

ECONOMIC PERSPECTIVES

MAY/JUNE 1989
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Federal Reserve Bank
of Chicago

**Capacity utilization
and inflation**

**Deposit insurance:
Lessons from the record**

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When factories are running flat out and full speed, price pressures build up, but the linkages between the two are neither simple, nor clear-cut

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Nothing new under the sun, said King Solomon, and the successes and failures of long-gone deposit insurance plans are instructive for those who must make Solomonic decisions about today's deposit insurance

ECONOMIC PERSPECTIVES

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Capacity utilization and inflation

Thomas A. Gittings



From the fourth quarter of 1987 to the fourth quarter of 1988, industrial production increased by more than 5 percent and the capacity utilization rate for manufacturing increased by more than two percentage points, from 82.1 to 84.2.

With the decline in the dollar over the past few years, many export industries are now producing at or near full capacity.

Historically, when manufacturing has been operating at the current levels of capacity utilization, inflation has tended to increase. For several years, the inflation rate has been remarkably stable in the range of 4 to 4 1/2 percent. This rate of inflation could increase in 1989 due to those factors that have pushed up the capacity utilization rates to levels that have not been reached since the late 1970s. While the linkage between capacity utilization rates and inflation is not very precise, capacity utilization does capture the general strength of the economy. Like the unemployment rate, the capacity utilization rate can be interpreted as a measure of excess demand pressures facing an economy. When demand is strong and capacity constraints become important, inflation is likely to increase.

This paper presents some empirical estimates of the macroeconomic linkage between capacity utilization and inflation and evaluates the usefulness of this approach. We begin by reviewing some theoretical explanations of how these variables might be related. Next we update earlier empirical estimates by McElhat-

The connection between capacity utilization and inflation varies in time and intensity from industry to industry; this makes the aggregate economy-wide capacity measure less useful as a predictor of inflation

tan (1978, 1985) using annual data from the 1970s and 1980s; we then use these estimates to forecast how much inflation might increase in 1989. These forecasts are very uncertain because there are large standard errors in the estimates and questions about the appropriate sample periods.

Further questions are raised by a sector-by-sector analysis. Cost and price changes are highly correlated with each other and capacity utilization rates are insignificant in explaining short-run price movements. Nevertheless, for a limited number of industries using annual data, capacity utilization rates can identify what sectors could have unusually large increases in prices. However, these sector linkages are often highly nonlinear and involve significant lags. Additionally the utilization rates that are associated with price increases vary significantly across industries. These difficulties raise questions about interpreting the implications of aggregate capacity numbers for inflation.

Theoretical considerations

The idea that there is a link between capacity utilization and inflation follows from some rather simple economic notions. When there is unused capacity, competition among producers holds prices down. As capacity constraints are reached, competitive pressures are increased and prices can be raised. Furthermore, an industry that is facing capacity

Thomas A. Gittings is a senior economist at the Federal Reserve Bank of Chicago.

constraints may be subjected to price increases from suppliers that face excess demand pressures. Therefore, both costs and prices might rise together in sectors that are operating at high capacity utilization rates.

The situation is analogous to the better known Phillip's curve, which postulates a relationship between expected real wages and unemployment. When many people are unemployed, wages and prices do not rise as fast as when firms must compete for scarce labor. At some "natural" rate of unemployment, the actual and expected rates of inflation are equal.

However, as simple as the theoretical justification is, it does not predict what the relationship between capacity utilization and inflation should be. Questions about timing and functional form¹ remain. In this regard, sector analysis complements the aggregate approach and can help to develop a detailed forecast of where inflationary pressures are likely to be concentrated.

The empirical examination

Using annual data, McElhattan (1978, 1985) presents evidence that capacity utilization provides better estimates of inflation than unemployment rates in some simple reduced-form models. In her studies the expected inflation rate is assumed to equal the actual rate of inflation in the previous year. Since the coefficient is not significantly different from unity, the model assumes that the change in the rate of inflation is a function of the capacity utilization rate. At some "natural" rate of capacity utilization, inflation remains constant. Whenever capacity is above this stable-inflation utilization rate, inflation will continue to increase. Conversely, inflation will decrease only when capacity is brought below this natural rate.

Aggregate data

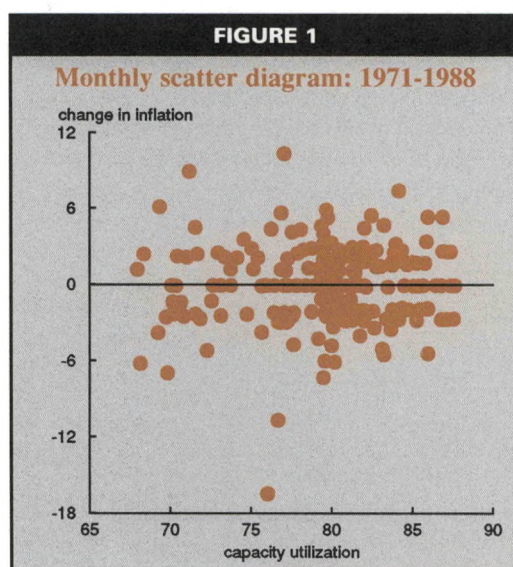
The first empirical results presented use the capacity utilization rate for manufacturing to estimate the change in four broad measures of inflation. These are the implicit GNP deflator, the fixed-weight GNP price index, the all-commodity producer price index, and the consumer price index less food and energy. The rate of change of the last index is some times referred to as the "underlying" rate of inflation.

By definition, capacity utilization is the ratio of a seasonally adjusted industrial production index to a related capacity index. These series are estimated by the Federal Reserve Board's Division of Research and Statistics and are released monthly. A description of how capacity is estimated can be found in Raddock (1985). Since the level of capacity tends to grow smoothly over time, short-run movements in the capacity utilization rate are almost entirely due to changes in industrial production. This series can fall sharply during recessions and grow strongly during recovery.

The change in inflation rates between successive months can be very "noisy" or erratic. On a month-to-month basis, there is no statistically significant relationship between the change in any of the rates of inflation and capacity utilization. Figure 1 is a scatter diagram of monthly data from 1971 to 1988.

Along the vertical axis is plotted the change in the underlying rates of inflation, and along the horizontal axis is plotted the capacity utilization rate. The correlation of these two series is essentially zero.

Because of the noisiness of these monthly data, economists estimate models after the data has been smoothed. In this case, the most common smoothing technique is to use annual data. The rate of inflation can then be calculated on a year-over-year or fourth-quarter-to-fourth-quarter basis. The change in the rate of inflation is simply the current year's rate of

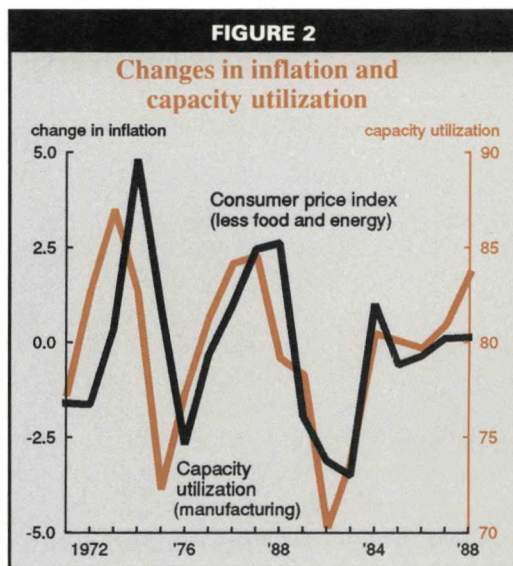


inflation minus the previous year's inflation rate.

Table 1 lists the four inflation equations we estimated, using annual data from 1971 to 1988. Each of these equations estimates the change in the inflation rate as a linear function of the current rate of capacity utilization in manufacturing. This is the basic equation that McElhattan estimated using earlier sample periods and excluding any dummy variables. There are several properties of these regressions that should be pointed out.

The estimated "natural" rate of capacity utilization in these regressions is around 80 to 81 percent, or approximately one or two percentage points less than that estimated by McElhattan. Probably the primary reason for this difference is the fact that our sample does not include data from the 1950s or 1960s. During these decades there were years when the annual capacity utilization rate were very high by more recent standards and the rate of inflation was not increasing very much. According to these more recent estimates, the inflation rate will remain constant when capacity utilization rates remain around 81 percent.

A second difference is that a one-year lag for capacity utilization is sometimes significant and helps to fit the different turning points in the price and capacity series. Figure 2 plots the change in the underlying inflation rates and the level of capacity utilization rate as two time series. A quick glance at these time series reveals that there is a fairly uniform one-year lag. Table 2 lists some regressions that include current and/or lagged capacity utilization rates. In these regressions, the estimated increase in inflation when capacity utilization rate is one percentage point above its natural rate is greater than previous estimates. McElhattan's models typically predict an increase in the rate of inflation of about 0.1



to 0.2 percentage points. Our equations predict increases about twice as large.

Using the models that have only lagged capacity utilization rates, we can predict the rate of inflation in 1989 by estimating the rate of inflation in 1988 and the capacity utilization rate for 1988. Figure 3 is a scatter diagram for the change in the underlying rate of inflation. The regression line has been drawn and the vertical line segment represents the 1989 point estimate, plus or minus one standard error. The length of this line reflects the large errors that are typical of economic forecasts.

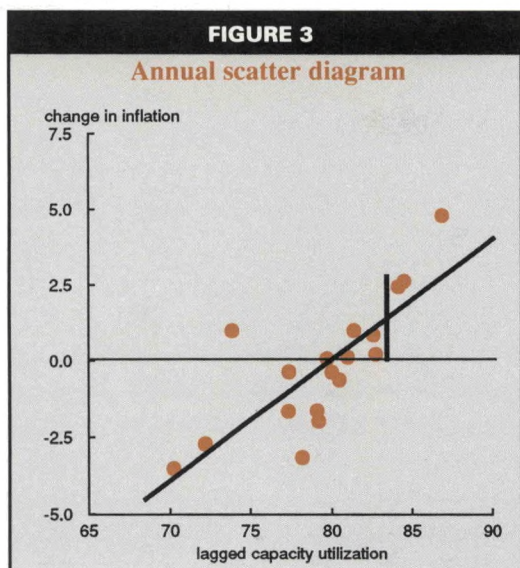
Policy implications

If this particular estimated relationship between inflation and capacity utilization holds over the next several years, the implications for monetary policy would be dramatic. We will suppose that the natural rate of capacity utilization is about 81 percent and a one-percentage-point increase in capacity utilization causes an approximate 0.4 percentage-

TABLE 1

Changes in inflation and current capacity utilization rates

Dependent variable	Intercept	(t-stat)	Capacity utilization	(t-stat)	Natural rate	R2
CPI (less food and energy)	-20.67	(-2.49)	0.2577	(2.48)	80.2	0.278
Implicit GNP deflator	-18.63	(-3.26)	0.2321	(3.24)	80.3	0.397
GNP fixed-weight index	-21.80	(-4.86)	0.2736	(4.87)	79.7	0.597
Wholesale price index	-70.85	(-5.89)	0.8880	(5.90)	79.8	0.685



point increase in the rate of inflation in the following year.

Capacity utilization for manufacturing in 1988 was about 83.5 percent and the underlying rate of inflation was about 4.4 percent. Using our rule of thumb, the expected increase in inflation in 1989 should be $0.4 * (83.4 - 81.0)$ or one percentage point. This increase is larger than the average forecast (0.6) increase in inflation, as measured by the overall consumer price index, reported in the March survey of 51 economic forecasters by Blue Chip Indicators.

If both capacity and manufacturing output grow at 3 percent in 1989, then the capacity utilization rate for manufacturing should remain constant, but at a level that has been associated historically with rising inflation. If capacity utilization averages 83.4 percent in 1989, the rate of inflation could increase by

another percentage point in 1990, that is, to 6.4 percent.

According to this particular model, in order to prevent an increase in inflation in 1990, capacity utilization would have to average the natural rate in 1989. For capacity utilization to fall this much, manufacturing output would have to grow approximately three percent less than the growth of manufacturing capacity.

