The Economic Consequences of Bank Failures during the Great Depression

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Dedicated to Milić, Mirjana and Radmila. Many years!

Посвеђено Милићу, Мирјани и Радмили. На многаја љета!

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Abstract

This thesis provides several pieces of empirical evidence which shed light on the role of bank failures during the Great Depression. In the first chapter, I introduce the predetermined vulnerabilities of each state's banking system as instruments of bank failures. I show that states and periods with more intense bank failures saw larger declines in value added by manufacturing throughout the interwar period. The second chapter uses a novel measure of financial dependence to show that, during the Great Depression, industries with greater interest costs compared to their earnings experienced greater declines in output than their peers; this differential is largest in states with intense bank failures. The third chapter tests whether bank failures of the Great Depression led to a rise in labor productivity as by causing liquidation of the least efficient jobs. I do not find evidence that failures could account for the observed rise in labor productivity.

Keywords: Great Depression, Banking Crisis, Financial Dependence, Manufacturing, Labor Productivity

Апстракт

Ова теза представља неколико емпиријских доказа који донекле осветљавају последице суспензија банака у време велике депресије у Сједињеним Америчким Државама (САД). У првом поглављу користим предодређене индикаторе осетљивости банкарских система појединачних држава САД као инструменталне променљиве за суспензије банака. То ми омогућава да покажем да су значаније суспензије резултирале у већем умањењу додате вредности прерађивачког сектора. У другом поглављу израчунавам једну верзију коефицијента покривености камате користећи податке из двадесетих година да покажем да су суспензије банака изазвале највећи пад производње финансијски најзависнијих индустрија. Резултати долазе из панела држава, година и индустрија које покривају 40% тадашње америчке прерађивачке индустрије. Треће поглавље испитује да ли су суспензије банака у време велике депресије довеле до повећања продуктивности рада, рецимо приморавши послодавце да затворе најнеефикаснија радна места. Резултати показују да је, као и у недавној финансијској кризи, продуктивност рада расла у низу сектора, али не дају доказе да су то узроковале суспензије банака.

Кључне речи: велика депресија, криза банкарског сектора, финансијска зависност, прерађивачка индустрија, продуктивност рада

Foreword

The importance of bank failures in the propagation of the Great Depression remains disputed. It remains disputed for the lack of empirical evidence. While Friedman and Schwartz (1963) argued that bank failures caused money supply reductions which in turn depressed economic activity, Bernanke (1983) suggested they raised the cost of credit intermediation. The empirical basis for both interpretations is not fully convincing. This thesis attempts to fill this gap by providing several pieces of empirical evidence which shed light on the role of bank failures during the Great Depression. It evaluates the impact of bank failures on the U.S. interwar manufacturing industries. In the first two chapters I study the effect of bank failures on value added and output. In the third chapter, I examine whether bank failures could explain the contemporary behavior of labor productivity.

The first chapter evaluates the importance of bank failures for value added by manufacturing in an interwar panel of U.S. states. I use two measures of pre-determined fragility of the banking systems of individual states as the instruments of bank failures. The first instrument is the percentage of branch offices in the year 1920 and it measures the risk sharing within the banking system. The second instrument is the increase in the value of farmland during the 1910s and it indicates the exposure of each state to the demand shock for food during WWI. When the demand for food from Europe declined after the war, the states in which farmers took loans to improve their farms were left with banks sensitive to any shock to income of their agricultural borrowers. The coefficient estimates suggest that bank failures could account for up to a third of the decline in value added by manufacturing brought by the onset of the Great Depression.

The second chapter introduces another dimension of variation into the interwar panel of U.S. states – the variation across 18 manufacturing industries which accounted for around 40% of U.S. manufacturing output in 1929. I use this variation to show that industries at the state level with higher needs for outside financing performed worse in the face of bank failures. I collect new data on the financing structure of U.S. firms in the 1920s to construct a measure of the inverse interest cover, an indicator of short term financing needs on the eve of the Great Depression. Industries with greater interest costs compared to their earnings saw bigger declines in output relative to their peers. This differential is largest in states that were affected the most by banking failures. To establish causality, I instrument bank failures with the same set of instruments I introduced in the first chapter. The findings matter quantitatively; under certain assumptions they associate bank failures with more than a third of decline in manufacturing output during the Great Depression.

In the third chapter I test for another real effect of bank failures during the Great Depression. In particular, I examine how bank failures affected labor productivity within the same sample of 18 manufacturing industries introduced in the second chapter. Labor productivity did rise sharply after the onset of the recent financial crisis in the fall of 2008. One proposed explanation is that the rise in the cost of credit intermediation made the least efficient jobs unprofitable and lead to their termination. I find that the labor productivity of a large part of U.S. manufacturing industries moved against the cycle during the Great Depression, just like in the current crisis. At the same time, I find no robust evidence that this pattern could be attributed to bank failures.

The thesis provides novel empirical evidence that bank failures made the Great Depression more severe. Much research however remains to be done. Bank failures of the Great Depression resulted in areas where access to external financing was limited for a prolonged period. Could the losses of the banking system account for a delayed recovery? On the other hand, is it possible that firms without access to external financing in the aftermath of the crisis had to liquidate the least efficient jobs, making the productivity rise? Understanding the recovery from the Great Depression remains a question of interest for both academics and policy makers.

Contents

1. BANK FAILURES AND THE SEVERITY OF THE GREAT DEPRESSION

1.1 Introduction

Between 1929 and 1932, U.S. output declined by a third. At the same time, the number of commercial banks failing increased fourfold. Whether the failures had a causal effect on output remains disputed. The question retains contemporary relevance, not in the least because of the important role of financial distress in the global crisis that erupted after 2008. If policymakers are to learn the right lessons from past downturns, establishing the right facts becomes essential.

Did bank failures indeed turn a "garden-variety" recession into the Great Depression? Friedman and Schwartz (1963) said so. They saw the banking panics as the principal propagation mechanism of the Depression. Failed banks reduced the money supply which, in their view, depressed economic activity. Bernanke (1983) instead emphasized the loss of information (about clients of the failed banks) and the resulting rise in the cost of credit intermediation. While the two works do not stress the same transmission mechanism, both approaches consider bank failures as crucial in deepening the downturn. The empirical basis for the two interpretations can however be criticized for relying on temporal correlation and succession to imply causation. Banks could instead be failing because their clients suffer. The skeptics, who mostly come from the real business cycle literature, have subsequently challenged their conclusions. The prominent works include Cole and Ohanian (1999, 2001) and Chari, Kehoe, and McGrattan (2003). With Temin's (2008) critique of the methodology used to study depressions in Kehoe and Prescott (2007), and their reply, the debate still continues.

In this paper, I show new evidence that bank failures played an important role in making the Great Depression more severe. Using a panel of U.S. states from the interwar years, I demonstrate that the value added by the whole manufacturing sector declined more in those states where banks failed. I further introduce a novel set of instrumental variables to show that bank failures had a causal impact on value added. Indicators of pre-determined vulnerability of the banking system in each state serve as instruments. One of them is the percentage of bank offices that belong to branch banks in the year 1920. States with better risk sharing within the banking system were more resilient to failures. The change in farm value over the 1910s serves as the other predictor of bank failures. Farmers were more leveraged in those states that expanded food production to meet the temporary European demand during WWI. As a consequence, the local banking systems were fragile after the war.

My findings are based on the whole interwar sample. In this way, I can avoid the potentially confounding effects of both domestic and international shocks specific to the years 1929-1933. Two extensions verify that bank failures mattered. I show that my findings hold in the cross section of U.S. states during the Great Depression only, in spite of the possible presence of spillover effects that blur cross-sectional identification. I find that a measure of output generated within a state, corporation income, correlates negatively with the percentage of deposits suspended. This agrees with the findings of Calomiris and Mason (2003) who use production income. Both improve on the measure of output used by Cole and Ohanian (2001), who use state personal income (which could include several types of inter-state transfers). I also separately examine the real effects of the March 1933 bank failures using national monthly series of real activity. This was necessary since 1933 had the most severe failures of the Great Depression but was also a year of recovery. Their immediate effects appear to be severe; this is consistent with the previous findings. But, in the months that followed either the guarantees of the new Roosevelt administration for the soundness of the reopened banks took the edge away from these failures, or their effects were blurred by the recovery that ensued for other reasons too. The results are economically important. I find that bank failures mattered throughout the interwar period.

My paper is related to research on the role of bank failures during the Great Depression. Bernanke (1983) and Friedman and Schwartz (1963) argue that banking failures had real consequences. Calomiris and Mason (2003) use loan-supply instruments to demonstrate that the growth in bank loans and deposits are a significant predictor of production income growth in the cross section of U.S. states during the 1930-1932 period. They argue that this supports Bernanke (1983) in that nonmonetary effects must matter too, because declines in the money supply emphasized by Friedman and Schwartz would be equally felt at the national level. In the period preceding the Great Depression, Kupiec and Ramirez (2010) use the VAR method to find evidence of real effects of bank failures. The notable works negating any significant real effects of Depression-era banking crises include Cole and Ohanian (1999, 2001) and Chari, Kehoe, and McGrattan (2003).

The rest of the paper is structured as follows. Section 1.2 places U.S. interwar bank failures in an historical context. Section 1.3 introduces my dataset. Section 1.4 presents the method and both the OLS and the IV regression results. In section 1.5 I show two robustness checks for my findings. I first examine the relationship between bank failures and measures of output during the Great Depression only. I then do the same in the months around March 1933. Both robustness checks confirm the main findings. The last section concludes.

1.2 Historical Background and Context

This section describes the U.S. interwar bank failures - their prevalence and likely determinants; it also describes declines in output during the Great Depression. There is variation both in the intensity and in the geographic distribution of failures between the twenties and the Great Depression. In the twenties, bank failures were widespread in rural areas. With the onset of the Depression, the failures became more widespread and more intense. Those of the fall of 1930 were frequently credited with turning a bad recession into the Great Depression, while the failures of 1931 were blamed for deepening the Depression. The suspensions of 1933 were unique in character. They were followed by resolute action of the federal government and produced little uncertainty. The causes of failures also varied between the two periods. Some shocks to banks were local (e.g. falling rural income) yet others were nationwide (e.g. Britain leaving gold in 1931). But, some determinants of failures, such as state banking structure and the conditions in the market for farmland, were common to both periods. Finally, while the Great Depression is associated with large declines in output, the evidence on whether bank failures made them more severe is mixed.

a. The Prevalence of Bank Failures

The interwar years can be divided into three periods by the prevalence of bank failures. These are the twenties, the Great Depression, and the years that followed it. Figure 1 shows the percentage of suspended deposits of the U.S. commercial banks per year; the three periods are evident. They are also evident numerically. Descriptive statistics of bank failures by period are presented in Panel B of Table 1. The twenties had a large number of failures in rural areas (Alston et al. 1994) - one to four percent of banks were suspended each year. Transition to Depression corresponded to a roughly five-fold increase in suspension rates. Friedman and Schwartz identify four banking crises in the Great Depression: the first that occurred in late 1930, two that marked 1931, and a three-week nationwide crisis that ended with the "bank holiday" of March 1933. The years following the Great Depression were a much calmer period; less than 1% of banks failed in any of the years. The guarantees of the newly established Federal Deposit Insurance Corporation, and a decade of widespread failures too (Walter, 2005), consolidated the banking system.

