully insured. Purchasers of such deposits may have little or no knowledge of the ultimate issuing bank. In the 1980s some of the most risk-prone and rapidly growing S&Ls relied heavily on brokered deposits as a source of funds. As the Kansas bank commissioner believed, it is often argued that these accounts should not be covered by deposit insurance. See, for example, General Accounting Office, *Deposit Insurance: A Strategy for Reform*.

[30] Kansas, *Biennial Report of the Bank Commissioner* (1922), p. 5.

[31] See Bremer, *American Bank Failures*, and Gambs, "Bank Failures--An Historical Perspective."

[32] *The Regulation and Reform of the American Banking System, 1900-1929*, p. 16.

[33] Sedgwick County, where the city of Wichita is located, had the most banks in 1920 (45), while Grant, Greeley and Stanton Counties had just one each. In 1920, 5% of state-chartered banks had total capital of less than $12,000, and 10% had total capital of less than $15,000. The par value of the capital of 35% of the banks was $10,000. Kansas, *Biennial Report of the Bank Commissioner* (1920).

[34] The correlation between the percentage of a county's population located in places of less than 2500 population and the ratio of banks to

population in 1920 is .68, which is statistically significant at the .01 level.

35 See Johnson, "Postwar Optimism and the Rural Financial Crisis of the 1920s," and the references in Alston, Grove, and Wheelock, "Why Do Banks Fail?"

36 Data sources are given in the appendix.

37 White, "The Merger Movement in Banking," found that bank mergers and failures were correlated during the 1920s, suggesting that they shared common underlying causes.

38 Of course, since state banks were not required to belong to the insurance system, banks did not have to switch to national charters to opt out. Insured banks that switched to national charters probably did so both to escape from the system and to maintain depositor confidence.

39 Some of those liquidating voluntarily, however, might not have been eligible for membership.

40 Unfortunately there are no county-level population data except for census years, and some may object to explaining bank failures from 1920 to 1926 with the change in population from 1920 to 1930. As an alternative I experimented with using the population change from 1910 to 1920. The use of one or the other does not substantially affect the coefficients of the other variables.

41 As might be expected in a predominantly agricultural state, population change was highly correlated with farm distress. The correlation between ΔPOP and $\Delta LBVAL$ is .51, which is significant at the .01 level, and between ΔPOP and $\Delta LAND$ it is .24, which is significant at the .02 level.

[42] A likelihood ratio test of the null hypothesis that the model has no explanatory power was conducted on each equation. In each case the null hypothesis is rejected at the .05 significance level or higher.

[43] Of course, the cutoff at five banks is arbitrary. I also estimated the STFRATE model after omitting counties with fewer than 10 banks and found little difference between those results and those when five banks is used as the cutoff point.

[44] The average ratio of insured to total banks in the excluded counties is 0.39, with a standard deviation of 0.352, while the average in the remaining counties is 0.59, with a standard deviation of 0.265. Interestingly, western counties tended to have much lower DIRATIOs than eastern counties. This is true even if non-eligible banks are excluded. I suspect this regional difference is related to competition, and Wheelock and Kumbhakar, "Which Banks Chose Deposit Insurance?" find that a bank's decision to join the insurance system was largely dependent upon the membership status of its competitors.

[45] The standardized, or "beta," coefficient on ΔPOP is −0.54 in Equation 1.1, while those on ΔLBVAL, ΔLAND, DIRATIO, BANKPOP, and NATRATIO are −0.42, −0.11, 0.33, 0.04, and 0.44. Thus, for example, a one standard deviation change in ΔPOP would produce a −0.54 standard deviation change in STFRATE. Descriptive statistics for each variable are presented in the appendix table A1.

[46] The three counties--Greeley, Hamilton, and Sherman--were located along the state's western border and experienced declines in farm land between 1920 and 1925 of 55%, 20%, and 28%. Greeley and Hamilton each had one state bank in 1920 (Greeley subsequently had two new entrants)

and Greeley and Sherman both had a bank liquidate voluntarily. None had any bank failures from 1920 to 1926.

[47] Their decisions were more likely affected by the condition of the insurance fund in the state as a whole since switching charter was one way of withdrawing from the insurance system.