Sources of uncertainty

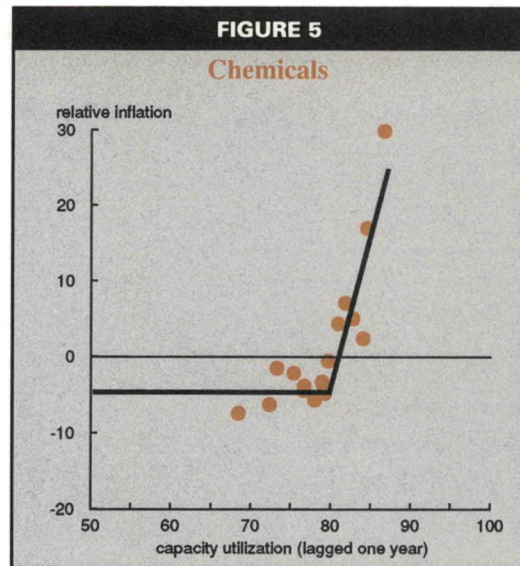
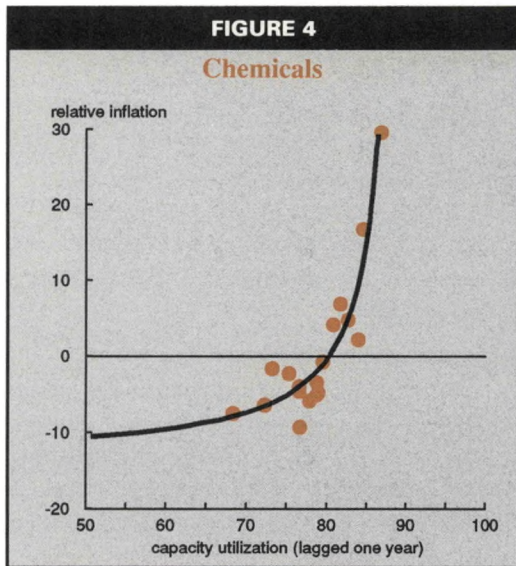
The empirical results presented are subject to the usual uncertainties associated with any estimates that use small samples of economic data. In addition there are several other factors that need to be raised. As already mentioned, our estimates of the natural capacity utilization rate are lower than McElhattan's earlier results and the inflationary impact is larger. These results seem to depend upon the sample period used. By omitting data from the 1950s and 1960s, when changes in inflation were often quite small even when the capacity utilization rate was relatively high, we have biased our estimates. The rationale is that the 1970s and 1980s might provide better estimates of what inflation is likely to do in the next few years. Only time will tell if this was a reasonable assumption.

Another source of uncertainty has to do with estimating the average inflationary response for a sample period that includes such varying circumstances. From a macroeconomic point of view, the past two decades have included some very different periods. In the mid 1970s, when capacity utilization rates were fairly high, inflation increased rapidly following the large and rapid increases in energy prices. In the late 1970s when the

TABLE 2

Lagged capacity utilization rates

Dependent variable	Intercept (t-stat)	Capacity Utilization	Capacity Utilization lagged 1 year	Natural rate	R2
CPI (less food and energy)	-31.24 (-5.04)	0.1261 (1.59)	0.3914 (5.03)	79.8	0.612
	-37.24 (-5.31)		0.3403 (4.20)	79.8	0.668
GNP Implicit deflator	-23.48 (-4.95)	0.1408 (2.60)	0.2930 (4.93)	80.1	0.603
	-30.12 (-6.27)		0.2360 (4.26)	79.9	0.727
GNP fixed-weight index	-22.02 (-4.73)	0.1974 (5.06)	0.2771 (4.74)	79.5	0.585
	-31.40 (-9.08)		0.1972 (4.94)	79.6	0.847



economy was very strong, double-digit inflation was pervasive and affected wages, costs of inputs, and prices of most goods and services. The early 1980s included sharp recessions as the rate of inflation was being brought down to below five percent. More recently, there has been a sustained economic recovery and remarkably stable inflation, especially when one factors out the volatile movements in energy and food prices. To use these different periods to estimate an average response may be as meaningful as estimating the average weather in Chicago. January's cold and August's heat might average to a nice temperature, but this average gives a very misleading impression of Chicago's weather.

Sector approach

Even more serious uncertainties are raised by a sector-by-sector analysis. At a theoretical level one can imagine a simple price-setting process whereby a sector or industry sets prices according to costs plus some factor that depends upon capacity or output conditions. Costs would be a function of wage rates and the prices of inputs used by the industry or sector. This could be a relatively simple markup process in which one of the relevant variables could be some measure of output, employment, or capacity utilization. A recent empirical study by Blanchard (1987) estimated industry prices as a function of wages and/or input costs. This study used input-output tables and producer prices series to construct

input-cost series for different industries. It found no significant output or employment effects using monthly data.

However, when one uses annual data, it is possible to identify some sectors and commodity groupings that are likely to have large price increases in 1989. Instead of using the change in inflation as the dependent variable, the sector models use the percent increase in a producer price index. These price increases are assumed to be a function of the capacity utilization rate in the corresponding industry and the underlying rate of inflation. The coefficient on the underlying inflation rate is constrained to equal unity. In order to predict price changes by sector, the capacity and underlying inflation rates are lagged one year.

There is the problem at the sector level of matching a price series with the corresponding capacity rate. The capacity utilization numbers are disaggregated according to the two-digit Standard Industrial Classification (SIC) codes. This corresponds to the breakdown of industrial production numbers. Until fairly recently, producer prices were only grouped according to commodity groupings and not by the net output of major industry groups at the two-digit SIC code level. Furthermore, the Board's staff does not estimate capacity utilization for every two-digit SIC industry. The result is that there is only a small number of industries with adequate price and capacity time series.

TABLE 3				
Nonlinear model for chemical industry 1971-1988				
C2 (t-stat)	C2 (t-stat)	C3 (t-stat)	Natural rate	R2
-13.28 (-3.87)	89.67 (89.27)	-123.5 (-2.60)	80.4	0.885

Before estimating a sector model, it is necessary to select an appropriate functional form. Scatter diagrams are helpful when selecting the equation to estimate. Along the vertical axis is the difference between the rate of change of a price index for a sector and underlying rate of inflation in the previous year. The horizontal axis is the lagged capacity utilization rate for the sector.

Figure 4 and 5 are two scatter diagrams of the chemical industry. When plotted this way, it appears that the relationship can be estimated as a simple nonlinear equation². In the first of these graphs a smooth and continuous curve has been estimated and plotted. The curve become steeper as the capacity utilization rate increases. The equation and coefficients for this regression³ are listed in Table 3 along with some of the relevant statistics. For this sector, the natural capacity utilization rate is estimated to be about 80.4 percent.

Figure 5 plots the same historical data for the 1970s and 1980s and estimates a different type of nonlinear model. Here we assume that the economy switches from one regime to another

whenever the capacity utilization rate crosses some threshold rate. When there is ample capacity, price changes in an industry tend to increase by less than the underlying rate of inflation. This constant difference corresponds to

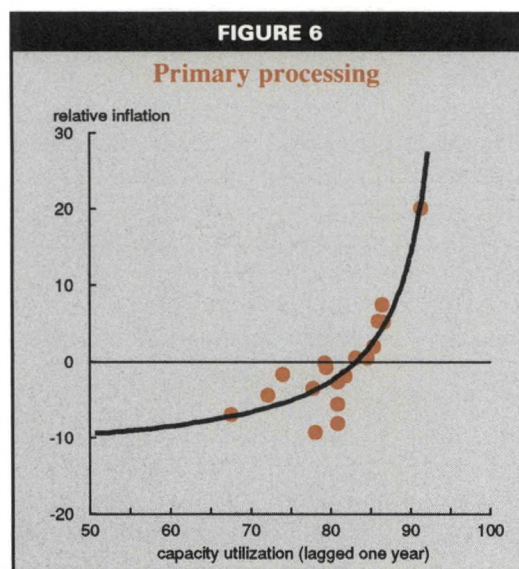
the horizontal line segment that has been plotted. Whenever demand is strong and capacity is pushed above the threshold rate, the change in sector prices becomes a linear function of the capacity utilization rate and the underlying inflation rate. This regime is represented by the positively sloped line segment.

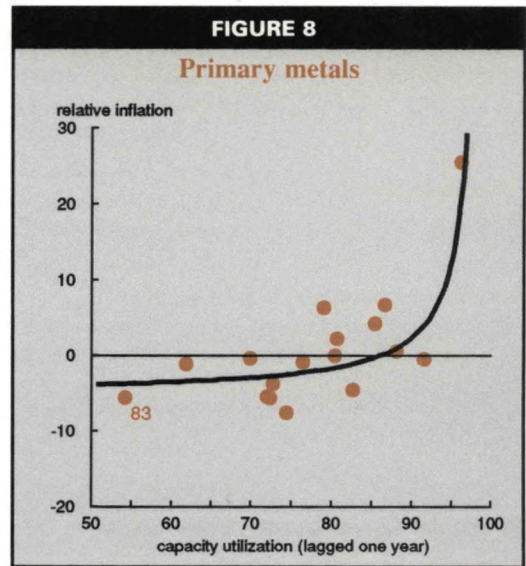
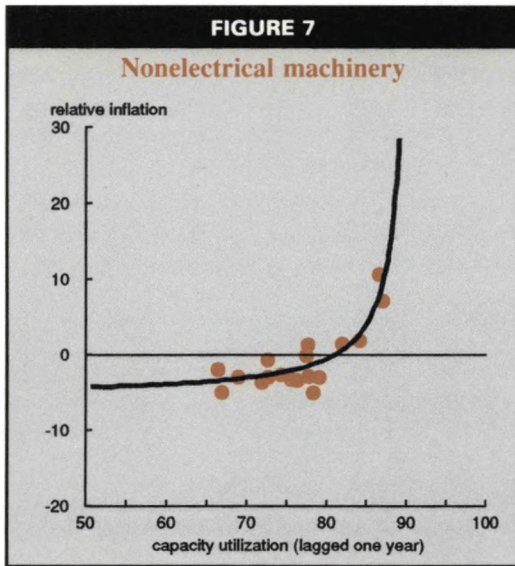
Figure 6-9 are scatter diagrams for some of the other sectors for which data is available. Each of these graphs are plotted using the same horizontal and vertical scales. The lagged capacity utilization rates are plotted along the horizontal axis, and the differences between inflation in the sector and the lagged underlying rate of inflation are plotted along the vertical scale.

Figure 6 displays the relation between capacity utilization in primary processing sectors for manufacturing and the relative inflation in the producer price index for intermediate materials and supplies. For this broad sector, the estimated natural rate is about 83 percent. The capacity utilization rate for primary processing was over 87 percent in 1988 or significantly above the estimated natural rate.

Figure 7 plots capacity utilization for nonelectrical machinery and the relative change in the producer price index for machinery and equipment. Although the fit is remarkably good, there is a considerable degree of mismatching between the particular industries that are grouped together in this two-digit SIC category and the types of machinery that are aggregated in this producer price index. For this reason the fit may be spurious.

Figure 8 plots the utilization rate for primary metals and the relative price changes for metals and metal products. This sector was chosen because it has a very large variance in the capacity utilization rate. The data point labeled 83 is the change in metal product prices in 1983 minus the underlying rate of inflation in 1982. It is plotted against the





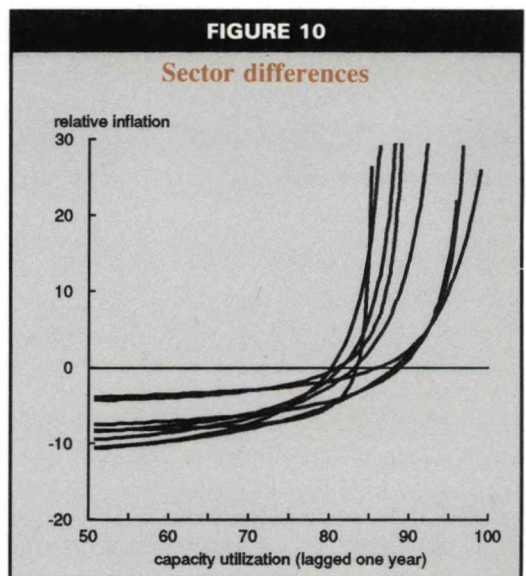
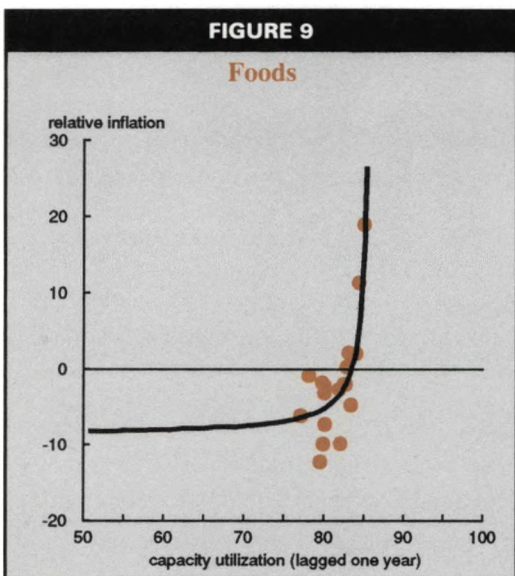
lagged capacity utilization rate. Capacity utilization fell below 55 percent in 1982 when the sector was especially hit by the recession.

