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BANK FAILURES AND OUTPUT DURING THE GREAT DEPRESSION

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ABSTRACT

In response to the Financial Crisis of 2008, macroeconomic policymakers employed a range of tools designed to prevent failures of large, complex financial institutions ("banks"). The Treasury and the Fed justified these actions by arguing that bank failures exacerbate output declines, rather than just reflecting output losses that have already occurred. This view is consistent with economic models based on credit market imperfections, but it is an empirical question as to whether the feedback from failures to output losses is substantial.

This paper examines the relation between bank failures and output by re-considering Bernanke's (1983) analysis of the Great Depression. We find little indication that bank failures exerted a substantial or sustained impact on output during this period.

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I. Introduction

In response to the Financial Crisis of 2008, macroeconomic policymakers employed several tools designed to prevent the failure of large and complex financial institutions ("banks").[1] Most importantly, the Treasury injected capital directly into banks, and the Fed expanded its balance sheet by purchasing roughly $1.3 trillion in mortgage-backed securities (Fuster and Willen 2010). The Federal Housing Finance Agency also placed Fannie Mae and Freddie Mac into conservatorship, and the Treasury supplied $100 billion of capital to each agency.

The Treasury and the Fed justified these actions by appealing to the claim that bank failures contribute to output declines, rather than just reflecting output losses that have already occurred. This proposition stems from theoretical perspectives (e.g., Bernanke and Gertler 1985) and has been supported by certain empirical work (e.g., Bernanke 1983, Bernanke and James 1991). Economists as a group supported the Fed and Treasury policies, mainly from concern that widespread bank failures would exacerbate the recession. A few even speculated that failure to support banks would risk another Great Depression.

Yet government aid to failing banks has costs, whether or not that support calms recessions. Most importantly, moral hazard generated by the prospect of bailouts can distort lending and investment decisions toward excessively risky projects or sectors. More broadly, the prospect of bailouts might increase uncertainty, delay appropriate adjustments as banks wait for policymakers to decide whether and whom to bail out, generate strategic actions by banks seeking to profit from bailouts, or reward politically connected banks rather than systemically crucial ones.

In assessing the wisdom of bailouts, therefore, it is important to know whether the feedback from bank failures to output is substantial or modest. If failures have a large impact on output, bailouts are potentially desirable even if they generate their own costs. If failures have a modest impact on output, the case for bailouts is less convincing.

[1] Some of the financial institutions targeted by these actions were not banks *per se*, but we use the term bank throughout for ease of presentation.

This paper examines evidence on the relation between bank failures and output by reconsidering the findings in Bernanke (1983). Bernanke (1983) appears to show that bank failures had a substantial impact on output during the Great Depression. We argue that the data provide little support for this proposition. Our conclusion follows, in part, because determining whether failures cause or reflect output losses is difficult. But the conclusion also follows because even under the most generous identifying assumption, the impact of bank failures during the Great Depression does not appear to have been large or persistent.

II: Bank Failures and Output During the Great Depression

In attempting to understand the Great Depression, Bernanke (1983) argues that the Friedman and Schwartz (1963) monetary explanation is incomplete because theoretical models of money cannot easily explain the protracted non-neutrality necessary to account for the length of the downturn from 1929-1933. Further, Bernanke suggests that the declines in money were not sufficient to explain the magnitude of the fall in output over the same period.

Bernanke therefore proposes that bank failures had a non-monetary effect on the real economy through credit rationing since failures made credit scarcer for borrowing firms. In his view, banks act as low-cost credit intermediaries who collect funds from lenders and evaluate the risk of borrowers. The non-trivial and costly-to-replicate service that the banking system provides is to differentiate between good and bad borrowers. Bank failures therefore decrease intermediation capital, raise the cost of loans, and reduce output because alternative sources of credit intermediation cannot arise quickly or in sufficient quantity after banks fail.[2]

Bernanke's Empirical Strategy

To quantify the importance of monetary versus non-monetary factors in generating the output declines of 1929-33, Bernanke estimates the equation

[2] Following Fisher (1933), Bernanke also argues that debt deflation in the 1930s decreased the net worth of both borrowers and banks, destroying intermediaries and available credit.

$$y_t = a(L)\, y_{t-1} + b(L)\, (m_t - {}_{t-1}m_t) + c(L)\, DBANKS_t + d(L)\, DFAILS_t + e_t$$

where

y_t is the log growth rate of monthly industrial production;

$m_t - {}_{t-1}m_t$ is the growth rate of M1 less the predicted growth rate;

$DBANKS_t$ is the first difference of real deposits of failing banks; and

$DFAILS_t$ is the first difference of real liabilities of failing businesses.