[Figure 1]

[Table 1]

Banking distress is frequently regarded as a key factor that deepened the Depression. Friedman and Schwartz attributed particular importance to the first acceleration of suspensions from November 1930 to January 1931. They argued it turned a bad recession into the Great Depression. The failures of two large banks characterized the first crisis. In November 1930 the Tennessee investment banking house Caldwell and Company failed. Through its network of business partners, the financial distress spread into the neighboring states. The December 1930 failure of the New York based Bank of United States created negative expectations nationwide, not in the least because of its name. The failures soon subsided, but the measures of hoarding suggest depositor confidence was never restored to pre-crisis levels; the system remained vulnerable to shocks that quickly followed. The second crisis lasted from April to August 1931. It consisted of a series of regional crises and urban panics (Wicker, 1996), the most prominent among which were in Toledo, Ohio and in

Chicago, Illinois. The Chicago banks were particularly vulnerable to declining real estate values. They held many mortgages in their portfolios and had sold real estate mortgage bonds with a repurchase provision. The third crisis of September and October 1931 followed the second one without interruption. It was more intense, nationwide, and triggered by Britain leaving gold (Wicker, 1996). What appears to have stopped it was the establishment of the National Credit Corporation in its midst. Overall, the failures of 1931 were surpassed by intensity only by those of 1933 (11 percent of commercial banks, with almost 4 percent of deposits, were suspended in 1931). The National Credit Corporation, soon renamed Reconstruction Finance Corporation, provided a boost to confidence and loans to troubled banks. It could have been decisive for 1932 to pass with less financial distress than 1931, but the rash of failures continued.

What followed in 1933 was an outlier among all interwar banking crises. It was the worst crisis with the best aftermath. This was the only time state banking moratoria and withdrawal restrictions were widely used. On the other hand, federal government itself guaranteed the soundness of each of the banks reopened in mid March. During the buildup of the crisis, the Federal Reserve and the Reconstruction Finance Corporation failed to agree on who is to act as the lender of last resort for a group of Michigan banks in distress (Wicker, 1996). This led the Governor of Michigan to declare a statewide banking holiday on February 14. Depositors from Michigan then attempted to obtain funds from any other state; the concerned residents of the contiguous states followed. This led to a cascade of more than thirty statewide moratoria. Payment suspensions in most parts of the country were already an accomplished fact by the time the new president Roosevelt declared a national "bank holiday" on March 6. One half of the banks with 11 percent of deposits was not allowed to reopen on March 15. There is evidence that the immediate impact of the crisis on industrial production was serious (Wicker, 1996). Nonetheless, the government's guarantee for the reopened banks quickly restored confidence in the banking system. Massive amounts of hoarded currency were redeposited, and the industrial production quickly recovered.

b. The Reasons for Bank Failures

The onset of the Great Depression creates a clear discontinuity in the prevalence of bank failures over time. It is however disputed whether the causes of failures also changed. Friedman and Schwartz (1963) make a distinction: falling borrower income led to most failures in the twenties while bank runs led to most failures in the Depression. On the contrary, Calomiris and Mason (1997) find that in the Chicago banking panic of 1932 few solvent banks failed. In a similar manner, the same authors show that the failures of most banks before 1933 were driven by their fundamentals - contagion and liquidity crises were relatively unimportant (Calomiris and Mason, 2001). Temin (1976) claims that many Depression-era failures were caused by falling agricultural income, and so were most failures in the 1920s. In a similar vein, White (1984) demonstrates that banks failing in the year 1930 had common characteristics with their counterparts from the previous years. The literature thus suggests that the failures from the two periods were not entirely different phenomena. If so, the same instruments could be used to predict them.

Rural banks failed often during all of the interwar period. Figure 2 demonstrates this. The three subplots correspond to periods before, during, and after the Great Depression. The observation points are specific to states and years. The dependent variable is the fraction of failed deposits, while the explanatory variable is the percentage of state population in towns with less than 2500 people (ICPSR, 197?). Two facts are apparent in each subperiod: the majority of failures took place in rural states, and so did the most intense ones.

[Figure 2]

One reason rural bank failures were numerous and intense could be rural unit banking; it limits risk sharing within the system. Another reason could be a change brought by the end of the Great War. The American farmers faced an increased demand for their products while the European peasants were fighting. As they borrowed to improve and expand their farms, the value of American farmland rose. But when the Europeans returned to their ploughs, the Americans saw their income fall. Meeting mortgage payments suddenly became difficult. The states with the greatest agricultural expansion could consequently expect the gravest bank distress in the interwar years. Banks in these states were particularly vulnerable to any shocks to income of its clients. Bad weather leading to poor harvest, for instance, frequently resulted in defaults on loans and bank closings. In general, any national shock propagating across the country would cause more failures in states with vulnerable banking systems. Both poorer risk sharing within the system (in states with less branch banking) and more leveraged clients (in states where agricultural expansion had been the greatest) make a banking system vulnerable. We shall examine these two indicators of banking system fragility in the data section shortly.

c. Declines in Output during the Great Depression

Over the course of the Great Depression, the U.S. GDP declined by 29% (Kendrick, 1961). The decline in manufacturing output, accounting for about a third of GDP at the time, was more pronounced than that of all output. The Statistics of Income show that the decline in the gross income of manufacturing was significantly surpassed only by that of the construction sector (U.S. Internal Revenue Service, 1929-1933). Output declined the most in construction and durables manufacturing, and less so in the services and nondurables manufacturing. This is consistent with Romer (1990) who argued that uncertainty about the future income introduced by the onset of the Depression caused a decline in the consumption of durable goods. The impact of the Great Depression also varied across the United States. Rosenbloom and Sundstrom (1990) show that the regional variation in the severity of the Depression, measured by the performance of manufacturing, can be for the most part attributed to regional differences in trend employment growth and industrial composition (that relates to output cyclicality).

While the Great Depression is associated with significant declines in output, the evidence that bank failures contributed to these declines is mixed. Rosenbloom and Sundstrom (1990) also find that rural areas with many bank failures (the East and West North Central, South Atlantic, and East South Central divisions) show no consistent tendency toward a larger negative cyclical shock in manufacturing output, controlling for industry composition. They nevertheless do not examine this state-by-state, and do not test for an effect of bank failures in areas with more industry. On the other hand, the monthly index of industrial production and the monthly deposits in suspended banks, shown in Bernanke (1983), are consistent with an instantaneous, as well as a 6-months lagged, effect of bank failures on output. In the cross section of states, Cole and Ohanian (2001) find no significant relationship between personal income and deposits in suspended banks. On the other hand, Calomiris and Mason (2003) find that, using a measure of production output generated within a state and loan-supply instruments, the growth of loans does predict output growth.

1.3 Data

This section explains my dataset. Dependent variable is the growth rate of value added of the whole manufacturing sector, which varies across states and periods. Bank suspensions specific to state and period serve as the explanatory variable. I also introduce two novel state-variant instruments of bank failures. These are the percentage of offices of branch banks in the year 1920 and the changes in farm value over the 1910s.

a. Growth Rates of Value Added by Manufacturing

The preferred measure of output performance is the growth in value added by the whole manufacturing sector. It varies by states and biannual periods. A unit of observation is, for instance, growth rate of value added by manufacturing in Massachusetts between 1925 and 1927. The 1947 U.S. Census of Manufactures publication served as the source, in particular the summary table for the whole interwar period (U.S. Bureau of the Census, 1947). The frequency of the variable is determined by the biannual frequency of the Census of Manufactures publication. The values of value added behind the growth were first deflated using the Consumer Price Index for All Urban Consumers (All Items) (U.S. Bureau of Labor Statistics, 2010). Growth rates of value added were then obtained for 7 biannual periods between 1921 and 1937. These are 1921-1923, 1923-1925, 1925-1927, 1927-1929, 1929-1931, 1933-1935 and 1935-1937. The 1931-1933 period (covering 1932 and 1933) is excluded because of the distinct character of the bank failures in 1933; the rationale for exclusion is explained in the subsection 1.3.b. The sample ought to be representative of the contemporary U.S. output; manufacturing accounted for 45 percent of the gross income of American establishments filing tax returns in the in 1929 (U.S. Internal Revenue Service, 1929). Panel A of Table 1 summarizes the growth rates of value added.

b. Bank Failures

I follow much of the literature in using deposits suspended as an indicator of bank failures. Both in the case of suspension and of failures, the customers have no immediate access to their funds, even if they later recover a part of their deposits. The two are nevertheless not the same. All deposit suspensions (including failures) were initially adopted as a proxy for bank distress rather than bank failures only because the measure was available across all states (Anari et al, 2005). Anari et al. (2005) emphasize that suspensions which do not involve failures usually implied faster and larger recovery rates of funds, and that many suspensions in the Great Depression did not result in failures. They argue that, for this reason, the use of suspensions (including failures) would overstate the prevalence of bank failures. The distinction is however the most relevant in the spring of 1933, the period I exclude from regression analysis. Moreover, to the extent that even suspensions that do not lead to failures cause uncertainty and expectations of future bank closings, they could still result in disintermediation with real effects. Finally, if deposit suspensions are an imperfect measure of financial distress, then their impact on the real economy which I estimate is just lower bound of the actual one.

The data are obtained as follows. Deposits of all commercial banks[1] are sourced from the Banking and Monetary Statistics 1914-1941 (U.S. Board of Governors of the Federal Reserve System, 1943), while the total deposits of suspended banks come from All Bank Statistics 1896-1955 (U.S. Board of Governors of the Federal Reserve System, 1959). The two measures combined

[1] Commercial banks include all banks other than the mutual savings banks (U.S. Board of Governors of the Federal Reserve System, 1943). In the whole period 1921-1937 there were only 13 failures of mutual savings banks in the whole country, and I exclude them from the analysis. Commercial banks thus include the national banks and two categories of state commercial banks: those that are members of the Federal Reserve System, and those that are not.

give the percentage of deposits in commercial banks suspended. A unit of observation is, for instance, the percentage of deposits in the banks suspended in California in 1928 and 1929.

The suspensions of the March 1933 banking holiday present a challenge for the analysis. This was by far the largest episode of interwar suspensions. On the other hand, the suspensions were accompanied by federal government action. That accounts for the absence of panic associated to the preceding failures. I expect the certainty to have made all the difference. Even though the suspended banks were inaccessible, the surviving ones had no reason to constrain lending in an atmosphere of renewed trust. Bernanke (1983) decided to treat the failures of March 1933 differently for their distinct character. He recoded them to 15% of their value, the size of the second worst episode of failures in October 1931.