Figure 9 displays capacity utilization for foods and the relative change in the price index for processed foods and feeds. This sector shows very little change in the utilization rates. The estimated curve is almost kinked and predicts extremely large price increases if capacity utilization were ever to approach 85 percent.

As one can readily see the degree of fit varies among the different sectors. Further-

more the natural capacity utilization rates and estimated curvatures are not the same among these sectors. This implies that aggregate capacity utilization rates can have different inflationary implications depending upon what sectors are experiencing capacity constraints.

These differences are illustrated in Figure 10 that plots a number of estimated curves in the same scatter diagram. These curves include those that have previously been presented and curves that were estimated for the paper and textile sectors. The points where these curves intersect the horizontal axis are



the different natural rates of capacity utilization for the various sectors. In this sample, the natural rates are between 79 and 89 percent, and the curvatures display a broad range of estimated values.

Conclusion

The linkage between capacity utilization and inflation is subject to a great deal of uncertainty. Even though the economic model estimated in this paper yields statistically significant coefficients, the standard errors are quite large. Using aggregate data, it appears that the economy is above its natural rate of capacity utilization and one could expect inflation to increase in 1989. If these results are accurate, in order to halt increases in the rate

of inflation, the economy would have to be slowed until the capacity utilization rate has been brought back to a rate that is consistent with stable inflation.

However, on a sector-by-sector basis, there appears to be significant differences in the linkage between capacity constraints and the increase in the price of the sector's output. These differences include the level of a sector's natural rate of capacity utilization, the importance of lags, the appropriate functional form for summarizing the linkage, and the degree of fit or range of confidence intervals for predictions. These differences indicate that policy makers should be wary of an over-reliance on capacity utilization rates as a measure of inflationary pressures.

FOOTNOTES

¹Functional form refers to the type of equation used to summarize the hypothesized linkage between capacity utilization and changes in inflation.

²The nonlinear equation estimated in this paper is a translated rectangular hyperbola. The function can be written as

$$y(t) = c1 + c3 / (x(t-1) - c2),$$

where c1 is the horizontal asymptote, c2 is the vertical asymptote, and c3 determines the degree of curvature. In this particular model, y(t) is the current rate of price change in the

chemical sector minus the lagged rate of underlying inflation, and x(t-1) is the lagged rate of capacity utilization in the chemical industry.

³In the regressions, a grid search technique was used for different values of the coefficient that determines the degree of curvature (c3). For any given value of this coefficient, the two asymptotes were estimated by ordinary least squares. The proportion of total variation that can be explained by the regression is measured by the coefficient of determination (R2).

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Deposit insurance: Lessons from the record

Charles W. Calomiris



The deterioration of the federal deposit insurance funds, particularly the Federal Savings and Loan Insurance Corporation (FSLIC), has become a common theme in the press and a major concern of financial regulators. Estimates of the amount necessary to reimburse depositors' losses in FSLIC member institutions range above \$100 billion. The Federal Deposit Insurance Corporation (FDIC) is in much better condition, but some fear that the structural flaws that led to the losses in FSLIC are present in FDIC insurance as well. At the state level, deposit insurance funds for thrifts have been collapsing at a rapid rate. The insolvencies of Mississippi's fund in 1976 and Nebraska's in 1983 have been followed by four others since 1984, and three other state systems are winding down. Only three state-level funds remain, and these have limited their scope.¹

Recent studies of deposit insurance funds have focused on banks' incentives to take on risky investments when deposit insurance is not fairly priced. It is argued that banks will choose to hold high risk-return portfolios because their losses are shared while their gains are private. Depositors, who would normally withdraw funds from high-risk banks and thus prevent such behavior, have little incentive to do so when their deposits are insured.

This article considers possibilities for deposit insurance reform in the light of historical successes and failures of bank liability

The successful state-run bank deposit insurance schemes were broad enough to give near-universal coverage, yet narrow enough to insure tight self-monitoring by banks—a neat trick, and one we may need to emulate

insurance in the United States. I address four central questions: What was the motivation for bank liability insurance historically? Is this concern justified by the historical record? Which “safety nets” for bank liability holders were most successful, and why? What are the lessons of the historical record for current reforms?

U.S. bank liability insurance before the FDIC

Prior to the creation of the FDIC, bank liability insurance was organized at the state level. These insurance schemes differed in important respects but they had the same essential motivation: to insulate the economy's payments system from the risk of bank failures.²

When bankers and depositors have different (asymmetric) information about the safety of banks, concerns about bank solvency can induce “unwarranted” withdrawals from banks and contraction of bank lending. In extreme cases, when banks respond to economy-wide runs by suspending convertibility of their liabilities on demand, asymmetric information can render bank claims useless as a medium of exchange, if uninformed traders become unwilling to accept them.³

Charles W. Calomiris is assistant professor of economics at Northwestern University and a consultant to the Federal Reserve Bank of Chicago. He is currently on leave to the Economics Department of Stanford University. He thanks Herbert S. Baer, Charles Kahn, and Edward Nash for helpful comments.

For example, during a recession, the solvency of banks may come to be questioned. Even when the initial disturbance to bank portfolios is small in the aggregate, if depositors are unable to determine precisely *which* banks have suffered from the shock, all banks may be perceived as riskier. Fears of bank insolvency can become self-fulfilling if withdrawal orders and forced asset sales (or the calling of loans) lead to the collapse of banks, and the contraction of credit and the medium of exchange. As a defensive action, banks would often suspend convertibility on demand during such economy-wide runs. Once banks have done this, the uninformed may be unwilling to accept bank claims, or accept them only at a large discount, in fear that the claims were “lemons” being unloaded by knowledgeable insiders.

Deposit insurance removes much of the incentive for economy-wide runs, and if suspension does occur, it eliminates the incentive for insiders to dump bad deposits on the unsuspecting. Thus, bank claims can continue to be a medium of exchange.⁴

What makes the payments system vulnerable to disturbances is that banks historically have performed two tasks simultaneously: They make “information-intensive” loans (loans that are not easily valued in centrally traded markets) and they issue checks and bank notes. If banks did not hold information-intensive loans, then their portfolios could be “marked to market,” and the liquidity of their claims would not be reduced during disturbances. Similarly, if banks issued long-term claims that were not used for transactions, shocks to their portfolios would not threaten the payments system. Recent research suggests that demandable debt banking was useful as a disciplinary device to limit the discretion of bankers; this, in turn, helped to make bank claims more liquid.⁵

Reasonable fears of insolvency of a subset of banks, and confusion as to which banks have suffered most from the shock, underlay most financial panics from the Roman bank run of 33 A.D. to those in the U.S. in the nineteenth and twentieth centuries.⁶ It is worth noting that a classic lender of last resort, who freely discounts acceptable assets at a market (or penalty) rate, would not provide the same protection to the payments system against

these disturbances as deposit insurance. A lender of last resort can offset shocks to the relative supply of money and marketable assets, but does not insure banks, or resolve the information problem of determining which banks’ information-intensive assets have fallen in value, and by how much.

Several recent studies see the development of nineteenth-century clearing houses (beginning in the 1850s) as one means to prevent financial collapse and ensure the continuing flow of transactions through the banking system during crises.⁷ Clearing houses performed many of the functions of state liability insurance funds, including the insulation of the payments system from individual or economy-wide bank runs. Clearing house banks banded together during crises to “make a market” in each others’ deposits and maintain the interbank check-clearing system, even when the withdrawal of deposits from the system was restricted. By developing self-imposed regulations, including reserve ratios and the restrictions on portfolio holdings, these associations ensured that banks would not take advantage of such co-insurance. Banks had strong incentives to monitor the actions of their partners in the clearing house, and to eject members who broke the rules.

The co-insurance of risk required ease of communication and monitoring among participants to ensure compliance with regulations. Unit banking laws in the North, which created a large number of banks scattered throughout the state, prevented the benefits of private coordination from spreading beyond the cities, and made regional or national clearing houses impracticable.⁸

In the South, the existence of large branching banks made such formal arrangements less necessary. Southern banks were able to maintain liquidity during crises as well as or better than their neighbors to the North. The South’s large branching banks used interbank loans and simultaneous region-wide bank suspension in much the same way as the clearing house system.

Self-regulation occurred in the South as in the North, though it could be more informal, due to the smaller number of parties involved. Coordination was facilitated by the clear leader-follower relationship between the large branching banks and the smaller banks.

Branching also reduced the fragility of the system by making it less vulnerable to confusion over the dispersion of solvency risk.

Historians have frequently pointed out that unit banking, which dominated the U.S. experience, made the system particularly vulnerable to crises and encouraged the development of deposit insurance.⁹ Both Carter Golembe and Eugene White argue that deposit insurance and unit banking reinforced each other: Without branch banking, an alternative to protect the payments system was necessary; once enacted, deposit insurance removed some of the pressure to allow branch banking.¹⁰

Patterns of success and failure

To compare performance it is necessary to settle on a measure of success. I define an ideally successful deposit insurance system as one that fully protects the payments system, without encouraging any excessive risk-taking. Systems that fail to protect the payments system, or those that collapse due to incentive incompatibility, therefore, are complete failures. The various insurance schemes I describe here can be adequately categorized either as complete failures, or as (qualified) successes.

Three Pre-Civil War failures

New York enacted the first government-sponsored insurance plan for bank liabilities in 1829. The Safety Fund Banking System required that all banks renewing charters in New York state join the system. Member banks were required to pay an annual assessment of 1/2 percent of capital until their total payments equaled 3 percent of capital. The accumulated funds would be used to redeem in full the notes and deposits of member banks that failed whenever the failed bank's assets were insufficient. Special assessments were authorized in the event of a shortfall but these were limited to 1/2 percent of capital per year. Note issues were restricted as a function of bank capital, and a board of commissioners was established to examine member banks. By the end of 1837 almost all of New York's banks were members.

New York's Safety Fund failed to provide lasting protection to the payments system. The Panic of 1837 and the subsequent panic and depression of 1839–41, both induced by constrictions of foreign credit by the Bank of

England, prompted asset and commodity price declines, immediate bank suspensions, merchant failures, and subsequent bank liquidations. The bank failures experienced by the Safety Fund during the Panic were primarily the result of economy-wide "debt-deflation" shocks, rather than the fault of the insurance system.¹¹

But the failure to protect the payments system from 1839 to 1841, and subsequently, was the fault of the Fund and not of the Panic. New York's system failed because it was neither credible nor broadly based, and did not create the proper incentives for prudent risk-taking. The failure is particularly disturbing because the losses of liquidated member banks, and of non-member free banks in New York from 1837 to 1860, were a small portion of aggregate bank capital.¹²

The system was undercut by a 1838 law which allowed entry into banking by uninsured "free banks," whose notes were backed by reserve holdings of bonds, but whose deposit issues were unregulated and uninsured. After the establishment of free banking, no new Safety Fund charters were granted, and upon expiration of charter, banks were invited to join the free banking system. In 1840 more than 90 percent of bank liabilities were covered by the Safety Fund; by 1860, only 2 percent were covered.¹³ The protection to the payments system was even less than these proportions indicate, because an attack on any unprotected part of the system sufficient to disrupt interbank check and note clearing threatened the whole.