Bernanke creates the monetary surprises as residuals from a regression of the growth rate of *M1* on four lags of the growth rate of industrial production, wholesale prices, and *M1* itself (Bernanke 1983, p. 268). Bernanke also estimates a version of Equation (1) in which he replaces the money surprises with price surprises, defined analogously.

Under the null hypothesis that bank and business failures play no independent role in the propagation of output, DBANKS and DFAILS should not enter Equation (1). Instead, the only impact of bank failures should occur via their impact on the money stock, consistent with the Friedman and Schwartz view that monetary shocks generated the lion's share of the output declines during the downturn. In this case, the monetary surprise variable, $m_t - {}_{t-1}m_t$, should explain most of the behavior of output.

Overview of the Data

Before examining estimates of Equation (1), we consider the raw data. Figure 1 displays the log of monthly industrial production along with the real value of deposits in failed banks for Bernanke's sample period, 1919:1 – 1941:12.[3] Figure 2 shows these same data for 1928-1934 to facilitate closer

[3] In constructing the time series for the value of deposits in failed banks and the value of commercial failures, we had to face two issues that Bernanke does not explain in his original paper.

First, to construct both series we had to combine several data sources. The Federal Reserve Bulletin provides monthly data on deposits in failed commercial banks for January 1921– December 1936 and three different overlapping series for commercial failures (January 1894 – August 1938, June 1934 - December 1939, and January 1939 – December 1968). The FDIC provides data on deposits in failed insured commercial banks and savings associations for January 1934–December 1941. These series are not equal for the overlapping time periods. We employ the Fed Bulletin bank failure series for

examination of the timing. These graphs suggest three conclusions about the relation between output and failures.

At the broad-brush level, an impact of bank failures on output does not leap from the graphs. Industrial production fluctuated significantly during parts of the interwar period that experienced few bank failures. In particular, industrial production declined 28.8 percent over a span of fifteen months, from the cyclical peak in July, 1929 to the first wave of bank failures in November,1930. That magnitude decline – almost half the overall drop – makes it plausible that bank failures were partly a response to adverse economic conditions, whether or not failures contributed to output losses.

At a more detailed level, these data are consistent with the view that failures reduce output, since in November 1930, October 1931, and March 1933, a reduction in output (relative to the downward trend) occurs simultaneously with a spike in failures. The output declines in these periods were not by themselves enormous, and failures do not appear to have had a persistent impact on the output path, but some correlation is apparent.

The graphs also suggest that one particular observation – the bank holiday in March, 1933, declared by President Franklin Roosevelt on March 6th – might play a substantial role in driving the correlation between failures and output declines. The real value of deposit liabilities of suspended banks in March, 1933 was seven times larger than the second largest value, in October, 1931.

As it turns out, our conclusions based on the regressions presented below are consistent with the impressions provided by this graphical examination. We conclude that failures plausibly had some impact on output, but this impact is sensitive to the identifying assumption about timing, is not especially large or persistent, and is somewhat sensitive to exclusion of the bank holiday from the sample.

1921-1936 and append the FDIC series for 1937-1941. For commercial failures, we employ the 1894-1938 series for January 1921 – August 1938, the 1934-1939 series for September 1938 – December 1939, and the 1939-1968 series for January 1940 – December 1941. Our results are not sensitive to these choices.

In addition, Bernanke notes that both commercial and bank failures are scaled by the wholesale price index but does not specify the base year for that index. Following the normalization of industrial production, we set 1935-1939=100.