Because the suspensions of 1933 were a unique phenomenon I exclude them from the analysis. I expect my test of the role of failures in the Great Depression to still be valid for two reasons. First, Wicker (1996) examines monthly output at the national level and observes that 1933 failures did have real effects. This is in line with my findings for the other failures. They were however short lived - revived trust in the system started the recovery soon after March 1933. Second, three out of four Depression-period banking crises identified by Friedman and Schwartz occurred in 1930 and 1931; they are included in my sample. It was the banking crisis of the fall of 1930 that was attributed a causal role in turning a run-of-the-mill recession into the Great Depression, and the crisis of 1931 was given a role in worsening the downturn. If the 1930 and 1931 failures had important real consequences we can conclude that bank failures deepened the Great Depression.

c. Determinants of Bank Failures

Any OLS regression that includes bank failures as predictors of growth in value added might suffer from reverse causality - banks could be failing because the value added by their clients is declining. To measure the true impact of bank failures on value added, this paper uses two instruments that vary at the state level: percentage of branch offices in the year 1920 and the increase in the value of farmland during the 1910s. They are summarized in Panel C of Table 1.

The associated literature documents a number of predictors of financial distress. Alston et al. (1994), Calomiris (1989), Grossman (1994), Wheelock (1995), Carlson and Mitchener (2005), and Richardson (2007) all examine the consequences of banking structure, regulation, and policy on financial stability. Among the previously used predictors of failures, I found three to have the greatest power: branching indicators, population per bank, and deposits per capita. For simplicity, I chose to use only a branching indicator - the percentage of branch offices in a state[2]. Note that the changes over time in the prevalence of branch banks at the state level could be simultaneously determined with the growth rates of manufacturing industries. To minimize the concern, I use only the value of branching indicator from the year 1920, at the very beginning of the studied period. The data on branch banking are sourced from the Banking and Monetary Statistics 1914-1941 (U.S. Board of Governors of the Federal Reserve System, 1943). They include the number of banks in a state that operate branches and the total number of branches for selected years. Combining branch banking data with the total number of banks, I constructed the state-specific ratio of branch bank offices to the total number of offices in the year 1920. The indicator is calculated as shown in equation (1):

$$branching_s = \frac{Nbranchbanks_s + Nbranches_s}{Nallbanks_s + Nbranches_s} \in [0,1] \quad (1)$$

The paper uses another measure of sensitivity of each state's banking system to financial distress – the changes in farm value over the decade of the Great War. I follow Temin (1989) by giving importance to international disequilibria created by WWI in leading to the Great Depression. The greater had been the expansion in agricultural land and its value in the 1910s, the more leveraged were the local clients in the years that followed (as outlined in section 1.2.b.). In states with highly leveraged residents, banks were more likely to fail as a result

[2] State legislation allowing branching was found to exhibit a high degree of collinearity with the actual branching outcomes I use here.

of any state or national economic shock. The source for the data on values of farmland is Pressley and Scofield (2001). That both instruments are not expected to affect output other than through bank failures is discussed in the next section with the IV results.

1.4 Method and Main Results

In this section I first explain the regression specifications used and then present the OLS and IV results. The regression model tests how the growth in value added by manufacturing correlates with deposit suspensions in order to verify that bank failures had real effects. The OLS results give the correlation while the instrumental variable analysis measures the causal impact of bank failures on value added.

a. Method

A characteristic of the U.S. interwar banking market were local banking relationships; a firm would typically borrow within the same state, more likely the same town or county (White, 2000). At the same time, there were limitations on both within-state and inter-state branching. For this reason, any effect of bank failures ought to have been felt the most within the same state. Specification (S1) thus matches the growth in value added and bank failures by state and period.

$$gVA_{st} = \beta_0 + \beta_1 \cdot fail_{st} + u_{st} \qquad \text{(S1)}$$

The dependent variable is the growth rate of value added by the whole manufacturing sector in state s over the biannual period t, gVA_{st}. Biannual frequency ought to allow for enough time for lagged effects of failures to manifest themselves. The sample interval is 1921-1937. The explanatory variable is the percentage of deposits in suspended banks in state s during period t, $fail_{st}$. The coefficient β_1 is used to test for an effect of bank failures. The β_1 will be negative if bank failures on average cause the value added by manufacturing to decline. Its value represents the difference in growth of value added, in percents, between states with one percent of suspended deposits and states without deposit suspensions in the same period.

I estimate two other specifications which also include state fixed effects (a_s), specification (S1), and both state and period fixed effects (a_t), specification (S2).

$$gVA_{st} = \beta_0 + \beta_1 \cdot fail_{st} + a_s + u_{st} \qquad \text{(S2)}$$

$$gVA_{st} = \beta_0 + \beta_1 \cdot fail_{st} + a_s + a_t + u_{st} \qquad \text{(S3)}$$

The fixed effects control for unobserved factors that affect both banks and producers; however, they could also capture a part of the effect of bank failures themselves and thus result in too conservative coefficient estimates. Specification (S1) includes state fixed effects which capture the unobserved state characteristics that influence output. Specification (S2) also includes time fixed effects a_t; they are included to control for any omitted factors that operate across all states in the same period. For two reasons, time fixed effects in particular are expected to capture a part of the effect of deposit suspensions. Firstly, bank failures were widespread across states in some periods. Secondly, a spatial spillover effect could make the effect of failures felt in the neighboring states. To the extent that in both cases bank failures would be indistinguishable from a nationwide shock, their effect would in part be removed by the time fixed effects in specification (S2). The estimate of β_1 in (S2) could thus only be correctly interpreted as the lower bound of the true β_1. Finally, any OLS estimates could be biased by reverse causality. Banks failing as a result of output declines in the same state would lead to a negative $\beta_{1.}$ The IV regressions address this concern.

b. Main Results

The results of OLS regressions are given in Table 2. The estimates are economically and statistically significant. Bank failures are associated to lower growth of value added by the manufacturing sector. The results suggest that bank failures had important effects on the real sector in the same state.

[Table 2]

The estimates of β_1 do not change much when state fixed effects are included; the first two specifications suggest that a one percent of deposits in suspended banks is associated with a two percent decline in the value added by manufacturing in the same state. Adding the period fixed effects however reduces the coefficient substantially and makes it statistically insignificant. Even if bank failures matter for the real economy, this could have been expected for two reasons: bank suspensions were widespread across states in some years, and the effect of failures could have a spillover effect across state borders. In both cases bank failures resemble a nationwide shock which is then removed by the time fixed effects. Although the OLS results are consistent with a causal effect, banks could still be failing as a result of output declines in the same state (making β_1 negative). To make a claim that bank failures caused declines in value added, I proceed to the IV analysis.

I use two state-specific indicators to predict the ability of the local banking system to absorb any given shock. These are the percentage of branch offices in the year 1920, $bstructure_s$, and the increase in the value of farmland over the 1910s, $\Delta farmvalue_s$. The two are summarized in Panel C of Table 1. I assume that neither state-variant indicator is systematically related to industrial output growth other than through bank failures. My first indicator, the percentage of branch offices, is telling of risk sharing within the system; unit banks were likely to fail during the 1920s. It also indicates how much risk taking occurs in expansions; branched banks that greatly expanded in the twenties were likely to fail during the Great Depression. The risk-sharing effect turns out to dominate in the 1921-1937 sample used. Driven by differences in regulation long predating the Great Depression, I assume that branching will not affect manufacturing output other than through bank failures. My other indicator, market conditions for farmland inherited from the previous period, predicts the quality of the loans banks made. The European agricultural demand during the Great War fueled a rise in the price of farmland. The most affected states were left with fragile banking systems - the farmers would fail to pay the mortgages they took out in expansion when challenged by the subsequent decline in agricultural prices. If anything, changes in the value of farmland would make it harder to find an effect of bank failures using IV inference. Experiencing a decline in income, farmers would demand less manufacturing output. But, this would at the same time make them willing to supply their labor to local manufacturing at a lower cost. As long as goods markets were better integrated than the labor markets, the net effect on manufacturing production would be favorable, making it even harder to find an effect of failures.

The two indicators, in their original form, are however for two reasons not appropriate to be used as instruments of bank failures. First, they are not able to explain by themselves the variation in failures over time. Second, because they only vary across states, they are not fit for use in any specification that includes state fixed. To overcome these difficulties, I interact them with the period-specific national level of deposit suspensions $USfail_t$. The compound instruments I obtain both vary over time and survive the inclusion of state fixed effects. The rationale is the following: any national shock that propagates across states would result in more failures in states with poorer risk sharing within the banking system and more leveraged clients.

Table 3 presents the IV results. Panel A reports the results of the first-stage regressions underlying each of our three regression specifications. Panel B gives the corresponding second-stage regressions, the estimates of the causal impact of bank failures on the growth in value added by manufacturing. Each column thus corresponds to one of the specifications.

[Table 3]

The results of the first stage regressions in panel A confirm that the compound instruments are significant predictors of deposit suspensions. The interaction between the percentage of branch offices in 1920 and the national level of failures is negative. This means that the more branched a banking system was, that is the better was the risk-sharing within the state, the fewer failures resulted in that state for any given level of failures at the national level. On the other hand, the interaction between the change in the value of farmland and the national level of failures is positive; the greater was the expansion in farmland in the 1910s, the more fragile were the banks afterwards and more failures resulted in that state from any shock that operated at the national level. The test of instrument strength verifies that our IV estimates ought to be reliable, in particular in the first two specifications. The F statistic of the excluded instrumets is around 20 in the first two specifications; it only falls to around 7 when period fixed effects are added.

The results of second-stage IV regressions are given in Panel B. The estimates are again economically and statistically significant. Bank failures appear to cause a reduction in growth of value added by the manufacturing sector. The estimates of β_1 in the first two specifications, without and with state fixed effects, agree with each other. They suggest that a one percent of deposits in suspended banks causes the growth in value added by manufacturing in the same state to decline by more than five percent. Adding the period fixed effects in the third specification removes the statistical and most of the economic significance of the effect of suspensions. Because the time fixed effects are expected to capture in part the effect of failures themselves, this need not be evidence against an effect of bank failures.

The estimated effect of bank failures is more than twice as large as its OLS counterpart. This finding is striking. If the OLS estimates are affected by reverse causality, whereby declines in output lead to bank failures, the use of instruments is expected to instead reduce the OLS coefficients. Two factors however could make the true effects of failures, estimated using instruments, larger than the OLS estimate. First, our instruments could have more predictive power in areas with fewer alternatives to financing by banks. The change in farm value in the 1910s must be a better predictor of bank failures in rural than in urban areas. Rural manufacturing establishments likely had less access to non-bank financing than their urban counterparts. Second, deposit suspensions can be interpreted as measuring financial distress with an error.

Suppose that bank failures have a direct and an indirect effect. The direct effect is limited to the same state where the failures happen. Because most lending was local, the lost lending of the failed banks belongs to this category. The indirect effect operates both in the state experiencing failures and in the neighboring states. When banks fail, they can create expectations of future failures and alter the behavior of both banks and depositors, and both firms and consumers, both within and beyond state borders. For instance, banks build cash reserves and reduce lending in fear of bank runs; their clients engage in precautionary deposit withdrawals, further limiting the lending ability of the surviving banks.