[48] There is a debate as to whether agriculture was depressed during the 1920s. Holt, "Who Benefited from the Prosperity of the Twenties?" argues that farmers in general prospered during the 1920s. The evidence in Alston (1983) and in Alston, Grove and Wheelock (1991), however, indicates that farmers who had borrowed heavily before 1920 subsequently failed or suffered severe financial distress.
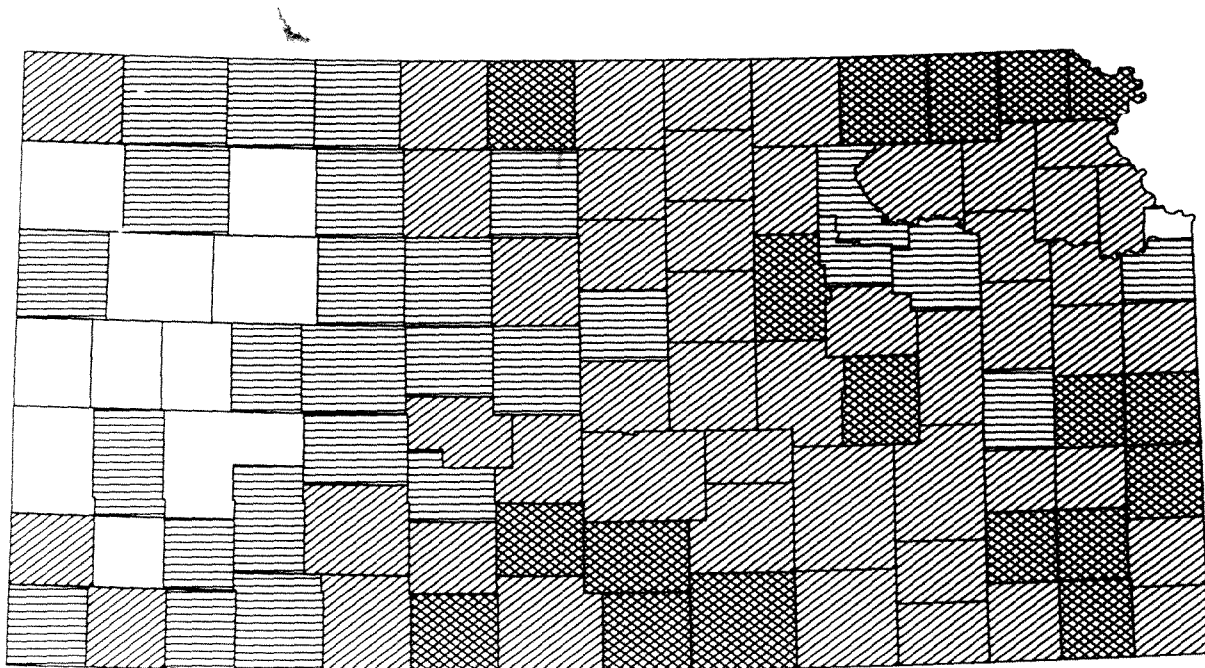
[49] See White, *The Regulation and Reform*, pp. 189-204.

Figure 1 : Bank Failure Rates
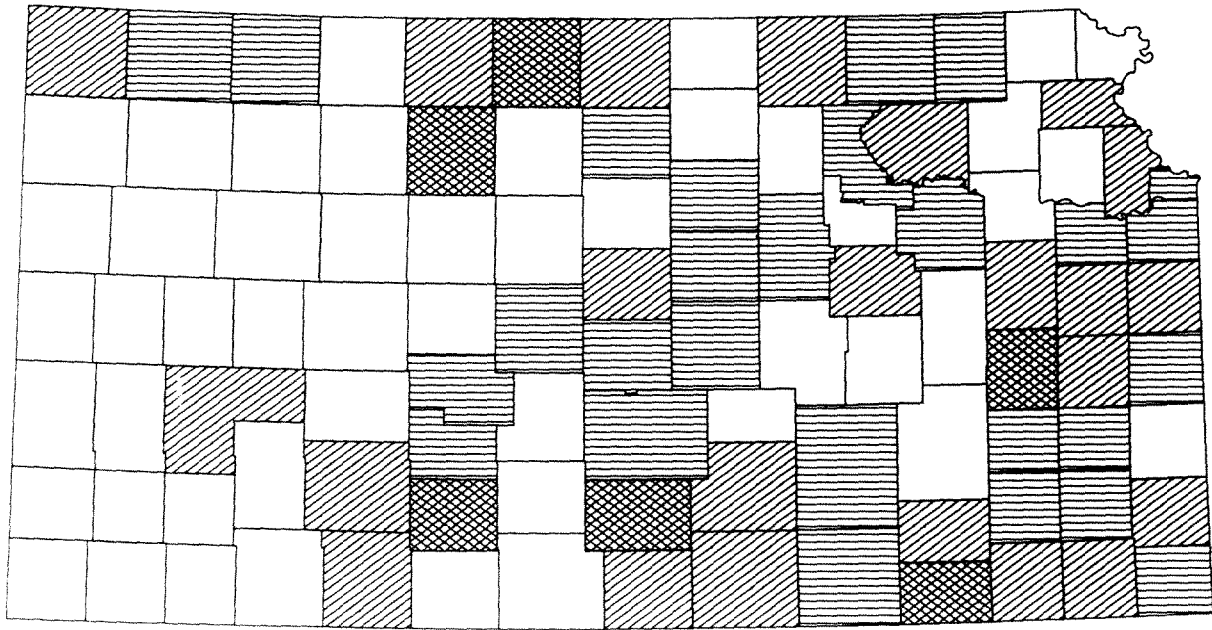
STFRAT ☐ 0   ☐ 0 to .15   ▨ .15 to .30   ▩ .30 to .50