Regression Results

Table 1 presents our replication of the results from Bernanke's 1983 paper (Table 2, Equations (1) - (4)).[4] Our estimates are close, but not identical to, those reported in Bernanke.[5]

The coefficients on the contemporaneous money or price surprises are positive and significant, consistent with the Friedman and Schwartz view that money played a role in the propagation of the Depression. The lagged monetary surprises are never significant while the first lags of the price surprises are.

The coefficients on the contemporaneous and lagged values of the liabilities of failed banks are both negative and significant. This is the crucial result in Bernanke's paper; it suggests that even after controlling for the impact of bank failures on the stock of money, bank failures played an additional, non-monetary role in generating the output declines of the 1929-1933 period. The coefficients on the business liabilities variables are negative but inconsistent in significance, so they provide no independent confirmation of Bernanke's hypothesis.

These results are thus consistent with Bernanke's conclusions. We now examine whether these results are robust to certain specification issues.

The Bank Holiday

As Bernanke notes and Figures 1-2 illustrate, bank failures were unusually high in March 1933. It is not obvious whether to include this observation in gauging the impact of failures on output, since the mechanism by which banks closed during this episode (an economy-wide, government-imposed shutdown) was not identical to the more usual mechanism. We take no position on this issue and instead examine alternative empirical approaches to dealing with this observation.

[4] Bernanke reports OLS standard errors, and we do so as well to facilitate comparison. The conclusions from both the simultaneous and lagged estimates are not changed with HAC standard errors.

[5] We have attempted to replicate Bernanke's estimates precisely, so far without success. Two possible explanations for the discrepancies are data revisions and the normalization of the wholesale price index. No parameters we have tried produce Bernanke's estimates exactly.

Bernanke's reported results include the March, 1933 data. Bernanke notes that he tried an alternate specification in which he scaled this observation to 15% of its reported value (p.270), and that under this modification, the bank failure coefficients retain high significance. We obtain the same result with our data; this approach to handling the March, 1933 observation does not produce a material change in Bernanke's results (Table 2, Regressions (5) - (6)).

We then estimate regressions dropping all observations that require the value of bank failures in March 1933. Regressions (7)-(8) of Table 2 show the results. In this specification, the bank and business failure variables still enter negatively, consistent with Bernanke's hypothesis, but the coefficients lose their statistical significance. Thus, exclusion of the Bank Holiday does not reverse Bernanke's results but does weaken them substantially.

It is not obvious whether results that exclude the bank holiday are more or less informative than those that include this observation. On the one hand, the number of failures and the quantity of deposits involved was enormous in March, 1933. This implies that this observation is most relevant to episodes like the recent crisis in which many large banks appeared to be at risk of failure. On the other hand, the exact nature of these suspensions differed from those arising "endogenously," since those during the bank holiday were nationwide, applied to all banks, and imposed by government decree.

Identification

A crucial issue in interpreting Bernanke's results is whether causation runs mainly from bank failures to output declines or from output declines to bank failures. Bernanke recognizes this issue and explains why he believes his regressions measure the impact of failures on output, rather than the reverse, but we do not find his reasoning persuasive. Bernanke states,

> To conclude that the observed correlations support the theory outlined in this paper requires an additional assumption, that failures of banks and commercial firms are not caused by (anticipations) of future changes in output. To the extent that, say, bank runs are caused by the receipt of bad news about next month's industrial production, the fact that bank failures tend to lead production declines does not prove that the bank problems are helping to cause the decline (p.271).

We find this description of the identifying assumption confusing. Bernanke seems to suggest that his equation suffers from simultaneous equations bias only if anticipations of *future* output declines can increase bank failures. But as his regressions are specified, they are subject to such bias so long as *current* output declines can affect current failures.

The ideal way to resolve this issue is to instrument for contemporaneous bank failures, but we are not aware of convincing instruments.

An alternative approach is to assume it takes at least a month for bank failures to disrupt credit intermediation and thereby lower output. Under this assumption, any contemporaneous relation between output and failures is assumed to represent the impact of output on failures. We can then determine the effects of failures on output by excluding contemporaneous failures from the regressions. At a minimum, it seems reasonable to consider this specification.