Further, by limiting the fees paid by member banks to an annual assessment of 1/2 percent, the Safety Fund could not credibly guarantee the value of member banks' notes and deposits and, therefore, could not adequately ensure liquidity of member bank's obligations. In 1842, when the claims of noteholders and depositors on the Fund exceeded available resources, payment was delayed. Later failures by banks in the Fund led to large market discounts on failed banks' notes, indicating that noteholders perceived the insurance to be virtually worthless. Although the Fund was able to make good on all outstanding claims by 1866, this ex post success was not anticipated by the market (Safety-Fund banks' notes traded at high discount rates), and insurance

did not provide any protection to the payments system during crises.¹⁴

After the Fund became delinquent in 1842, the law was amended to protect only noteholders in subsequent bank failures. Thus, the growing deposit base of the insured banks, which financed some 30 percent of bank assets in Safety-Fund and free banks alike, was uninsured. Sudden depositor withdrawals proved particularly important in the onset of the Panic of 1857 and later panics. The exclusion of demandable deposits and the notes of free banks left the state's banks vulnerable to disintermediation, and eventually to depositor runs, when losses by bank borrowers dependent on the fortunes of the declining bond market of September and October 1857 caused mounting uncertainty about the solvency of New York City banks.¹⁵

The New York system was also plagued by fraud and excessive risk-taking, resulting in part from inadequate supervision. The Fund failed to levy risk-based premiums, and thus removed the incentives of depositors to avoid risky banks. The resulting additional risk-taking could only be offset by more efficient examination. While regular examinations were called for under the law, they do not seem to have offset the decrease in depositor monitoring. Prior to 1842, when the Safety Fund was perceived by depositors as providing insurance, bank fraud and "unsafe practices" were a far more important cause of failure than afterwards. Sixteen of the twenty-one failures of Safety-Fund banks occurred prior to the end of 1842, and ten of these were traced to fraud or unsafe practices. Of the five post-1842 failures, only two were so described.¹⁶

The failure of the Safety Fund cannot be blamed on the severity of the shocks that buffeted the banking system. If the Safety Fund had been broad-based in membership and liability coverage, if it had effectively guaranteed payment (say, through unlimited mutual liability of banks), and if it had provided for thorough bank supervision, it could have offered adequate protection to the payments system and prevented crises like the Panic of 1857.¹⁷

New York's bank liability insurance plan spread to other states in the North. Vermont enacted similar legislation in 1831, and Michigan adopted the New York plan in 1836.

Vermont's insurance fund suffered many of the weaknesses of New York's system. Like New York's, its coverage was only partial. While the Vermont system insured notes and deposits of member banks, it did not require bank membership in the system. In 1839, Vermont exempted several banks from joining the system, and in 1840 liability insurance became voluntary. Banks could withdraw from the system with the full value of their contributions to the fund.¹⁸ The establishment of a free banking statute in 1851 created a further alternative to insured banking in Vermont.

The insurance fund covered 56 percent of bank liabilities in 1840; this rose to 78 percent in 1845 and fell to 8 percent by 1858. In 1859, the last bank withdrew and the fund was closed. Outstanding obligations of \$17,000—some 28 percent of total claims on the fund—were never paid.

The Vermont fund was a failure, not only because it failed to insure creditors *ex post*, but because, like New York's system, it failed to provide credible backing for bank liabilities *ex ante*. As in New York, the upper bound placed on annual assessments implied that bank liabilities could exceed the ceiling on fund resources. This was compounded by provisions giving solvent banks the option to withdraw. Thus, depositors could not reasonably have expected that losses to a few banks would be covered by remaining banks. In fact, the Vermont system collapsed under the weight of only two bank failures in its 29-year history, one in 1839, the other in 1857. These failures were sufficient to force other banks out of the system.

By allowing banks to join and depart at will, the fund suffered, and was ultimately undone by, the problem of *adverse selection*. Adverse selection takes place when the insurance encourages only the worst risks to participate. When failures occur they force up premiums, raising the cost of remaining in the system. The best banks—which stand to gain the least—opt out and the average riskiness of insured banks rises. Subsequent failures lead to further selection against the best banks, until finally only the worst risks remain.

In Vermont, adverse selection also operated at the point of entry into the system. While the first failure resulted from fraud at a

TABLE 1

Pre-Civil War insurance systems

State and period	Supervisory agency	Enforcement powers	Funding method	Non-member banks
New York 1829–1866	1829–37 Three bank commissioners; one appointed by Governor, two by banks. 1837–43 Three bank commissioners; appointed by Governor. 1843–51 State comptroller. 1851–66 State Banking Dept.	Could apply to court for injunction to stop operation of insolvent banks or banks in violation of law.	Safety fund, with upper bound on annual assessments.	Free banks, after 1838.
Vermont 1831–1858	1831–37 Three banks commissioners; one appointed by Governor, two by banks. 1837–58 One bank commissioner appointed by legislature.	Could close insolvent banks or banks in violation of law.	Safety fund with upper bound on annual assessments.	Member banks could join and leave at will. Free banks, after 1851.
Michigan 1836–1842	1836–40 Bank commissioners appointed by Governor. 1840–42 State's Attorney General.	Could close insolvent banks or banks in violation of law.	Safety fund with upper bound on annual assessments.	All state banks (including free banks) participated in system.
Indiana 1834–1865	Board of Directors; four appointed by legislature and one by each insured bank.	Could close banks in violations of law or regulations. Could regulate ratio of assets to capital. Could regulate dividend payments.	Mutual guarantee without limit.	Free banks, after 1851.
Ohio 1845–1866	Board of Control; one member appointed by each insured bank	Could close banks at will for violations of regulations. Could regulate total notes outstanding, or total liabilities. Could regulate dividend payments. Could regulate notes of vault cash to total reserves. Could require banks to make interbank loans.	Mutual guarantee without limit and safety fund.	"Independent" banks after 1845, and free banks, after 1851.
Iowa 1858–1866	Board of Control; three appointed by legislature, one by each insured bank.	Could close banks at will for violations of regulations. Could regulate total notes or liabilities. Could regulate dividend payments.	Mutual guarantee without limit and safety fund.	No free banks chartered under free banking statute.

SOURCE: Golembe and Warburton, *Insurance of Bank Obligations in Six States, passim*.

long-time member, the second failure was that of a new entrant that joined the fund only after its prospects worsened.¹⁹

A successful, broadly based insurance program in Vermont was feasible. The actual obligations incurred by the fund could have been paid if withdrawal had not been allowed. Golembe and Warburton estimate that, had the fund been expanded to cover all banks, its insurance liability would have been increased by roughly \$100,000, and that this could easily have been covered by surviving banks.²⁰

Michigan's program extended coverage to all liabilities and all banks (including free banks). Unlike the Vermont system, however, Michigan's was established on the eve of a financial crisis, and there was no time to accumulate funds with which to meet its first obligations. In the absence of a mutual-guarantee commitment or state lending to reimburse borrowers, the fund could not maintain its commitments or keep the payments system afloat. Under pressure by healthy banks, mandatory membership was dropped, and uninsured free banking became the alternative system of choice. There were no banks left in the fund by 1841, and it was closed in 1842.

The failures of these three pre-Civil War insurance systems reflected basic flaws in their design. Protection of the payments system requires an insurance fund that is broad in its coverage of demandable claims. Alternative free-bank chartering or voluntary insurance precludes protection of the payments system and weakens deposit insurance through adverse selection. Furthermore, fixed premiums, with upper bounds for special assessments and no state guarantees, cannot provide a credible guarantee to depositors. Finally, in the absence of effective regulation and supervision, fixed-fee deposit insurance involves *moral hazard* — that is, the potential for fraud or excessive risk-taking — because it subsidizes risk-taking by individual banks. While all three insurance systems limited bank assets as a proportion of capital and loans to insiders and provided for examinations of bank records by government officials, supervision was ineffectual; unsound banking practices were not detected until after banks had failed.

Pre-Civil War success stories

Indiana enacted a different kind of liability insurance plan in 1834. Unlike the systems

of New York, Vermont, and Michigan, the Indiana system charged no advance fees, and special assessments were made as needed without limit. Liabilities of failed banks not covered by liquidated assets were redeemable by surviving banks without limit. Both notes and deposits were insured. This “mutual guarantee” system became the basis for similar legislation in Ohio in 1845 and Iowa in 1858.

The banks in the Indiana system, though separately owned and operated, were called “branches” of the State Bank of Indiana.²¹ From its inception in 1834 until the chartering of free banks began in 1851, the system covered virtually all the liabilities of banks in Indiana. After that date, the two systems existed side by side.

Rapid growth by free banks meant that by the beginning of January 1854, 25.7 percent of the obligations and only 12.6 percent of the banks in the state were insured. But the financial crises of 1854–1855 and 1857 wrought havoc on the state's free banks, and the proportion of insured banks rose and remained high until the enactment of the national banking system. Between 1858 and 1864 over half the state's banks, and an average of three-fourths of the liabilities, were in the insured system.²²

The system's president and board of directors had broad powers to investigate bank operations and to close banks if necessary. Examinations were required at least every six months. Upon a two-thirds majority vote of the board, any bank could be closed, without recourse to the courts. The board also had power to set limits on the volume of member bank assets relative to capital.²³

Most board members were appointed by the individual banks; the president initially was appointed by the legislature, but later was appointed by the board. Thus, control of the supervisory authority was in the hands of the member banks. This was an important feature, because it gave regulatory authority to those with a strong interest in monitoring the behavior of member banks. Member banks had access to a particular bank's records at any time and could limit risk-taking by restricting a bank's loans relative to capital or, in extreme cases, by closing the bank.

Regulation served to limit the potential for excessive risk-taking by members. Dividend

payment policy, loans to officers and directors, loan interest rates, and loans in excess of \$500 were all regulated in ways that served to protect the system. Stockholders were liable for bank losses up to twice their capital contribution and officers and directors of failed banks were presumed guilty of fraud until they proved otherwise. If they failed to prove their innocence, their liability was unlimited.²⁴

The Indiana system was well conceived. Its coverage was thorough (until 1851) and credible. It established strong supervisory authority to eliminate the problem of moral hazard, and gave that authority to the banks themselves, which (because of mutual liability) had an incentive to implement it properly. The board was quick to take disciplinary action to enforce compliance and corrected problems before they threatened bank solvency.²⁵

Indiana's system was extraordinarily successful. During its thirty years of operation no insured bank failed, and only one was briefly suspended at the behest of the board, in response to perceived irregularities in its loan portfolio.

The Indiana system weathered the Panic of 1837 admirably, even though the Panic came only three years after the system was enacted. The mutual-guarantee provision removed the dependence on pre-existing funds that proved fatal to Michigan's system. Indiana's insured banks were not able to avoid nationwide suspensions of convertibility that occurred from May 1837 to August 1838 and November 1839 to June 1842. But this was the last suspension for insured banks. When the regional panic of 1854–1855 hit, the insured banks all survived without suspending convertibility, while 55 of Indiana's 94 newly created free banks failed. When the Panic of 1857 came, the insured banks again avoided failure and suspension of convertibility, while 14 of the 32 free banks in Indiana failed.²⁶

Ohio's insured banking system was organized later, in 1845. Ohio was already a mature state with a long history of banking under special chartering. The weakening of the system after the Panic of 1837 and the lapsing of several charters in 1843 and 1844 provided an opportunity for restructuring.

Like Indiana, Ohio adopted limitations on loans to insiders and restrictions on loan interest rates. Banks were required to maintain

reserves equal to 30 percent of their outstanding notes. In addition to unlimited mutual guarantee, Ohio banks were required to deposit with the Board of Control assets equal to ten percent of their outstanding notes. This "safety fund" ensured rapid redemption of any liabilities incurred by the system. Bank circulation was also bounded as a proportion of capital. Thus, for example, a bank issuing \$700,000 in notes was required to maintain a level of capital in excess of \$500,000 and a liquid reserve in excess of \$215,000.

The Board of Control had virtually unlimited authority over individual banks, with voting power by board members commensurate with bank size (a proxy for the degree of insurance provided by a bank under mutual liability). The board could compel banks to reduce their notes or deposits. The board could close banks on its own authority, or alternatively, it could recapitalize the banks, using the resources of the fund. In six of ten cases of bank difficulty the board chose aid or a combination of aid and reorganization instead of liquidation. More than half of the amount actually expended by the board was for aid rather than payments to noteholders.

The Ohio system was established alongside eight pre-existing banks and a new alternative system of "independent" banks was chartered in 1845 as well. A free banking statute was passed in 1851, providing an additional alternative to insured banking. Furthermore, insurance did not guarantee all liabilities, but was limited to the notes of member banks. From 1850 to 1864 insured banks accounted for between 60 and 70 percent of bank liabilities in Ohio. Roughly two-thirds of insured banks' liabilities took the form of bank notes. Thus, the system guaranteed about half the Ohio payments system.

While insurance was limited to the bank notes of member banks *de jure*, it acted *de facto* to insure deposits of member banks as well through the discretionary actions of the Board of Control. The board had authority to call on member banks to loan money to each other during times of crisis. During the Panic of 1857 the board used this authority to coordinate the banking system's response through interbank transfers, thereby preventing the national financial crisis from crippling Ohio's banking sector. In fact, by keeping the insured

banks from suspending, the board avoided failures throughout the system, as insured banks seem to have provided liquidity to uninsured independent and free banks. Thus, the board acted to protect the entire payments system from precisely the kind of economy-wide disturbances that prompted the establishment of deposit insurance.