Percentages

Figure 2 : Percent Change Land and Building Value, 1920—1925

LBVAL ☐ 0 to +.25   ☐ −.15 to 0   ▨ −.30 to −.15   ▩ −.50 to −.30

Figure 3 : Percent Change Farm Land, 1920-1925
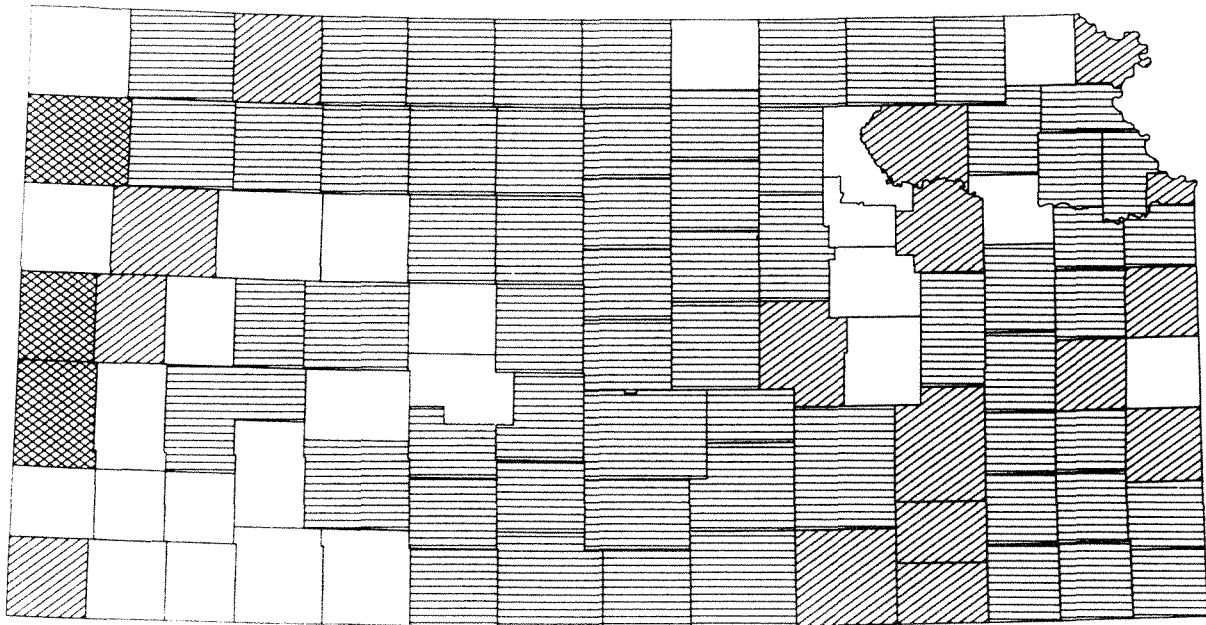
TOTAL ☐ 0 to +.65 ▤ -.10 to 0 ▨ -.20 to -.10 ▧ -.60 to -.20