Figure 3 illustrates how my explanatory variable measures the actual financial distress with an error; it shows two stylized maps representing states experiencing bank failures. I denote the direct effect with a δ and the indirect effect with a γ; both give the reduction in growth resulting from a unit of failures. The map on the left shows the direct effect. The total effect (that includes both the direct and the indirect effect) is depicted by the map on the right. Note that the state-specific deposit suspensions correspond to the direct effect only. This means that suspensions measure the total effect of failures, both in the states experiencing failures and the neighboring states, with an error (of -γ). As a consequence, the OLS estimates are biased towards zero.

[Figure 3]

But, my instruments should be able to correct for this bias by also predicting the indirect effect, both in the state experiencing failures and the contiguous states. The changes in farm value over the 1910s and percentage of branch offices in the year 1920 measure the fragility of a banking system. The indirect effect ought to be stronger in states with more fragile banking systems; vulnerable banks worry the most for their liquidity following failures in their neighborhood. By predicting financial distress even in the absence of bank suspensions, the IV inference ought to give the true and a greater effect of bank failures than the one implied by the OLS regressions.

For how large a part the Great Depression could then the bank failures account? The answer to this question depends on how much of the time fixed effects we should associate to the effect of bank failures, and how much to other unobserved factors. Assuming that half of the time fixed effects could be associated with bank failures, the IV estimates suggest that one percent of deposits suspended causes a decline of 3 percent in the growth of value added. Panel A of Table 1 suggests that the change in the growth of value added with the onset of the Great Depression was a decline of about 50% (from +17.83 in 1921-1929 to -31.02 in 1929-1931). Given that the average incidence of bank suspensions was 5% per year in 1929-1932[3], around 15% of this 50% decline could be associated to bank failures; somewhat less than a third. Given that my instruments have greater predictive power in the rural part of the sample where there are fewer alternatives to banks, a conservative estimate would suggest that bank failures accounted for less than a third of the Great Depression.

My results relate to those of Calomiris and Mason (2003) in defending the claim that bank failures were important in the Great Depression. They use loan-supply instruments to find a causal effect of changes in loans and deposits on production income in the cross section of states. My paper instead uses a novel set of instruments to show that bank suspensions themselves had a causal effect on output throughout the interwar period. I consider this broader. First, bank failures can affect output in other ways than a decline in loans, because failing banks create expectations of more failures, altering the behavior of banks (which could still lend, but only for firms to build buffer stocks of capital rather than produce), firms (which could delay investment to retain more earnings) and consumers (who could delay purchasing durables). Secondly, basing the findings on the whole interwar sample is robust to a critique that results are driven by other shocks of the Great Depression which only coexist with bank failures.

1.5 Robustness

This section presents the robustness checks. I first examine the relationship between bank failures and output declines only in the sample of the Great Depression, rather than the whole interwar sample. I then use national monthly data to evaluate the real impact of the unique bank failures of March 1933.

a. Only the Sample of the Great Depression

The results from the interwar sample thus assign a prominent role to bank failures in causing declines in value added by manufacturing. The use of the full

[3] The year 1933 is not considered because of the special character of the 1933 bank failures.

interwar sample is to make the estimates more reliable; there were many shocks in the Great Depression and their effects could be confounded with those of the bank failures. I want to however verify that the bank failures also had real consequences in the Great Depression itself. There are limitations to testing this using value added by manufacturing; data from the censuses of manufactures are biannual, and 1931-1933 is to be excluded because of the unique features of 1933 bank failures. This leaves us with 1929-1931 period only[4]. Instead, I use another measure of the real performance of the economy for which I have yearly data. This is gross corporation income. To test for the real effects of bank failures in 1929-1932, I thus analyze how gross corporation income correlates with deposit suspensions across states.

I find that the growth of gross corporation income in the Great Depression correlates negatively, across states, with deposit suspensions. Cole and Ohanian (2001) found no correlation between personal income growth and bank suspensions in a similar exercise. But, gross corporation income should be more affected by the shocks to local banks than personal income; it is a measure of output produced within a state. Personal income must also include a number of inter-state transfers (such as the salaries of federal employees) that blur cross-sectional identification. The gross income of corporations is obtained from the Statistics of Income (U.S. Internal Revenue Service, 1929-1933). Figure 4 plots growth in gross corporate income over the Great Depression against the state fraction of deposits suspended. The correlation is negative, although marginally statistically insignificant. This agrees with the findings of Calomiris and Mason (2003) who show that the growth in loans and deposits in the 1930-1932 period (which ought to be in part driven by bank failures) predicts contemporaneous growth in production income in the cross section of U.S. states.

Any inter-state spillover in the effect of bank failures would however make the correlation with any measure of output hard to observe. I study the consequences of spatial spillovers for cross-sectional identification in a Monte

[4] In the cross section of U.S. states for the 1929-1931 period only, growth in value added by manufacturing correlates negatively with bank failures, the relationship being statistically insignificant.

Carlo exercise. The results show that documenting correlation becomes particularly difficult under conditions that were satisfied during the Great Depression. These include failures which are intense and widespread, large spillover effects of failures (that could be caused by contagion), and failures that originate in the economic and financial centers of the country. The correlation between corporate income growth and bank suspensions observed in this paper should be given a high value in light of my simulation results; figure 4 shows that higher declines in production occurred in states experiencing intense failures.

[Figure 4]

b. Bank Failures of March 1933

The failures of March 1933 were unique among all interwar failures -- they were followed by resolute action of the Roosevelt administration that guaranteed the soundness of the reopened banks. Unlike the failures in any other biannual period in my panel, those of 1932-1933 are not associated with sharper declines in value added by manufacturing[5]. In this subsection I use national monthly data to argue that they too had important immediate effects. In the months after March 1933 these effects were however either reversed by the recovery of trust to the banking system, or their identification was blurred by the recovery that ensued.

In the biannual interwar panel of states I find significant real effects of bank failures in all except the 1932-1933 period. 85% of these suspensions are associated to the year 1933, primarily to the aftermath of the March banking holiday. Monthly data on real indicators from the period nonetheless suggest they too had important real effects. But, unlike the bank failures in any other period, the uncertainty they were associated with was quickly resolved. Figure 5 gives the monthly index of manufacturing production in the period around the last banking crisis of the Great Depression in February and March 1933. The four panels of Figure 6 show indices of industrial production, factory

[5] Out of the whole interwar sample, the correlation between growth in value added by manufacturing and deposit suspensions is actually positive and statistically significant only in this (1931-1933) biannual period.

employment, freight car loadings and department store sales. All the indicators follow an identical pattern. First, the initial effect of the February and March closings appears severe, consistent with my findings from times when failures also created uncertainty and fear of more failures. All the indices reach their lowest values in March. The rate of decline is also the highest during the crisis - January to March 1933 manufacturing production declined by 9%. Second, as soon as government action restored the trust to the banking system, a strong recovery ensued. Followed by resolute government action that guaranteed the soundness of the reopened banks in mid-March, the 1933 failures were thus only briefly associated with the uncertainty that resulted from the earlier failures. The government also demonstrated real commitment to its proclaimed goal. In particular, following the banking holiday in 1933, the Reconstruction Finance Corporation was entrusted with providing aid to the reopened banks; this included implementing their capital. The redepositing of $600 million until the end of March (Wicker, p.136), one tenth of the currency in circulation, shows that the intervention restored the trust in the system. Without the return of confidence, uncertainty could have led to lending constraints of the surviving banks, precautionary borrowing, and the build-up of cash reserves by the firms -- all with contractionary consequences.

[Figure 5]

[Figure 6]

The recovery of trust in the banking system appears to have taken the edge away from the effect of bank failures. Moreover, even if the remaining effect was significant, its identification would be blurred because of the recovery that, for other reasons too, ensued at the same time (after March 1933). Eggertsson (2008) presents a prominent explanation of the recovery. He follows Temin (1976) in associating a deflationary shock with the origin of the Great Depression. In the resulting deflation, the nominal interest rate slid towards the zero bound while the real rate was well above the new efficient level. Eggertsson argues that Roosevelt made the real interest rate fall by creating expectations of a higher future money supply. The shift in expectations was made possible by parting with the Hoover-era policy dogmas: the gold standard, balanced budget and small government. Using a standard DSGE model, he manages to explain 70-80 % of the recovery. Thus, policy actions of the new Roosevelt administration, other than the guarantees to the reopened banks, could have led to a strong recovery that makes it hard to identify any remaining effect of March 1933 bank failures.

My results also provide some evidence on whether bank failures and uncertainty can account for the deflationary shock in Eggertsson (2008), although they do not fully resolve the question about its origin. Eggertsson's model of policy change fits the data only if a low intertemporal shock is present both since the beginning of the Depression (1929-1933), and throughout the recovery (1933-1937). If the shock instead ends in 1933, the recovery does not require a change in expectations. But, this leads to an immediate rise in the nominal interest rate, contrary to the facts. Eggertsson mentions two possible sources of the shock: the uncertainty effect of the stock market crash (Romer, 1990) and the bank failures (Bernanke, 1983). My findings on the real effects of bank failures prior to 1933 confirm that such a shock could have lasted through the contraction (1929-1933). As for the failures of March 1933, their effect was either significantly dampened by the recovery of trust to the banking system, or its identification is blurred by the coincident recovery that could have proceeded for other reasons. After the banking holiday of March 1933, however, there were only a handful of failures throughout the 1930s. The cumulative losses of the banking system in the Depression could have nonetheless contributed to keeping the deflationary shock high during the recovery. The evidence given by Carlson and Rose (2011) suggests the shock could have remained. They show that banking distress during the Great Depression was still an important predictor of the variation in the availability of loans in 1934 at the county level. Besides the bank failures, the other proposed source of the deflationary shock is the rise in uncertainty brought by the Great Crash at the onset of the Depression; the uncertainty about future income then depressed durable consumption (Romer, 1990). To the extent that the recovery of the trust in the banking system, after the actions of Roosevelt's administration in March 1933, contributed to the removal of general uncertainty about future income too, it is less likely that the same uncertainty continued into the recovery.

1.6 Conclusion

While bank failures were traditionally seen as a factor which played an important role in making the Great Depression worse (Friedman and Schwartz, 1963; Bernanke, 1983), the empirical support for this view has not been solid. My paper attempts to strengthen this support. It does so by evaluating the importance of bank failures for value added by manufacturing in an interwar panel of U.S. states, and using a set of two novel instruments of bank failures.

My findings indicate that bank failures caused declines in value added by manufacturing, in particular near the failed banks (in the same states). Two measures of pre-determined fragility of the banking systems in each state served as the instruments of bank suspensions. These are the percentage of branch offices in the year 1920 and the increase in the value of farmland during the 1910s. The former measures the risk sharing within the banking system of a state, while the latter indicates the state-specific exposure to the demand shock for food during WWI. My estimates suggest that one percent of deposits suspended causes a decline of around 3 percent in the growth of value added. This suggests that bank failures could account for up to a third of the decline in value added brought by the onset of the Great Depression.