Table 3 presents the results. In these regressions, bank failures have no predictive power for output; indeed, the coefficients on bank failures imply that failures predict increases in output. Thus, if the identifying assumption implicit in Table 3 is correct, these data and this specification provide no evidence (indeed, contradict) the view that bank failures cause output declines.

Whether this identifying assumption is convincing is impossible to say on a priori grounds. Thus, it is not correct to interpret Table 3 as showing that Bernanke's conclusions are invalid. But the Table 3 results do show that under an alternate and plausible identifying assumption, the interwar data do not support these conclusions.

The Magnitude of the Effects

A different issue in the assessment of Bernanke's conclusions is the quantitative importance of bank failures in contributing to declines in output, whatever identifying assumption one makes. The raw data examined above did not seem to suggest a large impact, but we reconsider this issue based on the estimated regressions reported in Table 1. Thus, we return to Bernanke's identifying assumption that all of the contemporaneous correlation between output and failures reflects the influence of failures on output.

Figures 3 and 4 display forecasts of the log of industrial production, along with the actual values, based on estimates of Regressions (1) and (3) that exclude and include, respectively, the bank and business failure variables. We present two sets of forecasts, beginning in July 1929 and July 1930. The first date is the peak of Industrial Production, while the second date is the forecast start date used by Bernanke. We construct the forecasts in the following way: first, we generate the fitted value for the growth rate of industrial production for the first month of the forecast period using the relevant regression. Second, we set the forecasted log of industrial production in the first forecast month equal to the log of industrial production in the last month of the non-forecast period plus the predicted growth rate from that period to the first forecast period. Third, we forecast the growth rate from the first to the second month in the forecast period using the forecasted value from the first period and the relevant regression. For all subsequent months, we set the forecasted log of industrial production equal to the forecasted log of industrial production for the previous month plus the growth rate predicted using the relevant regression and all previous forecasted values.

The figures suggest that Bernanke's credit variables have minimal impact on the ability of such regressions to explain the decline in output from the peak of Industrial Production in 1929 to the trough in 1933. The purely monetary equation does a reasonable job: it gets the direction of most ups and downs correct, and it explains a non-trivial percentage of the decline in output. The equation augmented with the failure variables, however, does not improve the forecast between 1929 and 1933. Thus, even under Bernanke's identifying assumption, in which credit variables are statistically significant determinants of output growth, they are not quantitatively important determinants of that growth.

III. Discussion

The results we have presented, by themselves, shed light on our understanding of the Great Depression. As Bernanke confirmed, monetary factors do appear to have played a major role in the downturn, consistent with the work of Friedman and Schwartz. But the main avenue through which bank

failures mattered seems to have been through their impact on the money supply, rather than via a credit intermediation channel.

Our results do not deal directly with whether bank failures during the recent financial crisis would have generated a deeper or longer recession than occurred, had the Treasury and Fed not taken the actions that forestalled these failures. This is because the two episodes differed in important respects. Perhaps most significantly, bank failures during the Great Depression occurred mainly for large numbers of small banks; bank failures during the recent episode would plausibly have involved small numbers of large, interconnected banks. Thus our results shed little direct light over whether Too-Big-to-Fail concerns were valid.

To the extent U.S. experience during the Great Depression – and especially the view that bank failures played a significant, independent role during that period – formed the intellectual foundation for Treasury and Fed actions, however, our results suggest a hint of caution. If the Great Depression does not constitute evidence for Too-Big-to-Fail, then what historical episodes do provide that evidence? We leave that question for another day.

References

Bernanke, Ben (1983), "Non-Monetary Effects of the Financial Crisis in the Propagation of the Great Depression," *American Economic Review*, **73**(3), 257-76.

Bernanke, Ben and Mark Gertler (1987), "Banking in General Equilibrium," in *New Approaches to Monetary Economics,* W. Barnett and K. Singleton, eds., New York: Cambridge University Press.

Bernanke, Ben and Harold James (1991), "The Gold Standard, Deflation, and Financial Crisis in the Great Depression: An International Comparison," in R. G. Hubbard, ed., *Financial Markets and Financial Crises,* Chicago: University of Chicago Press.