Percentages

Figure 4 : Insured / Total Banks
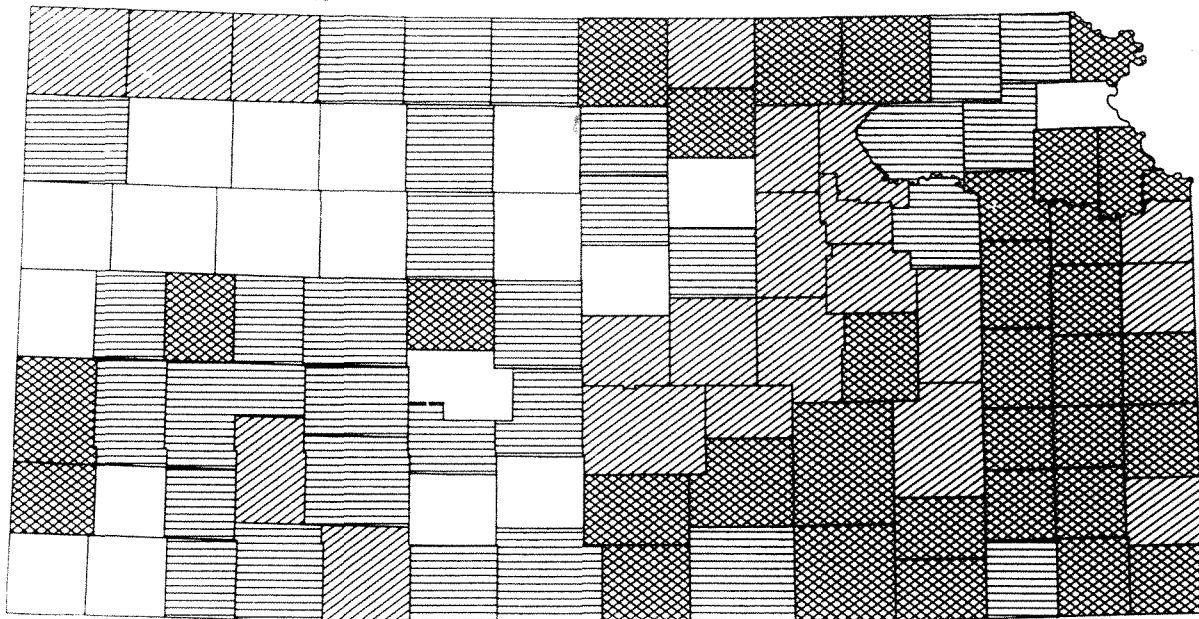
DIRATIO ☐ 0 to .25 ▤ .25 to .50 ▨ .50 to .75 ▧ .75 to 1.00

Percentages

TABLE 1

Failure Rate Model Estimates
Dependent Variable: STFRATE

Variable	1.1	1.2	1.3	1.4
Intercept	−0.15	−0.19	−0.19*	−0.32**
	(0.11)	(0.12)	(0.11)	(0.16)
ΔLBVAL	−0.35**	−0.59*	−0.15	−0.70*
	(0.18)	(0.39)	(0.17)	(0.46)
ΔLAND	−0.12	−0.13	−0.08	−0.01
	(0.29)	(0.63)	(0.35)	(1.03)
DIRATIO	0.13**	0.20*	0.19***	0.37**
	(0.07)	(0.13)	(0.07)	(0.18)
ΔLBVAL*DI		0.38		0.90
		(0.55)		(0.67)
ΔLAND*DI		−0.02		−0.16
		(0.97)		(1.52)
ΔPOP	−0.23**	−.23**	−.09	−.09
	(0.13)	(0.14)	(0.14)	(0.14)
BANKPOP	−0.22	−0.16	0.19	0.41
	(0.61)	(0.63)	(0.57)	(0.59)
NATRATIO	0.36**	0.34**	0.55***	0.56***
	(0.18)	(0.18)	(0.23)	(0.23)
log like.	−9.38	−9.12	5.03	6.11
LR test	29.04***	29.56***	16.74**	18.90**
obs.	105	105	82	82
non-zero obs.	56	56	53	53

Notes: standard errors in parentheses; ***, **, * indicate statistical significance at the .01, .05, and .10 levels (one-tail tests). log like. is the value of the log likelihood function. LR is the likelihood ratio test statistic.