Two robustness checks confirm my findings. The relationship between bank failures and output (measured by gross income of corporations) by states over the course of the Great Depression confirms my findings from the whole interwar sample. I also separately examine the real effects of the March 1933 bank failures using national monthly series of real activity. Their immediate effects appear to be severe, consistent with the previous findings. But, in the months that followed their effect faded. This could have occurred either because of the guarantees of the new Roosevelt administration for the reopened banks, or because their effects were blurred by the recovery that started for other reasons too.

What do we learn from this paper about the Great Depression? While bank failures are frequently seen as important in that period, to this day there is no consensus on their contemporary role. This paper provides novel evidence that bank failures were important in the Great Depression, both at its origin and in the deepening phase. This suggests they could have contributed to the deflationary shock which Eggertsson (2008) finds important in explaining the Great Depression. Whether the losses of the banking system could cause such a shock to persist in the aftermath of the Depression, and also account for a delayed recovery, remains as a question for future research.

1.7 Figures

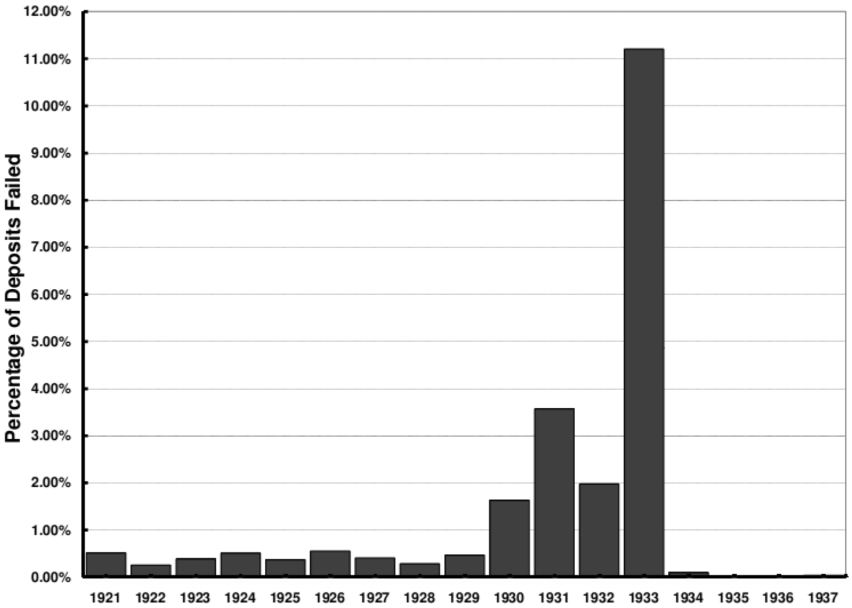

Figure 1

U.S. Interwar Bank Failures

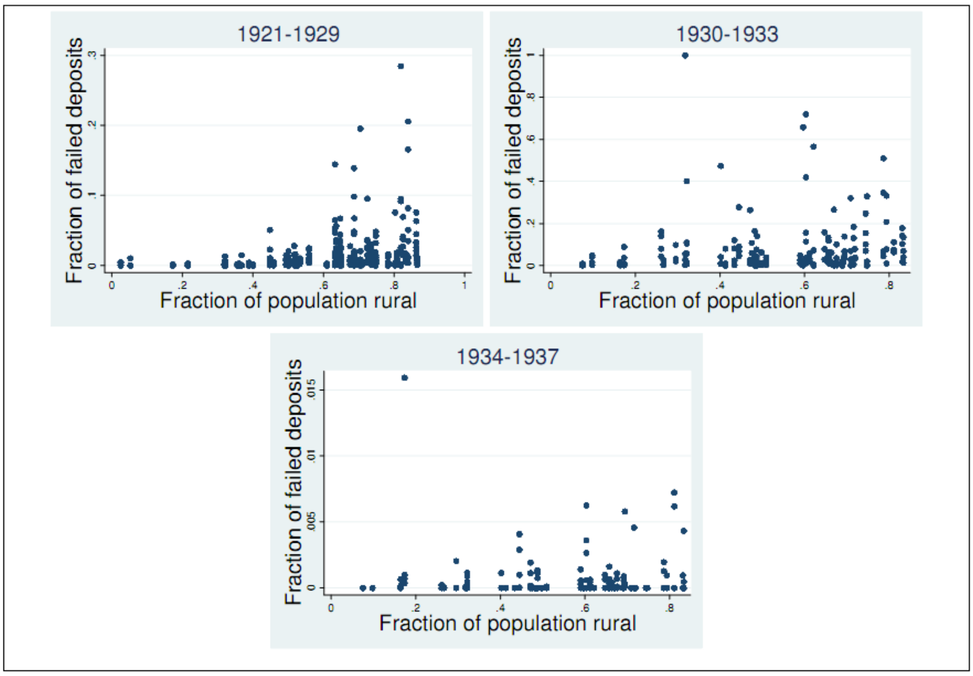

Figure 2

Bank Failures in Rural and Urban States, by Period

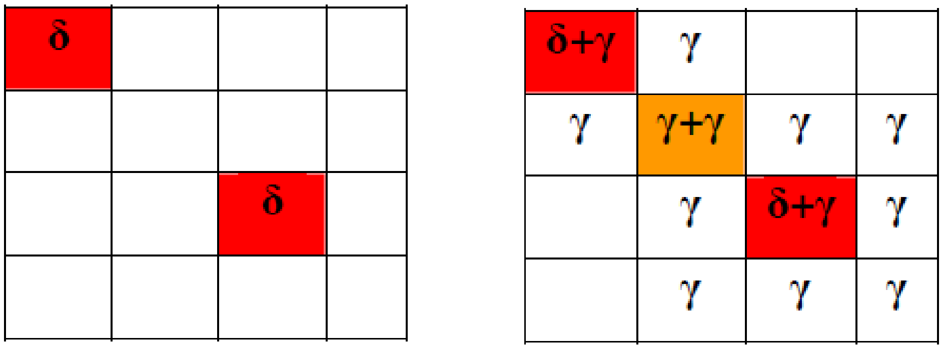

Figure 3

Direct and Indirect Effect of Bank Failures in a Cross-Section of States

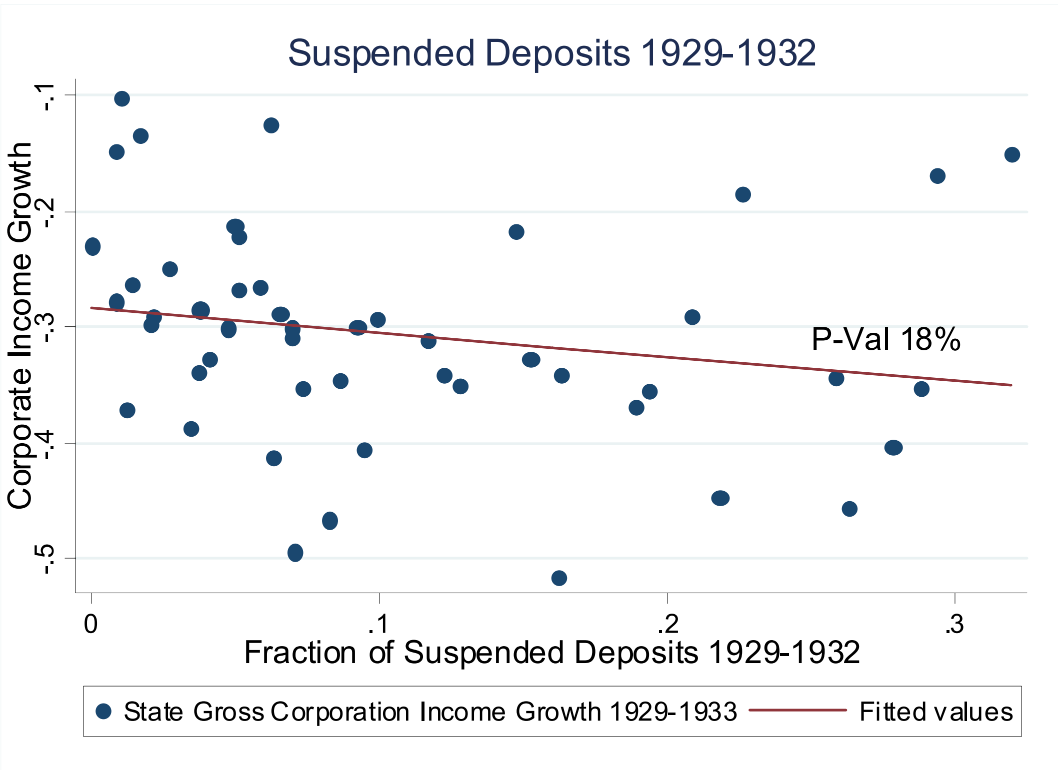

Figure 4

Growth in Corporate Income in the Great Depression

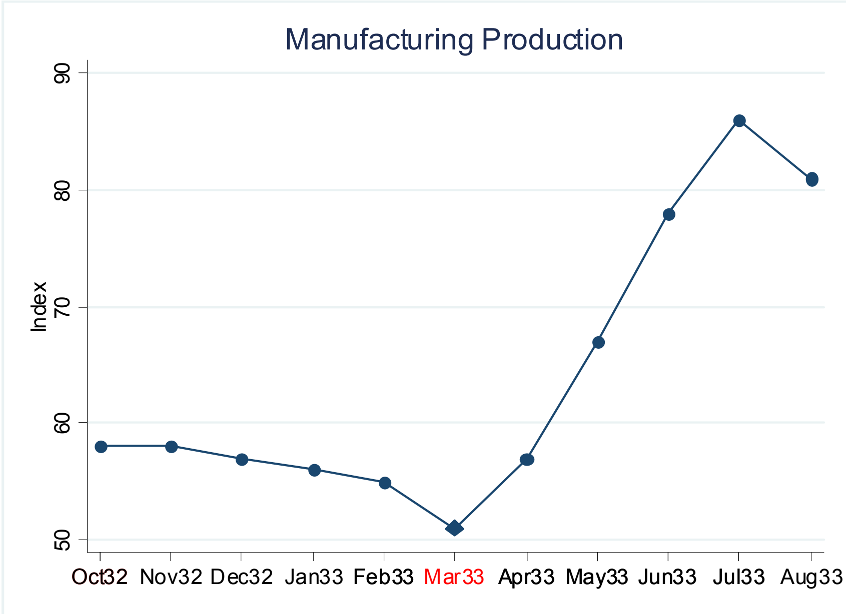

Figure 5

Manufacturing Production before and after March 1933

Note on data: Manufacturing Production, Adjusted for seasonal variation, 1935-1939=100, from "Federal Reserve Bulletin", Washington DC, August 1940, p.765