Fisher, Irving (1933), "The Debt-Deflation Theory of Great Depressions," *Econometrica*, **1**, 337-57.

Friedman, Milton and Anna J. Schwarz (1963), *A Monetary History of the United States, 1867-1960,* New York: National Bureau of Economic Research.

Fuster, Andreas and Paul Willen (2010), "$1.25 Trillion is Still Real Money: Some Facts About the Effects of the Federal Reserve's Mortgage Market Investments," Federal Reserve Bank of Boston Public Policy Discussion Paper No. 10-4.

Table 1: Replications of Bernanke Table 2

	(1)	(2)	(3)	(4)
VARIABLES	Equation 1	Equation 2	Equation 3	Equation 4
IP_{t-1}	0.624**	0.554**	0.615**	0.613**
	(10.19)	(9.02)	(9.85)	(9.78)
IP_{t-2}	-0.118	-0.0575	-0.131*	-0.0810
	(-1.94)	(-0.97)	(-2.17)	(-1.34)
$Money_t$	0.443**		0.273*	
	(3.75)		(2.40)	
$Money_{t-1}$	0.0928		0.0471	
	(0.77)		(0.42)	
$Money_{t-2}$	0.0500		0.155	
	(0.42)		(1.36)	
$Money_{t-3}$	0.154		0.137	
	(1.29)		(1.24)	
$Price_t$		0.598**		0.595**
		(5.28)		(4.50)
$Price_{t-1}$		0.490**		0.314*
		(4.11)		(2.31)
$Price_{t-2}$		0.146		0.00990
		(1.21)		(0.07)
$Price_{t-3}$		-0.145		-0.112
		(-1.20)		(-0.86)
$DBANKS_t$			-0.0000277**	-0.0000270**
			(-5.85)	(-6.10)
$DBANKS_{t-1}$			-0.0000138**	-0.0000130**
			(-2.80)	(-2.83)
$DFAILS_t$			-0.000378*	-0.000273
			(-2.47)	(-1.81)
$DFAILS_{t-1}$			-0.000341*	-0.000226
			(-2.22)	(-1.49)
Constant	0.00152	0.00166	0.00216	0. 00158
	(0.94)	(1.09)	(1.43)	(1.08)
RMSE	0.0262	0.0248	0.0236	0.0228
Observations	268	268	250	250

OLS t-statistics included in parentheses. Sample: January 1919 - December 1941 (Regressions 1 and 2); January 1921 - December 1941. (Regressions 3 and 4). * significant at 5%; ** significant at 1%

Table 2: Bank Holiday: Omitting and Scaling March 1933

VARIABLES	(5) Scaled Eq. 3	(6) Scaled Eq. 4	(7) Omitted Eq. 3	(8) Omitted Eq. 4
IP_{t-1}	0.608**	0.599**	0.585**	0.609**
	(9.71)	(9.50)	(9.50)	(9.69)
IP_{t-2}	-0.125*	-0.0846	-0.102	-0.0719
	(-2.05)	(-1.39)	(-1.72)	(-1.18)
$Money_t$	0.344**		0.320**	
	(3.05)		(2.86)	
$Money_{t-1}$	0.0705		0.168	
	(0.62)		(1.47)	
$Money_{t-2}$	0.118		0.233*	
	(1.03)		(2.06)	
$Money_{t-3}$	0.163		0.172	
	(1.46)		(1.58)	
$DBANKS_t$	-0.000123**	-0.000111**	-0.0000527	-0.0000283
	(-5.04)	(-4.73)	(-1.66)	(-0.90)
$DBANKS_{t-1}$	-0.0000604*	-0.0000534*	-0.0000236	-0.0000136
	(-2.41)	(-2.23)	(-0.75)	(-0.43)
$DFAILS_t$	-0.000226	-0.000129	-0.000260	-0.000242
	(-1.45)	(-0.83)	(-1.65)	(-1.54)
$DFAILS_{t-1}$	-0.000359*	-0.000237	-0.000250	-0.000193
	(-2.32)	(-1.53)	(-1.58)	(-1.22)
$Price_t$		0.593**		0.546**
		(4.37)		(4.01)
$Price_{t-1}$		0.340*		0.289*
		(2.43)		(2.10)
$Price_{t-2}$		0.0976		0.00193
		(0.71)		(0.01)
$Price_{t-3}$		-0.0505		-0.0991
		(-0.38)		(-0.75)
Constant	0.00216	0.00159	0.00153	0.00132
	(1.41)	(1.05)	(1.03)	(0.90)
RMSE	0.0240	0.0235	0.0230	0.0228
Observations	250	250	247	247