Ohio was one of the very few states to avoid general suspension of specie convertibility during the Panic of 1857, and only one Ohio bank failed.²⁷ Ohio's success is remarkable, because many Ohio banks had substantial deposits on account with the Ohio Life Insurance and Trust Company, whose failure in August of 1857 marked the beginning of the financial crisis. Moreover, each member of the insured system was obligated to redeem all other member banks' notes on demand, a move which could have accelerated the rate of disintermediation.

This exceptional performance can be traced to the wise and timely policies of the Board of Control. First, the board acted quickly to insulate the banks from the Ohio Life and Trust's failure. Assets of the failed bank were transferred directly to its depositor banks to secure their deposits. This effectively subordinated the debts of individual depositors and other creditors of the Ohio Life and Trust to those of the Ohio banks. Some of these assets were liquidated to help keep the banks afloat during the crisis.

Next, the board established a program of mutual assistance among the banks. Within a few days after the failure of the Ohio Life and Trust, the first letter from the secretary of the board was dispatched instructing the Commercial Branch in Cleveland to render aid to the Merchants Branch of Cleveland. Over the next two months four insured banks received \$56,000 in assistance. All of these transactions were treated explicitly as interest-bearing loans, backed by collateral in the form of time notes or paper currency, and guaranteed by the insurance system as a whole.²⁸ More important than the amount transferred, however, was the clear signal the board's policy sent. The risk of runs on banks would be borne collectively.

The stability of the insured banks proved "contagious;" the collective action of the large insured banks reduced the threat to the pay-

ments system. In addition, evidence suggests that the insured banks came to the aid of uninsured banks. As a result, Ohio had the lowest bank-failure rate in the North.

Iowa's bank insurance legislation, enacted in 1858, was the last of the pre-Civil War period. The success of Ohio's system led to imitation in Iowa, and many of the key political figures backing the plan had been residents in Ohio with experience in its insured system. Features of the Iowa plan included: mutual guarantee protection, a "safety fund," limitation of insurance to bank notes, self-regulation by the Board of Directors of the State Bank, co-insurance, and par convertibility of members' notes.

In addition to a 25 percent specie reserve against notes outstanding, banks had to maintain a 25 percent reserve on their deposits. Note issues were limited as a decreasing proportion of capital. Loans to stockholders and directors were limited. Stockholders were made to assume double liability in the event of bank failure. Interest charged on loans was limited, and violation of the law was penalized by cancellation of the debt. The supervisory board has broad powers of enforcement, including closure and limitations of dividend payments. Board records indicate thorough regular examination of banks, and willingness to force compliance by restricting dividends.

The state-insured system comprised the entire chartered banking system of Iowa. Its coverage of the banking system was virtually complete.²⁹ During its seven years of operation no insured bank failed in Iowa. Two banks experienced difficulties during this period, one due to fraudulent activities by a cashier, the other due to portfolio deterioration. The case of fraud was solved quickly with a change in management, and the other case was solved with a collateralized loan. Neither resulted in losses to the system.

Iowa's system was unique among pre-Civil War insurance plans in that it was never tested by an economy-wide financial crisis. However, its close resemblance to Ohio's plan makes it likely that it would have done as well as Ohio.

The lessons of success

The successful liability insurance schemes of Indiana, Ohio, and Iowa shared common features with each other and with private clear-

TABLE 2

Insurance systems after 1907

State and period	Supervisory agency	Enforcement powers	Funding method	Non-member banks
Oklahoma 1907–1923	1907–1913 State banking board consisted of Governor, Lt. Governor, Auditor, Treasurer, and President of Agriculture Board.	Bank commissioner could take possession of and liquidate banks, or revoke bank charter for cause.	1907–1909 Safety fund with unlimited special assessments.	National banks.
	1913–1923 State banking board consisted of three members chosen by Governor from a list of banks' nominees, and the banking commissioner and assistant commissioner.		1909–1923 Safety fund with upper bound on annual assessments.	
Texas 1909–1925	State banking board consisted of Attorney General, Commissioner of Insurance and Banking, and Treasurer of State.	Bank commissioner could take possession of and liquidate banks, remove officials from member banks, and adopt rules and regulations as needed	Safety fund with upper bound on annual assessments.	National banks and state banks that chose private insurance.
Kansas 1909–1929	Governor appointed Commissioner of Banking and Insurance and his deputies.	Commissioner of banking and insurance could close and take possession of banks and appoint receiver.	Safety fund with upper bound on annual assessments.	National banks or state banks that chose not to participate.
Nebraska 1909–1930	State banking board consisted of Governor, Attorney General, and auditor of public accounts.	Board could take possession of bank and apply for receiver.	Safety fund with upper bound on annual assessments.	National banks.
South Dakota 1909–1931	Depositors Guaranty Fund Commission composed of public examiner and three members appointed by Governor from a list of twelve bank nominees.	Commission could take possession and liquidate.	Safety fund with upper bound on annual assessments.	National banks, or state banks that chose not to participate. After 1916, compulsory for state banks.
North Dakota 1917–1929	Depository Guaranty Fund Commission composed of Governor, State Examiner, and three appointees of Governor.	Commission could take possession and apply for receiver.	Safety fund with upper bound on annual assessments.	National banks.
Washington 1917–1929	Guaranty Fund Board consisted of Governor, State Examiner, three appointees of Governor, two of which were officers of director of member banks.	State examiner could take possession and apply for receiver, or cancel insurance for violation of law.	Safety fund with upper bound on annual assessments.	State banks choosing not to join. National banks.
Mississippi 1914–1930	Three independent district examiners elected by popular vote.	Examiners could take possession and liquidate banks.	Safety fund with upper bound on annual assessments.	National banks.

SOURCES: Robb, *The Guaranty of Bank Deposits*; Barnett, *State Bank and Trust Companies*; Cooke, "The Insurance of Bank Deposits;" *Laws of Kansas, 1909*; *Laws of Nebraska, 1909*; *Laws of Oklahoma, 1907-1908*; *Laws of Mississippi, 1914*; *Session Laws of South Dakota, 1909*; *Supplement to the 1913 laws of North Dakota*; *General Laws of the State of Texas, 1909*; *Pierce's Washington Code, 1919: Annotated Cyclopedia*.

ing house arrangements. These included thorough coverage of the payments system (whether *de jure* or *de facto*) made credible by the mutual guarantee commitment of member banks, provisions for sufficient reserves to ensure liquidity during crises, and the effective co-insurance of liquidity risk. Thoroughness of coverage due to limited competition by other forms of banking and compulsory membership without the opportunity for contingent entry and exit also limited the potential for adverse selection. Moral hazard was avoided by effective supervision of individual banks.

An especially important feature of the three successful insurance schemes and clearing houses was the alignment of the incentive to regulate and the authority to regulate. The mutual guarantee feature made it in the interest of members to establish effective means to discipline each other. By giving members control over the supervisory authorities, the legislators provided them with the means to act in their own interest and in the collective interest, by restricting excessive risk-taking and free riding. The vigilance of the three bank-operated supervisory bodies, as compared with those in the unsuccessful systems, is attested to by the number of fraudulent or risky practices that were detected and corrected early. Furthermore, by granting the supervisory authority to banks (which presumably had a comparative advantage in monitoring each other) the government could benefit from bankers' expertise in identifying unsafe or dishonest practices. Finally, by giving bankers the choice whether to liquidate or reorganize troubled banks, legislators ensured that this decision would be made by the best informed parties, who also had an interest in minimizing the cost.

While these systems were successful in providing protection to the payments system, they did so at some cost. Reserve requirements entail foregone earnings, and restrictions on portfolio investments reduce the asset opportunities of banks, and may cause scarcity of credit for some worthy enterprises. Supervision entails costs as well. The similarities, however, with privately developed schemes of regulation through clearing houses suggest that the state systems were not far in cost from privately determined (and presumably cost-minimizing) alternatives.

Bank note insurance under the National Banking System

The National Banking System was enacted in 1863 primarily as a war-financing measure to increase the demand for government bonds. Its 10 percent federal tax on state-chartered bank notes effectively put an end to the antebellum liability insurance systems, all of which had ceased operations by 1866. The advantage of joining the state-insured systems, rather than the free-banking system, had been the low cost of note issues, given the high reserve requirements of the other state-chartered (free) banks.³⁰ When this advantage was removed, banks opted either for uninsured state charters or national charters, and most of the previously insured banks chose national charters.

The National Banking System probably reduced the safety of the payments system. It drove out the successful state insurance programs and precluded further imitation of their success by other states. It substituted the narrower insurance of national bank notes, backed by government bonds and guaranteed by the Treasury, for the broader coverage of notes and deposits found in the successful state systems. Furthermore, bank runs by noteholders were not the primary threat to banks by the 1850s. Bond and specie reserve requirements against note issues and subordination of deposits to notes made noteholders' risks minimal. Even during suspensions of convertibility, discounts on notes were small, and bank failures often resulted in little or no loss for noteholders.³¹ These considerations explain why conversion to the national system was slow initially, and had to be induced by the 10 percent tax on state bank note issues.

Later deposit insurance systems

Deposits were not insured under the National Banking System. But, partly in response to the increased (regulatory) cost of note finance, and partly because of developments in the technology of processing checks, banks turned more and more to deposits as the principal means of financing bank activities.³² The ratio of deposits to currency rose from 1.0 in 1860 to 1.5 in 1870. By 1900, deposits were five times currency in circulation.³³

As uninsured deposits became a larger part of the banking system's balance sheet,

financial crises and the risks to the payments system came to be identified with runs by depositors and difficulties in the transactability of deposits. As early as 1857, runs by depositors had become the primary threat to the liquidity of banks.³⁴ Under the National Banking System and its federally insured currency, crises were exclusively deposit-related.

One option to insulate banks from such disturbances was branch banking, and a movement arose to eliminate restrictions on branching. The political forces of unit banking, however, proved too powerful. When, in the aftermath of the Panic of 1907, branching was increasingly advocated, eight states established insurance funds instead.

I evaluate the performance of four of these systems below. Because the other states' systems were organized just before, or in the midst of, adverse economic shocks, their failures are less instructive about the relative advantages of different plans and the potential for excessive risk-taking.

Oklahoma was the first state to initiate deposit insurance following the Panic of 1907. It established a fixed-premium system with a provision for emergency assessments. The fund promised full immediate payment to bank depositors upon bank failure. Deposit insurance was compulsory for state-chartered banks and voluntary for national banks. National bank participation was precluded, however, by a Comptroller of the Currency ruling in 1908 that prohibited membership in state insurance schemes. Entry and exit from the system, therefore, accompanied change of charter.

The Oklahoma system provides nearly perfect conditions to examine the potential for moral hazard and adverse selection. Entry and exit into the system were essentially voluntary, and the actions of member banks were virtually unfettered.

When Oklahoma enacted its deposit insurance scheme, there were many private banks that had never been subject to any regulation. Deposit insurance was one of the first pieces of legislation passed in the state, which had achieved statehood only in 1907. The existence of the private banks meant that potential members of the insurance system included banks with which regulators had virtually no experience, in addition to existing banks chartered by the territory and national banks that

wished to convert to state charters in order to join the system.

The authority to examine banks was vested in the Bank Commissioner. All banks were examined before being admitted to the system. The entry examinations were superficial. Within sixty days thirty-one bank examiners evaluated the solvency of 468 banks. Because there were no limits on leverage or clear standards of banking practice, virtually all banks passed their examinations.³⁵

Although the Bank Commissioner also had authority to limit the rate of interest paid on deposits (thereby limiting a bank's ability to attract funds for high-risk investments), these ceilings were not effective. Bankers found it easy to disguise larger-than-legal payments to depositors.³⁶ Binding regulations on banks in the system were virtually non-existent.

Banks hurried to take advantage of the plan. From June 1907³⁷ to June 1909, deposits in state-chartered banks rose from \$17.3 million to \$45 million. The number of banks in the state system rose from 470 to 662, while the number of national banks fell from 294 to 242.

The first failure of an insured bank occurred in September of 1909. The Columbia Bank and Trust Company, the largest bank in the state, failed with nearly \$3 million dollars in liabilities, some 6 percent of all bank deposits covered by the fund. The existing balance of the fund was insufficient to pay depositors, whose losses were met by a special assessment on member banks.

The experience of the Columbia Bank and Trust is instructive. Prior to passage of the insurance law, the bank had operated an unexceptional banking business. In October 1908, the bank was taken over by an oil speculator, W. L. Norton, who used the bank to finance his speculative oil enterprises. A decline in the oil market brought down his thinly leveraged enterprises, and with them, the bank.