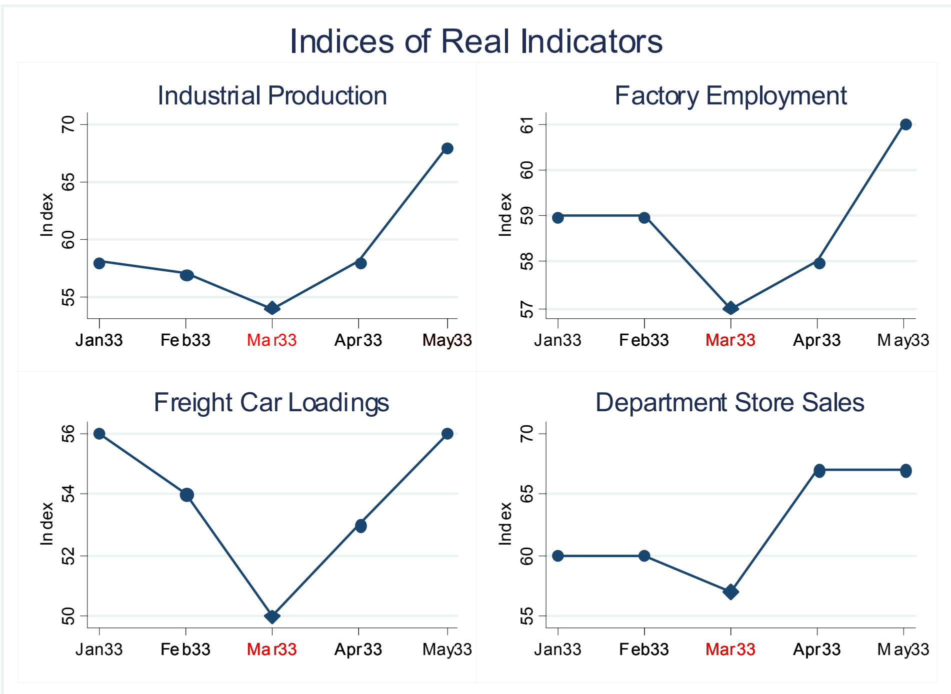

Figure 6

Real Indicators before and after March 1933

Note on data: Industrial Production, Adjusted for seasonal variation, 1935-1939=100, from "Federal Reserve Bulletin", Washington DC, August 1940, p.765; Factory Employment, Freight Car Loadings and Department Store Sales, 1923-25=100, from "Annual Report of the Federal Reserve Board for 1933", Washington DC, 1934, pp.240-1

1.8 Tables

TABLE 1
DESCRIPTIVE STATISTICS

This table presents sample statistics. Panel A shows the biannual growth in value added of the whole manufacturing sector which varies by states and periods. The first column covers the whole sample (1922-1937) while the other columns divide it by sub-periods. The source for the data is the interwar summary table in the 1947 Census of Manufactures. Value added used for calculating the growth rate was deflated using "CPI for all Urban Consumers, All Items" from the U.S. Bureau of Labor Statistics. The biannual period 1932-1933 was excluded from the sample. Panel B summarizes state-period specific biannual percentage of deposits in suspended banks. The first column covers the whole sample (1922-1937) while the other columns divide it by sub-periods. The variable was obtained by combining deposits in all commercial banks sourced from "Banking and Monetary Statistics 1914-1941" with the total deposits of suspended banks from "All Bank Statistics 1896-1955". The biannual period 1932-1933 was excluded from the sample. Panel C shows two state specific predictors of bank failures: branch bank offices as a percentage of the total number of offices in the year 1920 and the change in farm value over 1910s. The data on branch banking are sourced from the "Banking and Monetary Statistics 1914-1941". The data on values of farmland come from the ICPSR dataset 9, Pressley and Scofield (2001).

	Panel A Biannual Manufacturing Growth Rates			
	1922-1937	1922-1929	1930-1931	1934-1937
Value added growth$_{st}$ (%)				
Mean	13.02	17.83	-31.02	25.40
Standard deviation	(28.41)	(25.11)	(10.53)	(18.47)
Number of state-periods	336	192	48	96
	Panel B Percentage of Deposits in Suspended Banks			
	1922-1937	1922-1929	1930-1931	1934-1937
Deposits suspended$_{st}$ (biannual %)				
Mean	2.48	2.37	7.50	0.17
Standard deviation	(4.99)	(4.66)	(7.16)	(0.71)
Number of state-periods	336	192	48	96
	Panel C Banking Structure and Farmland Value Change			
Branch offices in 1920$_s$ (%)				
Mean	8.27			
Standard deviation	(12.08)			
Number of states	48			
Farm value change over 1910s$_s$ (%)				
Mean	73.31			
Standard deviation	(44.95)			
Number of states	48			

TABLE 2
REAL EFFECT OF BANK FAILURES - OLS RESULTS

This table presents the results from estimating ordinary least squares models to measure the effect of bank failures on the growth in value added by manufacturing. The dependent variable is the biannual growth in value added by the whole manufacturing sector (summarized in Table 1). The explanatory variable is the percentage of suspended deposits (summarized in Table 1). The regressions reported in each of the three columns differ by the set of fixed effects included. The biannual period 1932-1933 is excluded from the sample because of the special character of 1933 bank failures. Constants were calculated but were not reported. Heteroskedasticity-robust standard errors are in parentheses: * p < 10%, ** p < 5%, *** p < 1%.

Dependent variable is Value added growth$_{st}$	OLS Results (1921-1937)		
	(1)	(2)	(3)
Deposits suspended$_{st}$	-1.85	-2.25	-0.10
	***(0.34)	***(0.41)	(0.26)
Fixed effects			
State	No	Yes	Yes
Period	No	No	Yes
Obs	336	336	336
R^2	0.106	0.162	0.752

TABLE 3
REAL EFFECT OF BANK FAILURES - IV RESULTS

This table presents the results from estimating two-stage least squares regression to measure the effect of bank failures on the growth in value added by manufacturing. The regressions reported in each of the three columns differ by the set of fixed effects included. The biannual period 1932-1933 is excluded from the sample because of the special character of 1933 bank failures. Panel A gives the first stage results. The two state variant instruments of bank failures, percentage of branch offices in 1920 and the change in the value of farmland over the 1910s, were interacted with a period-variant measure of deposit suspensions at the national level to enable their use in regressions which include state fixed effects. Panel B gives the second stage estimates of the effect of deposit suspensions on growth of value added by manufacturing. The dependent variable is the biannual growth in value added by the whole manufacturing sector (summarized in Table 1). The explanatory variable is the percentage of suspended deposits (summarized in Table 1). Constants were calculated but were not reported. Heteroskedasticity-robust standard errors are in parentheses: * p < 10%, ** p < 5%, *** p < 1%.

Dependent variable is Deposits suspended$_{st}$	Panel A First Stage Regressions		
	(1)	(2)	(3)
Branch offices in 1920$_s$ (%)	-1.88	-0.87	-1.36
X US Deposits suspended$_t$ (%)	**(0.94)	(0.95)	(1.02)
Farm value change over 1910s$_s$ (%)	1.77	1.82	1.59
X US Deposits suspended$_t$ (%)	***(0.30)	***(0.29)	***(0.51)
Fixed effects			
State	No	Yes	Yes
Period	No	No	Yes
Obs	336	336	336
F-test of excluded instruments	17.62	23.74	6.59

Dependent variable is Value added growth$_{st}$	Panel B IV Results (1921-1937)		
	(1)	(2)	(3)
Deposits suspended$_{st}$	-5.36	-6.33	-0.26
	***(0.90)	***(0.89)	(0.49)
Fixed effects			
State	No	Yes	Yes
Period	No	No	Yes
Obs	336	336	336

2. FINANCIAL DEPENDENCE AND THE SEVERITY OF THE GREAT DEPRESSION

2.1 Introduction

During the Great Depression, the U.S. output collapsed in an environment of widespread bank failures. Whether the bank failures actually caused the contemporary declines in output remains disputed. Friedman and Schwartz (1963) argued that bank failures led to money supply reductions which in turn depressed economic activity. Bernanke (1983) suggested they raised the cost of credit intermediation. The empirical basis for both interpretations is not fully convincing. The paper which constitutes the first chapter of my thesis introduces a novel set of instrumental variables to argue that bank failures had a causal effect on output throughout the interwar period. It however does not provide evidence of the mechanism by which financial distress was transmitted to the real economy. While the relationship between financial distress and business cycles is generally considered important, it is far from being fully understood. Most macroeconomic models until recently did not incorporate a financial sector (e.g. Prescott, 1986; Goodfriend and King, 1997); even those models that emphasize financial accelerator mechanisms (following Bernanke and Gertler, 1989; Kiyotaki and Moore, 1997) had little to say about the role of bank failures until the recent financial crisis (see Gertler and Kiyotaki, 2010). Both for theorists modeling the transmission of financial distress, and for policy makers, correctly uncovering the empirical facts from past recessions remains crucial.

In this paper, I provide new evidence that bank failures played a crucial role in making the Great Depression great. Extending the research presented in the first chapter of my thesis, I take a step towards identifying the transmission mechanism by which bank failures mattered. I demonstrate, in an interwar panel of state-industry observations, that financially dependent industries suffered the sharpest declines in output. I construct a novel indicator of financial dependence, appropriate for recessions, periods when capacities are unused and new investment is not a priority. Having collected industry-level data from the 1920s, I calculate the inverse interest cover on the eve of the Great Depression. It measures the difference between earnings (before interest and taxes) and interest payments due in the same year. It is firstly an indicator of short term financing needs - industries with lower interest cover are forced to borrow more, even if only for rollover of debt. Secondly, it is a measure of the difficulty to obtain credit in recessions. As a flow-side measure of assets and liabilities, it is indicative of bankruptcy risk, and in recessions lenders redirect credit away from high-risk borrowers (Bernanke, Gertler and Gilchrist, 1996). In addition, I use the external dependence measure of Rajan and Zingales (1998) which acts as an indicator of technology-driven investment needs. The later indicator just confirms my findings - greater external dependence also spelled faster output contractions, industry by industry, in states that were hit by bank failures.

In order to avoid confounding the effect of bank failures with that of a multitude of both domestic and international shocks of the Great Depression, I use the whole interwar sample. To verify that the identified effect of bank failures on output is causal, I use the novel set of instrumental variables which was introduced in the first chapter of this thesis. The two indicators of the pre-determined vulnerability of the banking system in each state are the percentage of bank offices that belong to branch banks in the year 1920 and the change in farm value over the 1910s. The risk-sharing between the offices of branch banks makes them more resilient to any shock. At the same time, states which experienced greater agricultural expansion during WWI had more leveraged farmers in its aftermath which made banks sensitive to any shock to agricultural income.

Several extensions verify both that bank failures mattered and that financial dependence is a relevant indicator of sensitivity to financial distress. In the period of the Great Depression only, I demonstrate that more financially dependent industries performed worse. Moreover, that the difference in performance of industries by financial dependence is driven by the output declines of highly dependent industries in states with intense bank failures. Furthermore, there is no evidence that the effect of bank failures on industries with different financial dependence is confounded with average firm size within an industry, the effect of uncertainty on consumption, or the cyclical movement of industry output expected in the absence of failures. The results are economically important. The estimates suggest not only that bank failures can explain at least a third of decline in manufacturing output during the Great Depression, but that the most financially dependent industries contract at least 1.5 percent more than the median dependent ones in states with one percent of suspended deposits. This suggests that at least a part of the effect of bank failures on output must have operated through declines in lending.