TABLE 2

Failure Rate Model Estimates
Dependent Variable: SUSRATE

Variable	2.1	2.2	2.3	2.4
Intercept	-0.04	-0.04	-0.09	-0.25*
	(0.08)	(0.09)	(0.09)	(0.13)
ΔLBVAL	-0.41***	-0.29	-0.41***	-1.08***
	(0.15)	(0.27)	(0.15)	(0.37)
ΔLAND	-0.48***	-0.73***	0.15	-0.02
	(0.19)	(0.29)	(0.29)	(0.88)
DIRATIO	-0.01	0.00	0.11*	0.35**
	(0.06)	(0.09)	(0.06)	(0.15)
ΔLBVAL*DI		-0.18		1.12
		(0.40)		(0.55)
ΔLAND*DI		0.80		0.21
		(0.54)		(1.28)
ΔPOP	-0.01	-0.06	0.00	0.00
	(0.09)	(0.09)	(0.11)	(0.12)
BANKPOP	0.07	-0.02	0.22	0.45
	(0.51)	(0.50)	(0.47)	(0.49)
NATRATIO	0.46***	0.53**	0.40**	0.44**
	(0.14)	(0.15)	(0.19)	(0.19)
log like.	14.91	16.36	32.41	34.77
LR test	28.76***	31.66***	20.14***	24.86***
obs.	105	105	82	82
non-zero obs.	80	80	69	69

Notes: standard errors in parentheses; ***, **, * indicate statistical
significance at the .01, .05, and .10 levels (one-tail tests). log
like. is the value of the log likelihood function. LR is the likelihood
ratio test statistic.

TABLE A1

Descriptive Statistics

Panel A: 105 Counties

	μ	σ	min.	max.
STFRATE	0.093	0.117	0	0.500
SUSRATE	0.169	0.140	0	0.600
ΔLBVAL	−0.173	0.142	−0.466	0.236
ΔLAND	−0.036	0.109	−0.553	0.630
ΔLBVAL*DI	−0.108	0.105	−0.356	0.226
ΔLAND*DI	−0.019	0.061	−0.204	0.315
DIRATIO	0.551	0.296	0	1.000
ΔPOP	10.936	27.701	−20.200	184.500
BANKPOP(*100)	0.098	0.033	0.026	0.189
NATRATIO	0.197	0.118	0	0.600

Panel B: 82 Counties with Five or more State Banks

	μ	σ	min.	max.
STFRATE	0.108	0.113	0	0.500
SUSRATE	0.169	0.123	0	0.600
ΔLBVAL	−0.207	0.115	−0.419	0.192
ΔLAND	−0.043	0.051	−0.176	0.077
ΔLBVAL*DI	−0.133	0.096	−0.356	0.155
ΔLAND*DI	−0.026	0.036	−0.164	0.051
DIRATIO	0.594	0.264	0	1.000
ΔPOP	3.659	13.704	−20.200	48.400
BANKPOP(*100)	0.097	0.033	0.026	0.186
NATRATIO	0.188	0.083	0	0.417

TABLE A2

Variable Definitions and Data Sources

STFRAT: Ratio of failed state banks, September 1, 1920 to August 31,
1926, to total state banks on September 1, 1920, adjusted for new
entrants and voluntary liquidations between September 1, 1920 and
August 31, 1926. Source: Kansas, *Biennial Report of the
Commissioner of Banking*, 1922, 1924, 1926.

SUSRATE: Ratio of failed state banks and state banks that liquidated
voluntarily to total state banks adjusted for new entrants,
September 1, 1920 to August 31, 1926. Source: Kansas, *Biennial
Report of the Commissioner of Banking*, 1922, 1924, 1926.

ΔLAND: Percentage change in total farm land, 1920 to 1925. Source: U.S.
Bureau of the Census, Agriculture (Washington, DC, 1925), part 1
(county table 1).

ΔLBVAL: Percentage change in the per acre value of farm land and
buildings, 1920 to 1925. Source: U.S. Bureau of the Census,
Agriculture (Washington, DC, 1925), part 1 (county table II).

DIRATIO: Ratio of insured to total state banks as of August 31, 1920.
Source: Kansas, *Biennial Report of the Commissioner of Banking*,
1920.

ΔPOP: Percentage change in county population, 1920 to 1930 (divided by
100 in the regressions). Source: U.S. Bureau of the Census,
Fifteenth Census of the United States, Population (Washington, DC,
1930), vol. 1 (county table III).

BANKPOP: Total banks per person, 1920 (multiplied by 100). State bank
totals source: Kansas, *Biennial Report of the Commissioner of
Banking*, 1920. National bank totals source: Bankers Encyclopedia
Co., *The Bankers Encyclopedia* (March 1921). County population
source: Bureau of the Census, *Fifteenth Census of the United
States, Population* (Washington, DC, 1930), vol. 1 (county table
III).

NATRATIO: Ratio of national to total banks, 1920. National bank totals
source: Bankers Encyclopedia Co., *The Bankers Encyclopedia* (March
1921). State bank totals source: Kansas, *Biennial Report of the
Commissioner of Banking*, 1920.

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