OLS t-statistics included in parentheses. Sample: January 1921 - December 1941. Regressions 5 and 6: March 1933 bank failures scaled by 0.15. Regressions 7 and 8: March 1933 bank failures set to missing.
* significant at 5%; ** significant at 1%.

Table 3: Identification: Excluding Contemporaneous Bank Failures

	(9)	(10)	(11)	(12)
VARIABLES	Eq. 3	Eq. 4	Eq. 3	Eq. 4
IP_{t-1}	0.635**	0.605**	0.657**	0.637**
	(9.53)	(9.01)	(9.59)	(9.26)
IP_{t-2}	-0.128*	-0.0884	-0.131*	-0.0976
	(-1.98)	(-1.36)	(-2.01)	(-1.50)
$Money_t$	0.462**		0.449**	
	(3.95)		(3.82)	
$Money_{t-1}$	0.0504		0.0888	
	(0.42)		(0.72)	
$Money_{t-2}$	0.0174		0.0345	
	(0.15)		(0.29)	
$Money_{t-3}$	0.114		0.0849	
	(0.97)		(0.70)	
$Price_t$		0.701**		0.715**
		(5.07)		(5.14)
$Price_{t-1}$		0.447**		0.425**
		(3.10)		(2.89)
$Price_{t-2}$		0.151		0.158
		(1.05)		(1.09)
$Price_{t-3}$		-0.0454		-0.0617
		(-0.33)		(-0.43)
$DBANKS_{t-1}$	1.55e-06	1.14e-06	6.29e-06	5.77e-06
	(0.35)	(0.27)	(1.16)	(1.14)
$DFAILS_{t-1}$	-0.000174	-0.0000704	-0.000155	-0.0000319
	(-1.11)	(-0.46)	(-0.94)	(-0.20)
$DBANKS_{t-2}$			8.01e-06	7.75e-06
			(1.52)	(1.59)
$DFAILS_{t-2}$			0.0000259	0.0000959
			(0.16)	(0.59)
Constant	0.00212	0.00148	0.00213	0.00153
	(1.32)	(0.94)	(1.32)	(0.97)
RMSE	0.0252	0.0245	0.0252	0.0244
Observations	250	250	249	249

OLS t-statistics included in parentheses. Sample: January 1921 - December 1941.
* significant at 5%; ** significant at 1%.