My paper is related to research on the transmission of financial distress to the real economy, the literature that relates bank failures of the Great Depression to output declines, and the work that relates bank failures to lending declines. Rajan and Zingales (1998) pioneer the measure of external financial dependence to study the relationship between financial development and growth. Using this indicator, Kroszner, Laeven, and Klingebiel (2007) and Dell'Ariccia, Detragiache, and Rajan (2008) document significant real effects of banking crises in cross-country studies. These works, however, do not address the concern over endogeneity, such as by using instrumental variables. The theoretical counterparts of my paper build on the concept of financial accelerator which dates back to Bernanke and Gertler (1989). This relates net worth of an agent with the external financing premium that he pays. Kiyotaki and Moore (1997) emphasize the interaction between asset prices and agency costs. Other papers, such as Bernanke and Gertler (1995), develop the concept of credit channel, the counterpart of financial accelerator when the original shock to the economy is monetary. But, the basic idea that declines in net worth and higher agency costs interact within an infinite loop remains the same. A finding of this literature is that the accelerator mechanism is even more pronounced in recessions. Brunnermeier and Sannikov (2011) concur in a recent study of full equilibrium dynamics of an economy with financing frictions. In addition to the recessions themselves, Gertler (2010) describes how banking crises can amplify the propagation mechanism. An empirical complement of this work relevant to my paper is Bernanke, Gertler and Gilchrist (1996). They show that the onset of a recession results in a "flight to quality" - a lower share of credit extended to borrowers facing higher agency costs.

Bernanke (1983), Friedman and Schwartz (1963), Calomiris and Mason (2003), and the paper which constitutes the first chapter of my thesis all argue that bank failures of the Great Depression had effects on output. Other work associates bank failures from the period to lending declines. In a recent contribution, Carlson and Rose (2011) demonstrate that bank failures reduced credit availability at the county level. Wicker (1996) gives a detailed description of the banking crises while Temin (1989) and Romer (1993) that of the Depression itself. Finally, Calomiris (1989), Alston et al. (1994), Wheelock (1995), Calomiris and Mason (1997, 2001), Carlson and Mitchener (2005), and Richardson (2007) all shed light on the causes of bank failures. In a recent contribution, Graham et al. (2011) find that firms with more debt and lower bond ratings in 1928 had a greater probability of becoming financially distressed during the Great Depression.

I proceed as follows. Section 2.2 places U.S. interwar bank failures in an historical context. I explain a number of ways in which bank failures can affect output in Section 2.3. Section 2.4 describes the data on output growth of manufacturing industries, measures of financial dependence, bank failures and their determinants. In Section 2.5 I explain the method used, present the main results that use inverse interest cover as the measure of financial dependence, and discuss my findings. Section 2.6 presents several robustness checks. It first verifies the main results using an alternative measure of financial dependence, the external dependence. It then confirms the principal findings in the period of only the Great Depression. The section also shows that the results are neither driven by the differences in average establishment size across industries nor by the cyclicality of durable output. The final section concludes.

2.2 Historical Background and Context

This section describes the prevalence, some of the causes, and the potential effects on output of the U.S. interwar bank failures. Moreover, it presents the evidence that bank failures led to declines in lending, in particular in the vicinity of the failed banks.

a. Bank Failures and Output Declines

Bank failures were widespread not only during the Great Depression but also during the 1920s. While the failures of the 1920s were particularly widespread in rural areas, those of the Great Depression were more equally distributed across the country. The onset of the Great Depression is associated with a fivefold increase in the intensity of bank failures measured by the fraction of deposits suspended. The failures of the fall of 1930 were frequently blamed for turning a deep recession into the Great Depression, while the failures of 1931 were considered responsible for deepening the Depression. The suspensions of 1933 were very intense; banks holding 11 percent of deposits were not allowed to reopen after March 1933 (Wicker, 1996). However, these bank failures were followed by decisive action of the federal government which guaranteed the soundness of the banks which were allowed to operate after the banking holiday of March 1933. Thus, they produced little uncertainty.

Several factors are seen as responsible for the bank failures of the 1920s and the Depression; these include falling borrower income, bank runs, and nationwide shocks related to the gold standard. However, common to both the twenties and the Great Depression were rural bank failures (Temin, 1976). Rural unit banking which limits risk sharing within the system could be one possible reason. The changes brought by the end of WWI could be another one. Many farmers which borrowed to meet the temporary war-time demand for food found it hard to meet their mortgage payments after this demand was gone; this left banking systems in some states particularly fragile to any shock to agricultural income.

Finally, the Great Depression is associated with large declines in output. GDP fell by 29% (Kendrick, 1961), while the decline of the manufacturing sector was even more pronounced. To what extent bank failures contributed to this decline remains however disputed. Rosenbloom and Sundstrom (1990) find that rural areas with many bank failures do not experience a greater fall in manufacturing output, although their analysis is performed by division rather than state-by-state. On the other hand, the monthly indices of industrial production and deposits in suspended banks are consistent with an effect of bank failures on output (Bernanke, 1983). Similarly, Calomiris and Mason (2003) use loan-supply instruments to argue that the growth in loans, which they associate to bank failures, does predict output growth.

b. Bank Failures and Lending Declines

Both the changes in the loans outstanding at the national level, and the availability of loans across the United States, suggest that bank failures of the Great Depression led to declines in lending. Bernanke (1983) observes that credit outstanding declined very little before the first banking crisis in November 1930. He also notices that the "shrinkage of credit shared the rhythm of the banking crises". For instance, October 1931 was both the month with the most intense failures before 1933 and the month of the largest decline in loans; credit declined by 31 % of personal income. Bernanke moreover explains how changes in behavior of the surviving banks reduced lending; he depicts a conscious effort of the banks to increase reserve-deposit ratios for precautionary reasons. The contemporary observers associated the banking crises with the "pressure by banks on customers for repayment of loans and refusal by banks to grant new loans" (National Industrial Conference Board, 1932). The ratio of loans outstanding to the sum of demand and time deposits declined from 0.8 before the first banking crisis to less than 0.6 just before the 1933 bank holiday. Calomiris and Berry (2004) shed light on yet another link between bank failures and lending. They demonstrate that declines in bank capitalization induced by deposit withdrawals (from depositors worried that their bank would fail too) are related to declines in lending. More authors show that lending declines were the most severe near the failed banks. Whicker (1996) says that a number of bank closings "resulted in the closing of many other banks, partly because of affiliate and correspondent relationships, and partly because of the spread of fear among depositors, particularly in territory near the location of the banks" (Whicker 32). More recently, Carlson and Rose (2011) use a 1934 survey on the availability of credit conducted by the Federal Reserve System of both banks and Chambers of Commerce. They demonstrate that various forms of financial distress, including the bank failures, reduced credit availability at the county level.

2.3 The Ways in Which Bank Failures Can Affect Output

In this section, I describe a number of channels by which bank failures can have a significant impact on real output. Combined, they give four testable predictions:

1. Bank failures will lead to real output declines.

2. A part of the output declines will result from a decline in lending; this will affect financially dependent industries the most.

3. The overall impact of these effects can make the total decline in output very large – a one percent reduction in intermediation capital can lead to a more than one percent decline in output.

4. All output declines will be the largest in the proximity of the failed banks.

The channels I outline agree with the previous work on the role of bank failures in the Great Depression. My predictions are moreover supported by the existing theoretical work. Both the earlier research on the financial accelerator, and the recent modeling of the initial impulse to the recession within the banking sector, predict large output declines that result from financial distress. Under certain conditions, the models also predict declines in lending; the financially dependent are then hurt the most.

a. Real Effects of Bank Failures – Channels of Transmission

I separate the effects of bank failures into those which are related to lending and those which are not. Table 1 gives my classification. All transmission channels of financial distress predict output declines. Among the lending-related ones, the effects through a decline in lending to firms play a special role; they predict larger output declines of the financially dependent industries. In need to borrow, but less able when lending declines, the financially dependent will both invest and produce less.

[Table 1]

Lost lending to firms of the failed banks

The declines in lending to firms can themselves result from the lost lending of the failed banks and the constraints in lending of the surviving banks. The lost lending of the failed banks could well account for only a modest part of the total effect of failures. If 1% of banking capital serves companies generating 1% of output, even if the banks failing lead to the disappearance of all their clients, hardly likely, not more than 1% of output would be lost. While the linkages up and down the supply chain could make the effect larger, any reliance on alternative sources of credit would moderate it.

Lending declines of the surviving banks

Failures also lead other banks to constrain lending. Declines in lending occur for three principal reasons: loss of assets in the failed banks, the precautionary effects - deposit withdrawals and increases in reserve-deposit ratio, and the loss of information about clients of the failed banks. The loss of loans to failed banks reduces assets of the surviving banks (see e.g. Whicker, 1996); the banks can then lend less subject to remaining solvent. The ability to lend is further impaired by precautionary deposit withdrawals (see e.g. Calomiris and Berry, 2004 for empirical evidence and Allen and Gale, 2000 for a model). Spread of fear of subsequent bank failures leads the depositors to reclaim their money while they still can. The reaction of the banks leaves even fewer funds for lending. To insure themselves against deposit withdrawals, they increase the reserve-deposit ratio by retaining more earnings (see e.g. Bernanke, 1983). Another channel of lending declines is the loss of information about clients of the failed banks. They face a higher cost of credit at the surviving banks who know little of them. Declines in lending to firms in turn impact investment and output, more so of the financially dependent. Notice finally that each of the reasons for lending declines to firms can also explain lending declines to consumers; they reduce output by suppressing demand financed by consumer credit.

Friedman and Schwartz's (1963) fall in the money supply and Bernanke's (1983) rise in the cost of credit intermediation are the two most prominent works that claim bank failures mattered. They too emphasize the role of bank failures in reducing Depression-era output via lending declines. In the interpretation of Friedman and Schwartz, the monetary contraction and lending reduction are inseparable. The money supply falls through the deposit multiplication mechanism: bank failures reduce deposits (some remain in suspended banks while others are withdrawn anticipating more failures) and lending while precautionary declines in lending of the surviving banks reduce the multiplier. In Bernanke's interpretation too, bank failures reduce lending. The former clients of the failed banks ought to borrow less after they face a higher cost of credit at banks that meet them for the first time.

Composition of lending effect

Bank failures also alter the expectations of the firms. This can change the composition of lending, resulting in output declines via the following mechanism. After the first banks fail, firms worry that more will follow and that funds will soon not be available. They then borrow to raise precautionary cash holdings, rather than to invest. This leaves fewer bank loans available for profitable investment. Changes in composition of lending can greatly amplify the initial effect of bank failures. For example, if a 1% of banks failing leads to a 5% increase in precautionary borrowing, the credit available for investment declines by 6%.