In one year, Norton had increased bank liabilities from \$365,000 to \$2.8 million. He attracted depositors by offering insured deposits and paid more than the legally allowed rate of interest. Some of the largest depositors in the bank were smaller banks, which failed along with Columbia when regulators decided to pay individual depositors before paying other banks.³⁸

Almost immediately, under pressure from surviving banks, new legislation, which took effect in June 1909, sought to deal with the problems of the fund. In part, the changes served to protect low-risk banks at the expense of reducing coverage of the payments system. Deposits were limited to ten times capital. The liability of members for assessments was limited to 2 percent per year of deposits. After 1916, this upper bound was further reduced to 0.25 percent of deposits.

Table 3 shows that the 1909 law did not eliminate the risk differential between the state and national systems, as indicated by the differing failure rates of state and national banks. During the period the insurance plan was in operation, 180 state banks, or some 35.6 percent of the average number of insured banks, failed, compared with 27 national bank failures, representing 7.6 percent of national banks. The higher risk-taking of state banks is also visible in the extraordinarily high average dividend payments that stockholders of state banks were receiving (which presumably reflected the funding of high-risk projects). In 1914, Oklahoma's insured banks paid a 17.9 percent dividend, compared with a 12.6 percent dividend by national banks in the state. The national average dividend rates of state and national banks were 10 and 11.4 percent, respectively, and the average for state banks in Western states was 12.5 percent.³⁹

The 1909 limitation on special assessments meant that the fund no longer guaranteed the liquidity of the payments system. After 1914, depositors of failed banks did not receive immediate reimbursement; only in 1920 did the fund's resources catch up to its liabilities. In the interim, the probability of repayment was far from certain, and the fund did not provide effective insurance to the payments system. The fund's positive net balance was short-lived. After 1920 the fund remained illiquid, with increasing failures caused by the agricultural depression in the Southwest. In 1923, the insurance legislation was repealed with outstanding obligations to depositors of \$7.5 million.⁴⁰

Without being able to force banks to remain in the system, the state had little chance of stabilizing the banking system by increasing the payments of members. Increasing the costs of membership simply encouraged more

low-risk banks to join the national system. Indeed, adverse selection caused a decline in membership, even under the limited assessments of the law as amended in 1909 and 1916. From 1910 to 1914, the number of national banks in Oklahoma rose from 225 to 343, while the number of state banks fell from 692 to 574.

There is little doubt that drastic price declines in oil in 1909 and wheat in 1920 precipitated the bank failures that brought an end to the system. Furthermore, it is in the nature of a state-level insurance system that such region-specific shocks may be practically uninsurable. The resources of a state deposit fund, or even a state government, are, after all, ultimately limited by the resources of the state itself. In contrast, a federal insurance system can pool risks of specific regions, and can rely on the ability of the federal government to create money during liquidity, or even solvency, crises.⁴²

Still, it would be wrong to view the failure of Oklahoma's system as inevitable. Moral hazard and adverse selection were clearly important. The differential failure rates of insured and national banks, which became most pronounced during the agricultural crisis, indicate that excessive risk-taking during the price booms played an important role in the Oklahoma system's collapse. From 1909 to 1921, 4.8 percent of the average number of insured banks failed, compared with 0.9 percent of national banks. During the agricultural decline, from 1922 to 1924, 24.1 percent of state banks failed, while only 6.1 percent of national banks failed. The liberal lending policies of the insured banks promoted excessive leveraging of farmers and banks and made the system susceptible to price shocks.

Kansas' system took effect on July 1, 1909. Like the amended Oklahoma plan, the Kansas fund was financed by annual assessments with an upper bound. The Kansas plan contained three important features, however, that made it different: the degree of regulation and enforcement was higher; reimbursement of depositors was not immediate; and membership was voluntary. Regulatory provisions served to protect Kansas from the extremes of moral hazard experienced in Oklahoma's first years, but voluntary exit and entry invited problems of adverse selection.

TABLE 3

**Membership and failures of national and state-chartered banks in
four post-1907 insured states**

	OKLAHOMA		TEXAS		KANSAS			NEBRASKA	
	State	National	State	National	Insured state	Uninsured state	National	State	National
Insurance begins	1908	—	1910	—	1909	—	—	1911	—
Number of banks in year before operation of insured system	393	294	616	528	—	749	208	670	232
Number of banks in year after beginning of insured system	613	242	828	511	456 ¹	443 ¹	207	693	245
Number of banks									
1915	558	351	997	537	526	427	215	803	212
1920	612	348	1,125	556	676	420	249	1,037	188
1923	446	459	1,071	561	681	357	266	968	182
1925	381 ²	393	943	642	611	381	258	939	172
1930	322 ²	278 ²	762 ²	593 ²	0	806	245	625	171
Insurance ends	1923	—	1925	—	1929	—	—	1930	—
Number of failures									
up to 1920			17	4					
up to 1921	29 ³	3	51	12	5	11	2	20	5
1920–1922					17	6	0		
1920–1923	68	7							
1920–1925			98 ⁴	14					
1922–1924	106	27	44	6	42	12	4	58	11
1924–1926					35	10	2		
1921–1930								329	31
Percent failing ⁵									
up to 1920			1.8	0.8					
up to 1921	4.8	0.9	5.1	2.3	0.9	2.4	0.9	2.6	2.4
1920–1922					2.5	1.4	0.0		
1920–1923	12.5	1.7							
1920–1925			9.1	2.4					
1922–1924	24.1	6.1	4.1	1.1	5.9	3.0	1.5	6.0	6.1
1924–1926					5.3	2.6	0.7		
1921–1930								38.5	18.2

¹Data are for 1912.²Insurance no longer in effect.³95 banks closed, but 66 were reorganized with no loss to the insurance fund.⁴150 banks closed, but 52 were reorganized with no loss to the insurance fund.⁵Percent of banks failing is defined as the number of failures divided by the average number of banks in existence during the period.SOURCE: *Annual Reports*, U.S. Comptroller of the Currency, 1909-1930; *All Bank Statistics: U.S., 1896-1955*, Board of Governors; Robb, *The Guaranty of Bank Deposits; Annual Report*, 1956, Federal Deposit Insurance Corporation, pp. 66-70.

By not endeavoring to reimburse depositors until after the liquidation of bank assets, the legislation failed to provide effective protection of the payments system. Liquidity crises are aggravated by delaying depositors' access to liquid resources. Moreover, when ultimate reimbursement is not certain, delays reduce the expected value of protection (and depositors' current net worth).

The key regulatory provisions intended to enhance soundness included: limitation of membership to banks in operation for at least one year; limitation of interest on deposits to 3 percent; a maximum deposit-to-capital ratio of ten; and double liability for bank stockholders (which had a similar effect to doubling the capital requirement). Perhaps most important, the law threatened to withdraw deposit insurance from banks found to be violating these regulations. This created an incentive for depositors to be concerned about the operation of the bank and thus discouraged bank violations of regulations, since offending banks would find it difficult to attract depositors.

Early growth under the voluntary Kansas plan was moderate compared to that of Oklahoma, and followed earlier trends, indicating less potential for abuse of insurance protection. In the five years prior to the legislation state banks increased from 572 to 778; from 1909 to 1914 their number (insured and uninsured) had risen to 932. Still, state-system growth was large relative to the national banks which showed virtually no growth in number or assets from 1909 to 1914.

The wartime boom of wheat and livestock prices initially masked the higher riskiness of insured banks' portfolios. As Table 3 shows, the percentage of failures from 1909 to 1921 was 0.9 for both insured and national banks. Uninsured state banks had a higher failure rate, but this seems due to the selection bias of the system, which excluded banks until they had been in operation for a year. Non-member state banks tended to be smaller and younger and, hence, more vulnerable. As farm incomes declined and borrower losses mounted, however, the insured-bank failure rate rose.

By 1925 healthy insured banks were leaving the system at a rapid rate, and by the end of 1926 only a handful remained. From 1922 to 1924, 5.9 percent of insured banks failed, compared with 3.0 percent of uninsured state

banks, and 1.5 percent of national banks. From 1924 to 1926, 5.3 percent of insured banks failed, compared with 2.6 percent of other state banks and 0.7 percent of national banks.

In 1929 the insurance legislation was repealed with \$7.2 million in outstanding claims.⁴³ While the regional agricultural crisis of the 1920s triggered the demise of the system, as in Oklahoma the relative failure experiences of national banks, non-participating state-chartered banks, and insured banks indicate that excessive risk-taking and adverse selection increased the fragility of the insured system. As one would expect, loan risk differentials became increasingly visible during bad times.

The Nebraska law came into full force in July 1911. In most respects Nebraska followed the lead of Kansas. However, unlike Kansas, membership was compulsory for state-chartered banks. Thus adverse selection was less of a problem in Nebraska than in Kansas.

Apparently bankers found the system attractive. From 1911 to 1914, the number of state banks rose from 661 to 910, and the assets of state banks tripled. Over the same period, the number of national banks declined from 246 to 191.

As in Kansas and Oklahoma, the greater risk-taking of the insured banks became increasingly visible in Nebraska as agricultural income fell. As Table 3 shows, from 1911 to 1924 the failure rates of state and national banks were virtually identical. As falling incomes became translated into bank loan losses, the state bank failure rate rose dramatically relative to the national bank rate. From 1921 to 1930, 38.5 percent of average state bank membership failed, compared to 18.2 percent of national banks. Declining membership from 1922 to 1930 contributed to the high state failure rate in the 1920s, but most of the difference was due to the greater risk-taking of state banks. The Nebraska law was repealed in 1930 with \$20 million in unpaid depositor claims.⁴⁴

The Texas system began operation in January 1910. Texas legislators tried to avoid the problems of Oklahoma's early experience by limiting deposits to between five and ten times capital. Special assessments were limited to a maximum of 2 percent of deposits per

year. As in Oklahoma, the Texas law provided for immediate payment of depositors at failed banks. Although the Texas statute did not limit interest on deposits, it restricted coverage to deposits receiving no interest.

A unique feature of the Texas law was the establishment of two separate deposit insurance systems. Banks could either join the guarantee fund, or opt for a different plan in which they would secure insurance privately and place the private bond with the state authorities. In the second plan, insurance could take the form of “a bond, policy of insurance, or other guaranty of indemnity in an amount equal to their capital stock.” In no case, however, could the amount of the bond be lower than one-half of average deposits for the preceding year.⁴⁵ Once banks had joined, the law did not permit them to switch from one plan to the other. The potential benefits of free-riding and the opportunity costs of investing in bonds seem to have favored the guaranty plan over the bond plan or national charters. Some 541 banks joined the guaranty system, while only 43 joined the bond plan in the first year.

Predictably, the Texas plan suffered the same problems as that of Oklahoma. Initially, growth was rapid. From 1908 to 1912, state banks increased in number from 506 to 878, while national charters fell from 533 to 515. But the combination of lax regulation and enforcement and the potential for moral hazard undermined the system. The problems in Texas came earlier than those in Kansas. Texas, like Oklahoma, was a cotton-producing state, and suffered from the poor harvests and falling prices of cotton from 1913 to 1915. Texas also followed Oklahoma’s example in admitting many newly organized banks into the insured system with minimal examination.⁴⁶ From 1910 to 1920 the failure rate among member banks was 1.8 percent, while the failure rate for national banks was 0.8 percent.

The fund managed to reimburse depositors at 17 failed banks in full from 1910 to 1920. However, as Table 3 shows, there was a steady migration of members to the national system. When the fall in agricultural prices came in the 1920s, the insurance system was unable to support deposits of failed banks. From 1920 to 1925, 9.1 percent of insured banks failed, while 2.4 percent of national banks failed.

Under the pressure of surviving banks that did not wish to bear the burden of other bank’s failures, the legislature allowed banks to switch to the bond plan in 1925, leaving outstanding depositors’ claims of \$15 million, which were gradually repaid by special assessments on remaining banks.⁴⁷ As in the other states, the agricultural crisis, combined with excess risk-taking and adverse selection, dealt the guaranty fund its final blow.

Repeating the mistakes of the past

With respect to supervision, these later systems differed in the extent to which bankers participated in appointing, or served as, regulators. In no state were banks given as dominant a role as in the three successful pre-Civil War systems, but in several cases there was a conscious effort to insulate bank supervision from political considerations by appointing bankers to state banking boards. For example, in its early years Oklahoma witnessed a politically motivated bank closure of a solvent institution, and a politically motivated intervention of the Governor to protect a member bank. In 1913, the legislature changed the composition of the state’s banking board to limit such politicizing and give a greater role to member banks.⁴⁸ South Dakota and Washington followed Oklahoma’s example, as shown in Table 2.