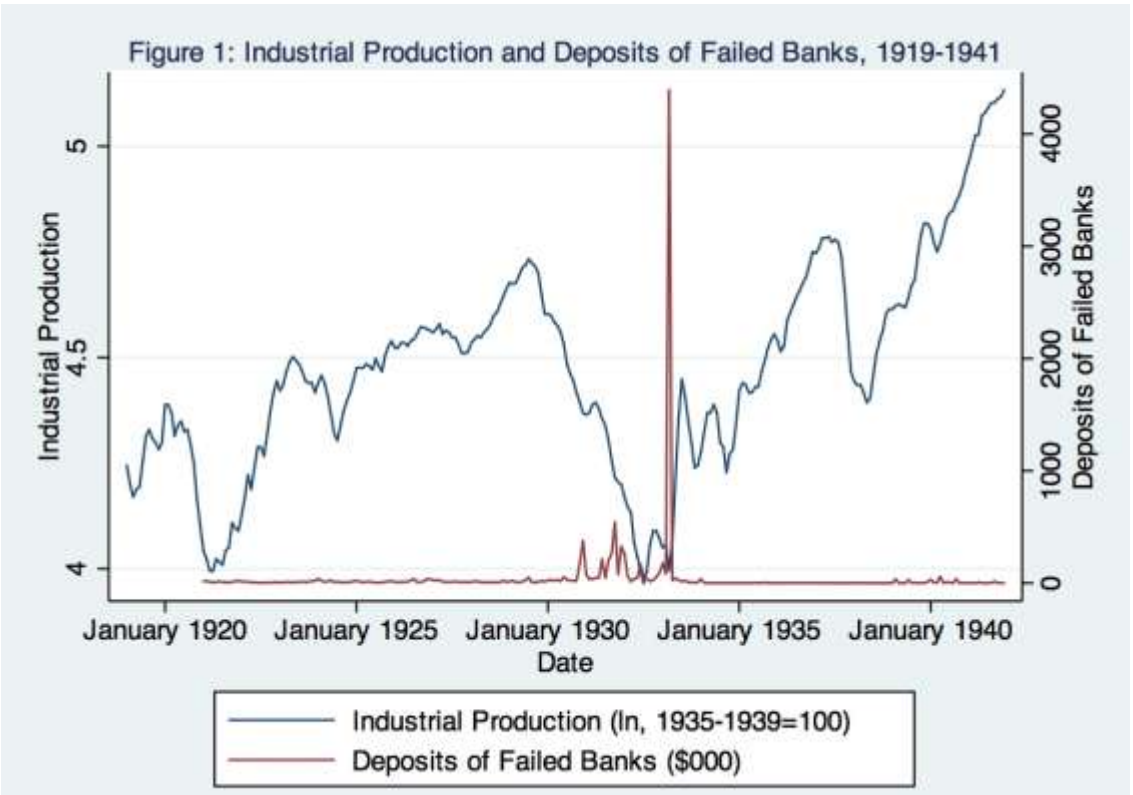
Figure 1: Industrial Production and Deposits of Failed Banks, 1919-1941
Industrial Production
4
4.5
5
Deposits of Failed Banks
0
1000
2000
3000
4000
January 1920
January 1925
January 1930
January 1935
January 1940
Date
Industrial Production (ln, 1935-1939=100)
Deposits of Failed Banks ($000)

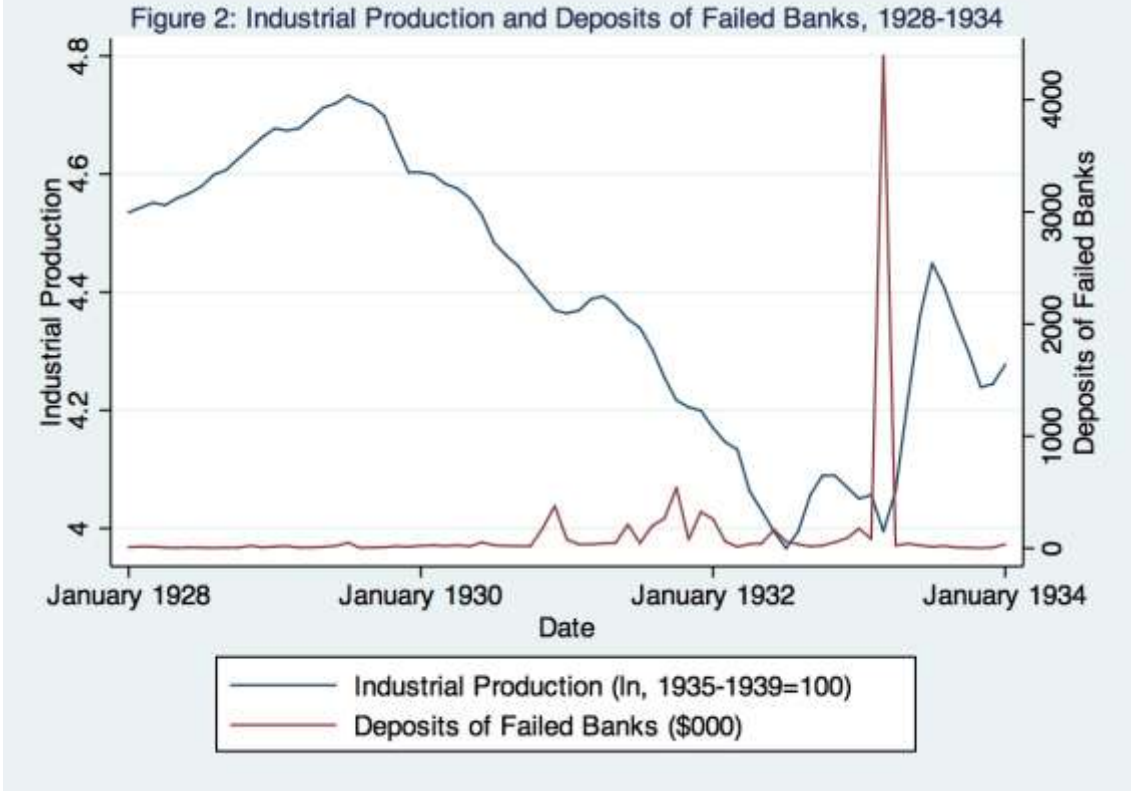
Figure 2: Industrial Production and Deposits of Failed Banks, 1928-1934
Industrial Production
4
4.2
4.4
4.6
4.8
Deposits of Failed Banks
0
1000
2000
3000
4000
January 1928
January 1930
January 1932
January 1934
Date
Industrial Production (ln, 1935-1939=100)
Deposits of Failed Banks ($000)