In part, the desire to include bankers on the supervisory boards reflected a belief that bankers would find it in their interest to promote supervision and monitor one another. This belief was based in part on the successful self-regulating clearing houses that existed at the time. Regulators were surprised to find, however, that members of the insurance system had little interest in monitoring one another or reporting on misconduct under the insurance systems. Robb writes that:

One of the fascinating arguments for bank guaranty was that, if all banks were required to contribute toward a fund with which to meet losses, the honest and conservative banks would keep watch on the reckless and dishonest, and that the inside pressure would force the rascals out of business. Practically every failure in Oklahoma, Texas, and Kansas has been caused by incompetency or dishonesty, and there is not a case on record where another banker has raised his finger against the proceedings.⁴⁹

Robb goes on to argue that in many cases banks did not inform regulators of fraudulent practices about which they clearly had information.

How can one explain the absence of inter-bank monitoring in this period and the indifference of bankers to each other's behavior, even when they were involved in the supervisory system? Certainly, the difference in the success of pre-Civil War and later self-regulation was not due to differences in enforcement power, as the later authorities had as much power to close and liquidate banks as did those in Ohio, Indiana, and Iowa.

The difference, it seems, can be traced to the incentives provided by a mutual guarantee system of a small number of banks, as contrasted with a fixed-fee system of a large number of banks. In the pre-Civil War mutual-guarantee states, banks had both the authority and the incentive to keep a close eye on their neighboring banks and to identify and put a stop to unsound practices early on. Under the limited assessment programs of the early 20th century, incentives to monitor and enforce were far less, since the cost of a bank's choosing not to monitor its neighbor was bounded by the maximum annual assessment. Furthermore, even if the premium was below the maximum allowed by law, the effect of any one bank's behavior on the assessment was likely to be small in a system with hundreds of banks.

Building a deposit insurance system that works

Adverse selection and moral hazard are more than theoretical constructs; deposit insurance systems that failed to deal effectively with these problems were undone by them. Banks vary with respect to their abilities and opportunities (hence the potential for adverse selection), and they have latitude in choosing among investments of different risk characteristics (hence moral hazard). When alternatives to membership exist or entry and exit are permitted on a voluntary basis, adverse selection becomes pronounced. Without proper safeguards against excessive risk-taking, banks will choose to free-ride on collective deposit insurance.

Excess risk-taking that accompanies poorly designed insurance schemes is not as

visible during good times when risky investments yield high returns. During bad times, however, when risky investments collapse, the riskiness of insured banks' portfolios reveals itself. Policymakers should not infer, therefore, that bank failures are "exogenous" to bank behavior just because they occur during bad times. Neither should they conclude that risk-taking is solely a response to bad times. It is likely that insured banks will take on riskier loans during bad times, since such loans offer the potential to avoid failure at little cost for the owners of a bank that already faces likely liquidation; but without assuming an *ex ante* bias toward risk on the part of many insured banks, one cannot explain the relative failure differences observed in the post-1907 period between state and national banks at the onset of adverse real shocks.

For deposit insurance to be effective, of course, it must do more than preserve the solvency of its members—it must protect the payments system from liquidity crises. A limited fund with upper bounds on emergency contributions will not prevent an economy-wide run. Only substantial borrowing power with a credible future asset stream to back it up or a mutual guarantee commitment among banks can provide the credibility needed to prevent systemic runs. Also, the resources of the system must be sufficiently liquid to meet large short-run withdrawals.

There are also lessons concerning effective and efficient supervision of banks. Self-regulation of banks, in privately organized clearing houses and in state-run mutual guarantee systems, worked very well. It aligned the incentives to monitor, the authority to monitor, and the ability to use information to the advantage of the system as a whole through disciplinary action and early closure or reorganization to reduce exposure to risk. Moreover, it established an efficient system in which those with a comparative advantage in gathering and interpreting information and deciding on bank closure and reorganization policy, actually performed those functions.⁵⁰

History does not provide adequate guidance concerning the optimal size of self-regulating organizations. On the one hand, when an insurance system is confined to a few banks in a small area, each bank has a strong incentive to monitor other banks and report unusual

The panic of A.D. 33

A few months after the panic of 1907, *Moody's Magazine* published an account by A. W. Ferrin of an earlier panic, that of A.D. 33, which brought the sophisticated financial and business world of Rome to the brink of disaster. To the businessmen and investors of 1908, the tale must have been startling in its parallels. It is still instructive; here is the story:

As with most panics, the causes were not obvious. About a year before, the firm of Seuthes & Son of Alexandria, lost three richly laden spice ships on the Red Sea in a hurricane. Their ventures in the Ethiopian caravan trade also were unprofitable, owing to a falling market in ostrich feathers and ivory. Rumors that they were insolvent were circulated in Rome. A little later the well-known house of Malchus & Co. of Tyre, with branches at Antioch and Ephesus, suddenly became bankrupt as the result of a strike among their Phoenician workmen and the defalcation of a trusted manager. It was learned that the great Roman banking house of Quintus Maximus & Lucius Vibo had loaned heavily to both Seuthes and Malchus. The depositors of Maximus & Vibo began a run on the bank and distrust spread throughout the Via Sacra (the Roman Wall Street), with the rumor that the still larger house of Pettius Brothers was involved with Maximus & Vibo.

The two threatened establishments might have pulled through had they been able to realize on their other securities. Unfortunately the Pettii had placed much of their deposits in loans among the Belgians. In normal times such loans commanded

a very profitable interest, but a rebellion among the semi-civilized Belgians had caused the government to decree a temporary suspension of processes for debt. The Pettii were therefore unable to liquidate. Maximus & Vibo closed their doors first but Pettius Brothers suspended the same afternoon. There were grave rumors that owing to the interlacing of credit many other banks were involved.

The crisis might still have been localized at Rome but for a new and very serious factor. The Senate, in a laudable desire to revive declining Italian agriculture had, with the consent of the Emperor, ordered one-third of every Senator's capital to be invested in lands in Italy. Failure to obey this law was punishable with heavy penalties. The time for compliance with the decree had almost expired, when many rich Senators awoke to the fact that they had barely time to effect the required relocation of their funds and avoid the wrath of the law. To obtain capital to buy land it was necessary for them to call in all their private loans and to draw down their balances at their bankers. Publius Spinther, for instance, notified Balbus & Ollius that they must pay him back the 30,000,000 sesterces (\$1,350,000) he had deposited with them two years before. Two days later Balbus & Ollius closed their doors.

The same day a notice in the *Acta Diurna*, the official gazette posted daily in the Forum, reported the suspension of the great Corinthian bank of Leucippus' Sons. A few days later came word that a big bank in Carthage had suspended. On receipt of this alarming information, all the surviving

activities to the supervisory authority, because it shares significantly in the costs of failing to do so. As a system becomes wider in its range, the costs of monitoring other members rises, and the benefits from identifying unsafe or dishonest bank practices fall with the number of banks participating. On the other hand, there are advantages to a wider geographical range of coverage that follow from inter-regional connections in the payments system and opportunities for diversification.

The geographical range of clearing house members was governed by the private interests of member banks, and did not adequately take into account the public benefits of expanded coverage. The range of coverage of the various state systems was limited by state borders.

A challenge for applying the lessons of the past is constructing a system which is national in its protection of the payments system and diversification of risk, but decentralized in its self-regulation. Below I explore how this might be achieved.

Restructuring deposit insurance

There are two valid reasons that guide the desire for insurance of bank obligations: protecting scarce information capital contained in the banking system (thereby maintaining the flow of credit to information-intensive borrowers) and preserving the payments system. It is quite possible that deposit insurance is no longer the best way to achieve these objectives. Unfettered interstate branch banking

banking houses in the Via Sacra gave notice that they would enforce the time clause on all deposits. The arrival of the corn fleet from Alexandria temporarily relieved the situation, but immediately afterwards came the news that two banks in Lyons and one in Byzantium were in trouble. From the provincial towns in Italy and the farming districts, where creditors had long allowed their loans to run at profitable interest but were now suddenly calling them in, arose cries of distress and tidings of bankruptcy after bankruptcy. After this nothing seemed able to check the panic at Rome. One bank closed after another. The legal 12% rate of interest was set at naught by any lucky man with ready money to lend. Courts were crowded with creditors demanding the seizure and sale by auction of debtors' houses, slaves, stocks or furniture; but the auctions were thinly attended, nobody had any money to buy anything. Valuable villas and racing studs went for a song. Men of excellent credit and seeming fortunes were reduced to beggars.

The panic was spreading all through the Empire and threatening suspension of all commerce and industry when Gracchus, the praetor, before whom most of the bankruptcy cases were being tried, sought help from the Senate which, after a hurried debate, dispatched a fast messenger to the Emperor Tiberius who was taking a vacation at Capri.

While Caesar's reply was awaited Rome held its breath. In four days the messenger returned. The Senate assembled with incredible celerity. A vast crowd in which slaves and millionaires rubbed

elbows filled the Forum while the Emperor's letter was read, first to the Senate, and then from the open Rostrum to the waiting throng. The situation reminds one of October 24, 1907, when New York bankers and brokers, with call money unobtainable, stood on the steps of J. P. Morgan's office awaiting word of their fate from the arbiter of American finance.

The solution of the crisis by Tiberius was similar to that made by the United States Treasury Department through J. P. Morgan & Co. on the fateful day of the 1907 panic. Secretary Cortelyou, it will be remembered, deposited \$19,000,000 in the New York banks, and J. P. Morgan & Co. loaned \$25,000,000 at 10%, breaking the deadlock. Similarly, the Emperor Tiberius ordered the distribution of 100,000,000 sesterces from the Imperial Treasury among reliable bankers, to be loaned to needy debtors, no interest to be collected for three years. He also suspended the decree forcing the investment of Senatorial capital in land.

The Government's action stemmed the tide and private bankers soon began to offer money at reasonable rates. Dispatches from Alexandria, Carthage and Corinth indicated that the panic had been stopped there. The Via Sacra resumed its normal aspect. A few banking houses and individuals never recovered, but the majority escaped permanent suspension and the panic of A.D. 33 passed into half forgotten history.

may provide a better approach for maintaining the smooth functioning of the payments system and eliminating the risk of bank runs.

Some advocates of deposit insurance reform propose limiting insurance to a narrowly defined monetary deposit backed by "marked-to-marketable" securities.⁵¹ While such a system would insulate the money supply from financial disturbances, it would not protect the banking system and the supply of commercial credit from liquidity crises. Commercial lending is likely still to be financed by short-term claims, and the potential for disintermediation and credit contraction still would exist.⁵² If, for economic or political reasons deposit insurance is to continue, the historical record offers some insight into how to protect against moral

hazard and adverse selection. Under the three successful mutual-guarantee insurance systems of the pre-Civil War period and, to a lesser extent, private clearing houses, banks worked to establish firm guidelines on portfolio composition, reserve holdings, loan practices, and capital. They also participated in enforcing these regulations and were far more successful in doing so than were government-appointed regulators. This approach worked because banks were adept at restricting risk-taking and at identifying least-cost regulatory structure (the optimal combination of reserve requirements, risk-based insurance premiums, capital and subordinated debt requirements, etc.). Because of their constant contact with neighboring banks, they also were in an excellent

position to monitor each other. The key to establishing an incentive-compatible deposit insurance system may well be to give banks expanded authority in regulating themselves as a group.

Expanding the authority of banks to determine and enforce their own regulations, of course, will only be successful if individual banks have an incentive to establish and enforce regulations that are in the collective interest of the system. The difficulty here is that when the insured system becomes very large, the benefits to any individual bank from monitoring its neighbors become small relative to the costs of doing so, because the reduction in each bank's risk exposure is not much affected by any one bank's monitoring behavior.

The solution to this problem may be a two-tier regulatory system of deposit insurance in which the government provides national protection, but relies on local incentives to monitor.⁵³ By making insurance premiums for banks in any region depend on the failure experience of their neighbors, for example, the government can make monitoring incentive-compatible. The size of such a basic region would have to be large enough to preclude collusion by a handful of banks and small

enough to encourage only low-cost monitors to do the monitoring (say, one or two groups per state on average), and the conditional increase in the insurance premium would have to be large enough to make monitoring worthwhile.⁵⁴ Collusive behavior among members of groups can be further discouraged by allowing geographical overlap and, hence, competition among groups.

Some regulations governing banks (including the geographic limits on bank groups) could be determined at the national level by a mainly bank-appointed commission, and other regulations might be allowed to vary at the level of the individual groups.

A successful self-regulating system of bank liability insurance is much more than a pipedream; it is the mechanism that characterizes the only successful liability insurance systems in the historical record. The deposit insurance lawmakers of the post-1907 period failed to learn from the pre-Civil War experience and, hence, repeated the mistakes of insufficient and delayed coverage of bank deposits and promoted systemic insolvency through moral hazard and adverse selection. The goal of this paper has been to help current policymakers start paying attention to history.

FOOTNOTES

¹For an excellent study of the incentive-incompatibility problems in the state-level systems, see Edward J. Kane, "How Incentive-Incompatible Deposit-insurance Funds Fail," mimeograph, Ohio State University, 1988.

²In his survey of the legislative history of bank insurance, Carter Golembe notes that the statements and actions of state legislators indicate that insurance of wealth was a secondary, incidental, achievement of bank liability insurance. See Carter Golembe, "The Deposit Insurance Legislation of 1933: An Examination of its Antecedents and its Purposes," *Political Science Quarterly* (June 1960), pp. 189-95.

³See George Akerlof, "The Market for 'Lemons': Qualitative Uncertainty and the Market Mechanism," *Quarterly Journal of Economics* (1970), pp. 488-500; Gary Gorton and George Pennacchi, "Transactions Contracts," mimeograph, University of Pennsylvania, 1988; and Charles Jacklin, "Demand Equity and Deposit Insurance," mimeograph, Stanford University, 1988.

⁴During normal times, in the absence of deposit insurance, the percentage of "lemons" was small, and the liquidity of bank claims was ensured by their demandability. The first-come-first-serve nature of demandable debt provided an

incentive for some depositors (particularly other banks) to monitor the actions of banks. Informed monitors made a market in the notes and deposits of banks through the interbank clearing of checks and the note brokerage market. As long as a bank was open (as long as informed monitors had not yet run on the bank), non-monitors were able to transact in bank claims with reasonable certainty about their value. Once banks had suspended, however, this sort of information sharing was no longer possible. See Charles W. Calomiris and Charles M. Kahn, "The Role of Demandable Debt in Structuring Optimal Banking Arrangements," mimeograph, Northwestern University, 1988. Of course, deposit insurance eliminates the first-come-first-serve preference for early withdrawals and ensures liquidity during normalcy and crisis through the government guarantee of deposits. Some current proposals for reforming deposit insurance emphasize the benefits of uninsured depositors or bondholders for disciplining bank behavior, as in the pre-insurance regime.

⁵See Calomiris and Kahn, "The Role of Demandable Debt."

⁶For a theoretical discussion of the problems created by depositors' inability to sort out the distribution of an adverse disturbance among banks, see Gary Gorton, "Self-Regulating Bank Coalitions," mimeograph, University of

Pennsylvania, 1989. Empirical evidence on the importance of this type of confusion for propagating the crisis of 33 A.D. can be found in A. W. Ferrin, "The Business Panic of A.D.33," *Moody's Magazine* (August 1908), pp. 81-2. For a discussion of this same problem during the Panic of 1857, see Charles W. Calomiris and Larry Schweikart, "Was the South Backward? North-South Differences in Antebellum Banking During Crisis and Normalcy," mimeograph, Northwestern University, 1988.

⁷See James G. Cannon, *Clearing Houses* (Washington, D.C.: 1910); Gary Gorton, "Self-Regulating Bank Coalitions," and Calomiris and Schweikart, "Was the South Backward?"

⁸The Suffolk System was wide ranging in that it operated throughout New England. While it succeeded in the more limited task of establishing a regional interbank network for clearing notes, it did not provide effective protection for the payments system as a whole. See Charles W. Calomiris and Charles M. Kahn, "Interbank Monitoring as Seignorage Sharing: The Suffolk System," mimeograph, Northwestern University, 1989.

⁹For discussions of the connection between unit banking and financial system fragility, see O.M.W. Sprague, *History of Crises Under the National Banking System* (National Monetary Commission: 1910); Milton Friedman and Anna J. Schwartz, *A Monetary History of the United States* (Princeton: 1963); and Charles W. Calomiris, R. Glenn Hubbard, and James Stock, "The Farm Debt Crisis and Public Policy," *Brookings Papers on Economic Activity*, vol 2 (1986).

¹⁰In *The Regulation and Reform of the American Banking System, 1900-1929* (Princeton: 1983), pp. 206-07, Eugene N. White argues that early twentieth-century Canadian banks used branch banking and informal coordination as an effective substitute for other measures (pp. 206-207). White also argues (pp. 218-22) that the bank failure experiences of the various states in the U.S. in the 1920s indicate that branching provided more effective protection than deposit insurance of unit banks. In "The Political Economy of Bank Regulation," *Journal of Economic History* (March 1982), pp 33-42, White claims that deposit insurance was pushed by unit banking interests which saw it as an alternative to branch banking. Carter Golembe argues that unit banking favored the use of deposit insurance and that deposit insurance reduced the costs of unit banking. He traces this political symbiosis from 1829 to 1933. See "The Deposit Insurance Legislation of 1933," pp. 195-99.

¹¹For a discussion of the causes of the Panic of 1837, see Peter Temin, *The Jacksonian Economy* (New York, 1969).

¹²See Calomiris and Schweikart, "Was the South Backward?"; Golembe and Warburton, *Insurance of Bank Obligations in Six States During the Period 1829-1866*, (Federal Deposit Insurance Corporation: 1958) Chapter II, pp. 55-7; and Robert E. Chaddock, *The Safety Fund Banking System in New York, 1829-1866* (National Monetary Commission: 1910).

¹³Golembe and Warburton, *Insurance of Bank Obligations*, chapter II, p. 33.

¹⁴See Calomiris and Schweikart, "Was the South Backward?"

¹⁵See Calomiris and Schweikart, "Was the South Backward?" Consistent with the lack of effective insurance, we find there is little evidence of moral hazard as a cause for bank failures during the panic of 1857.

¹⁶See Golembe and Warburton, *Insurance of Bank Obligations*, chapter II, pp. 35-7.

¹⁷Gorton, "Self-Regulating Bank Coalitions," argues that panics are often caused by depositor confusion over which banks are most affected by a given disturbance. Calomiris and Schweikart, "Was the South Backwards?" argue that the panic of 1857 began with a small aggregate disturbance that was propagated, and turned into a panic, by precisely this type of confusion. A deposit insurance system or an alternative means of dispersing risk (like branch banking) would have prevented the Panic.

¹⁸Some withdrawals were allowed even before the expiration of member bank charters, which was contrary to law, but the courts did not force the banks or the government to reimburse the fund. See Golembe and Warburton, *Insurance of Bank Obligations*, chapter III, pp. 16.

¹⁹The Danby Bank had operated outside the insured system from 1850 to 1856. It joined the fund in 1856 and failed on September 4, 1857 before the Panic of 1857.

²⁰See Golembe and Warburton, *Insurance of Bank Obligations*, chapter V.

²¹The state constitution only provided for the chartering of a state bank and its branches, which required that this language be used in the insured banking system. See Golembe and Warburton, *Insurance of Bank Obligations*, chapter IV, p. 1.

²²See Golembe and Warburton, *Insurance of Bank Obligations*, chapter IV, p. 14.

²³See Golembe and Warburton, *Insurance of Bank Obligations*, chapter IV, p. 6-7.

²⁴See Golembe and Warburton, *Insurance of Bank Obligations*, chapter IV, p. 9.

²⁵These included the forced resignation of bank officials and forced reductions of loans to insiders. See Golembe and Warburton, *Insurance of Bank Obligations*, chapter IV, pp. 17-24.

²⁶See Calomiris, "Falling Bond Prices, Contagion, and Bank Failures."

²⁷As I have noted, Indiana avoided a general suspension, but at the cost of many free bank failures.

²⁸See Golembe and Warburton, *Insurance of Bank Obligations*, chapter IV, p. 29.

²⁹Iowa had long prohibited the chartering of banks, and so the insured system had no competition from existing banks. While Iowa enacted a free banking law in 1858, the terms of these charters were prohibitively costly and no free bank was ever established under the law.

³⁰See Calomiris and Schweikart, "Was the South Backward?"

³¹See Calomiris and Schweikart, "Was the South Backward?," for a discussion of note discount rates during the panic of 1857.

³²This is not to say that the technological changes in check clearing were entirely exogenous; they were likely motivated in part by the costs of note issue. Still, the two effects—the rising costs of note finance, and the decreasing costs of deposits finance—were separate influences.

³³See Milton Friedman and Anna J. Schwartz, *Monetary Statistics of the United States: Estimates, Sources, Methods*, (New York: 1970), pp. 4, 8, 224.

³⁴The Panic of 1857 became a panic when depositors of banks in New York City ran their banks on October 13. This was first system-wide bank run precipitated by depositors in U.S. banking history, according to contemporary chroniclers. See James Cook, "The Report of the Superintendent of the Banking Department of the State of New York," *House of Representatives Executive Document no. 107*, 35th Congress, First Session.

³⁵See Thorton Cooke, "The Insurance of Bank Deposits in the West," in George E. Barnett, *State Banks and Trust Companies* (National Monetary Commission: 1910), pp. 261-303, and Thomas B. Robb, *The Guaranty of Bank Deposits* (New York: 1921), pp. 40-41.

³⁶Cooke, "The Insurance of Bank Deposits", p. 273

³⁷In May of 1908 the International Bank of Colgate was closed by the Commissioner, but it was reorganized and reopened soon thereafter, without imposing any loss and the fund. See Cooke, "The Insurance of Bank Deposits", pp. 281-2.

³⁸See Robb, *The Guaranty of Bank Deposits*, pp. 50-53.

³⁹See the Annual Report of the Comptroller of the Currency, 1914, volume 2, pp. 752-3.

⁴⁰See American Bankers Association, *The Guaranty of Bank Deposits*, (New York: 1933), p. 12.

⁴¹Additionally, higher assessments without supervision can make matters worse by forcing banks to finance this tax on deposits with higher return, higher risk loans. The printing of money to finance payments to banks offers banks direct and indirect relief. First, banks receive actual payments from the government. Second, banks receive the benefit of inflationary reductions in the value of nominal debts, which

increase the probability of borrower solvency.

⁴²The printing of money to finance payments to banks offers banks direct and indirect relief. First, banks receive actual payments from the government. Second, banks receive the benefit of inflationary reductions in the value of nominal debts, which increase the probability of borrower solvency.

⁴³See American Bankers Association, *The Guaranty of Bank Deposits*, p. 35.

⁴⁴See American Bankers Association, *The Guaranty of Bank Deposits*, p. 20.

⁴⁵See Cooke, "The Insurance of Bank Deposits," p. 322.

⁴⁶See Robb, *The Guaranty of Bank Deposits*, p. 155.

⁴⁷See American Bankers Association, *The Guaranty of Bank Deposits*, pp. 37.

⁴⁸See Robb, *The Guaranty of Bank Deposits*, pp. 28-9.

⁴⁹See Robb, *The Guaranty of Bank Deposits*, pp. 185.

⁵⁰Edward Kane particularly stresses the poor performance of bank regulators in the state and federal savings and loan insurance funds in detecting and correcting unsound practices. He argues that this poor performance can be traced to the incentives of the regulators to conceal problems. See Kane, "How Incentive-Incompatible Deposit-Insurance Funds Fail.

⁵¹Note that the theoretical motivation for demandable debt discussed above (a disciplinary device on bank behavior) does not arise when bank assets can be "marked to market." Furthermore, confusion would not occur when assets backing share accounts are marked to market.

⁵²The maturity mismatch of commercial lending predates the transactability of bank claims (see Calomiris and Kahn, "The Role of Demandable Debt"). The potential for credit contraction during liquidity crises has been apparent even in commercial paper markets, where borrowed quality is very high. See Charles W. Calomiris, "The Motivations for Loan Commitments Backing Commercial paper," *Journal of Banking and Finance*, forthcoming.

⁵³Marvin Goodfriend, in "Money, Credit, Banking, and Payments System Policy," (Federal Reserve Bank of Richmond; August 1988), also advocates a two-tier system.

⁵⁴Of course, unit banks in states with a non-diversified income base will still be vulnerable to cataclysmic regional shocks, even if the value of their transactable claims is guaranteed. Only branch banking, or improvements in information sharing that allow banks to hold interests in loans across state lines, can reduce that risk. If the government were to suspend insurance premiums penalties during regional crises, that would only encourage banks to take region-specific risks (which proved disastrous in the postbellum state systems), and would provide no incentive for other banks to prohibit or detect such practices.



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