Figure 3: Dynamic Simulation of Industrial Production, 1928-1941

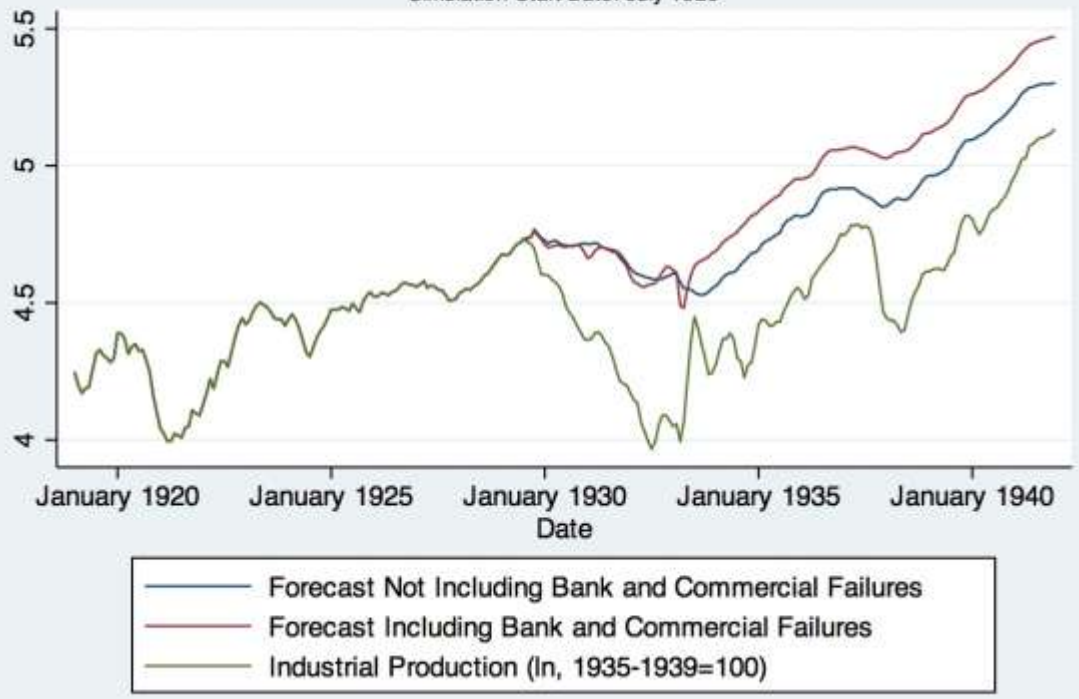

Figure 4: Dynamic Simulation of Industrial Production, 1928-1941