Uncertainty effects

The changes in firms' expectations open yet another avenue for output declines. This channel is not related to lending. Expecting that credit will not be available in the future, firms would not only borrow to build reserves but also change their use of retained earnings; they would invest less and keep more cash reserves. Even if say only 10% of firms would reduce their investment by 10% in response to 1% of banks failing, growth could plausibly be reduced by 1%. The incentives to accrue cash are even higher during deflation, rampant in the Great Depression. Consumption would also be affected by the uncertainty coming from bank failures. When the lifetime income becomes uncertain, consumers react by delaying irreversible purchases (Romer, 1990). In addition, deflation itself makes the build-up of cash reserves attractive also to consumers, depressing consumption overall.

I expect the outlined channels to have the greatest impact in the proximity of the failed banks. For the lost lending to firms of the failed banks, and the loss of loans to failed banks, it would be hard to argue otherwise. That most firms borrowed locally is consistent with the evidence given by Carlson and Rose (2011); the Chambers of Commerce in 1934 mostly blamed the failures of the local banks during the Depression for the difficulties in obtaining credit. Whicker (1996) in a similar manner gives evidence that banks maintained relationships mostly with their peers in the nearby territory.

But, even though all other channels I outlined in Section 3 could result in output declines beyond the surroundings of the failed banks, I still expect their impact to be the strongest there. Precautionary effects related to declines in lending, the composition of lending effect, and the uncertainty effects all depend on the changes in expectations. They ensue wherever the current bank failures cause expectations (of firms and consumers) of future bank failures. That local concerns were dominant is consistent with the evidence from the Great Depression. As outlined in Section 2, the "spread of fear among depositors" (Whicker, 1996) had causes in proximate bank failures.

While "local" effects of bank failures are a direct prediction of Bernanke (1983), they are also not inconsistent with the mechanism of decline in the money supply stressed by Friedman and Schwartz (1963). A "local" effect of bank failures has usually been associated with Bernanke (1983). Because most lending was local, the loss of intermediation capital would be felt the most near the failed banks. Friedman and Schwartz' (1963) narrative on the role of bank failures instead does not emphasize any cross-sectional effects; it describes a decline in the aggregate stock of money and its effects at the national level. Although the two works have a different emphasis, the mechanism by which money supply is reduced according to Friedman and Schwartz can also result in local effects. They argue that bank failures reduced the trust in banks, which made deposits a less desirable form in which to hold assets. This increased the ratio of currency to deposits, reducing the money multiplier and the money supply. But, if bank failures caused more precautionary deposit withdrawals in their proximity (i.e. if bank failures in Indiana caused more concern among depositors in Indiana than in New York), then the ability to lend of the local banks was impaired the most. This would in turn lead to local declines in lending and in output.

I have explained a number of channels by which bank failures cause declines in real output. My empirical analysis does not distinguish between each one of them. It only emphasizes the set of effects related to lending declines to firms (listed in the first row, first column field of Table 1); they ought to result in higher output declines of financially dependent industries. Nevertheless, the multitude of the effects predicts that bank failures can result in substantial output declines (more than proportional to the initial banking shock). Both the channels I describe and the empirical evidence from the Great Depression suggest that failures will have the strongest impact in the surrounding area, even if their effects could be felt further too.

b. Predictions of the Theoretical Literature

The related theoretical work predicts amplification of financial distress in its impact on output and, under certain conditions, lending declines caused by banking crises. This agrees with the channels I outlined; bank failures will result in large output declines that are even more severe for the financially dependent industries. Theoretical counterparts of my work belong to the family of literature in macroeconomics which models banks as financial intermediaries. These models are inconsistent with a Miller-Modigliani world. Financial markets are instead incomplete, and financial intermediaries bridge the informational asymmetry between the lenders and the borrowers.

The modeling of how financial factors propagate the real activity dates back to Bernanke and Gertler (1989). The most prominent theoretical mechanism used to rationalize significant real effects of financial factors is the financial accelerator. The basic concept relates the net worth of an agent with the premium on external finance that he pays - the agency cost of lending resulting from asymmetric information. A fall in borrower's net worth would raise the external finance premium that he faces, reducing his spending and output. If the negative shock is economy-wide, the financial accelerator would deepen the recession, implying ever higher premia and output declines within an infinite loop. Kiyotaki and Moore (1997) emphasize that further amplification can result from the interaction between credit constraints and asset prices which determine the agents' net worth. Related work developed the concept of credit channel (see e.g. Bernanke and Gertler, 1995), the counterpart of financial accelerator when the original shock to the economy is monetary. In all this work however the difference between an agent's assets and liabilities is the key determinant of his economic destiny. The agents with lower net worth will always face higher external financing premia. Moreover, they will be perceived as risky in recessions and lenders will redirect credit away from them (Bernanke, Gertler and Gilchrist, 1996).

The earlier theoretical work[6] had little to say about the role of bank failures themselves. But, once each of the channels I describe in Table 1 causes an initial decline in output, the financial accelerator is set in motion and output falls by more. Theory also predicts that accelerator becomes more pronounced in recessions; this implies greater total fall in output. Bernanke, Gertler and Gilchrist (1996) emphasize that changes in the financial condition matter more for those firms whose balance sheets are closer to the lending requirement cutoff. The deeper is the crisis, the more firms are affected. The empirical findings of Kashyap, Lamont and Stein (1994) for investment in inventories are also consistent with nonlinearities in the accelerator mechanism. Brunnermeier and Sannikov (2011) concur in a recent study of full equilibrium dynamics of an economy with financial frictions. Away from the steady state, in times such as the Great Depression, their economy is characterized by high nonlinearity.

During the Great Depression, the usual financial accelerator interacted with the disruptions of the financial system. The cost of external finance rose not only because of the lower net worth of the borrowers but the lost and unused intermediation capital (Bernanke, 1983). It was however not long ago that macro models started incorporating disruptions of the financial system. The recent crisis has spurred a lot of research that models the initial impulse to the recession within the banking sector itself[7]. Gertler (2010) gives an overview of

[6] For a survey see Gertler and Kiyotaki (2000).
[7] Much of this work is surveyed in Gertler and Kiyotaki (2010), while prominent new works include Gertler and Karadi (2011) and Iacoviello (2011).

the work that links banking crises to economic activity. The crux of his model is a maximum feasible leverage ratio (bank assets to equity) that creditors will tolerate; a bank cannot attract more deposits than proportional to its capital, i.e. its ability to cushion creditor losses. A binding leverage constraint precludes the arbitrage between the bank lending rate and the riskless rate. Banking crisis is a tightening in the limits to arbitrage; it disrupts the flow of funds between banks and depositors. In crises, bank capital is lost and the risk of banks not paying back rises. The loss of capital leads to a sudden rise in the leverage ratio, leading banks to sharply reduce lending to counter this. The rise in risk reduces the maximum leverage ratio for any given level of bank capital, also causing bank lending to drop. The rest of his stylized model explains why lending will decline only under certain conditions, while the excess return on capital will necessarily rise[8]. But, we can observe lending and we know that it fell during the Great Depression. This makes Gertler (2010) relevant for my work for two reasons. First, the mechanism that he describes is consistent with the channels I use to justify declines in lending of the surviving banks. Loss of loans to failed banks is a sudden drop in bank capital. In a similar manner, the changes in the reserve-deposit ratio and the precautionary deposit withdrawals are just adjustments to a lower maximum tolerable leverage ratio. Second, his model predicts lending declines; this implies the financially dependent industries, those in need to borrow, will be hurt the most.

There are thus three reasons for the theoretical literature to be supportive of large real effects of bank failures. First, any initial real effects will be amplified by the standard financial accelerator. Second, the accelerator will be stronger in deep recessions such as the Great Depression. Finally, the financial accelerator will interact with disruptions of the banking system; the external finance premium will rise for both reasons. Moreover, recent work sketched by Gertler

[8] The rest of the mechanism Gertler (2010) describes is outlined here. Lending declines lead to a fall in the price of capital and raise the required return to capital. This depresses the consumption of durables, affecting the real activity. The rise in the excess return to capital will work to counteract the increase in the risk, raising the maximum leverage ratio and contributing to an increase in lending. The gap between the return on capital and the riskless rate will nevertheless necessarily rise. The evidence from the recent crisis suggests that the quantity of credit could either rise or fall, depending in part on how well capitalized are the financial institutions at the onset of the crisis (the lending of investment banks fell, while that of commercial banks initially rose).

(2010) is consistent both with my prediction of declines in lending and the mechanisms through which it would ensue.

2.4 Data

This section presents my dataset. The growth rate of manufacturing output, variant across states, periods and industries, is the dependent variable. Industry-specific measures of financial dependence, and state and period specific bank suspensions, are the explanatory variables. I use the following two measures of financial dependence: external dependence of Rajan and Zingales (1998) and a novel measure of dependence, the inverse interest cover, constructed using data from the 1920s. The percentage of offices of branch banks in the year 1920, and the changes in values of farmland over the 1910s, serve as the state-variant instruments of bank failures.

a. Growth Rates of Manufacturing Output

The preferred measure of output performance is the biannual growth rate of output specific to state and industry. A unit of observation is, for example, growth of glass output in Arizona between 1923 and 1925. The biannual U.S. Censuses of Manufactures served as the original source. I use a modified version of the dataset used in Rosenbloom and Sundstrom (1999). Their data include twenty one out of thirty one largest employers among the manufacturing industries, as ranked in 1929. I exclude two of these to make the sample more compact: rayon (because it contains only a handful of observations), and cigars (because it is an outlier by external dependence). I also merge lumber industry and planning mills industry since I map them to a single score of external dependence. The changes result in a dataset of eighteen industries. Their growth rates are obtained for 7 biannual periods between 1921 and 1937. These are 1921-1923, 1923-1925, 1925-1927, 1927-1929, 1929-1931, 1933-1935 and 1935-1937. The 1931-1933 period (covering 1932 and 1933) is excluded because of the distinct character of the bank failures in 1933; the rationale for exclusion is explained in the subsection 4.3. The values of output behind the growth rates were first deflated using the Consumer Price Index for

All Urban Consumers (All Items) (U.S. Bureau of Labor Statistics, 2010). Panel A of Table 2 summarizes the growth rates of output.

My sample covers a lion's share of U.S. interwar production. Few but large, the sampled industries contributed with 40 percent to total manufacturing output in 1929 (U.S. Bureau of the Census, 1929). Manufacturing accounted for 45 percent of the gross income of American establishments filing tax returns in the same year (U.S. Internal Revenue Service, 1929). My data thus account for 15-20 percent of U.S. corporate income at the onset of the Great Depression. The sample is further representative of the large manufacturing industries. Rosenbloom and Sundstrom chose those of the biggest industries whose definition in the successive censuses did not undergo major changes. The changes in classification are not expected to be related to differences in growth across industries.

b. Measures of Financial Dependence

If finance matters, financially dependent industries should grow less when banks fail. My regression model emphasizes financial dependence as a predictor of industrial output growth in the presence of bank failures; those in need to borrow should contract more if bank failures reduced lending. But, if the financially dependent manage to obtain access to credit that remains after bank failures, their output will not fall by more. For their performance to be a relevant indicator of whether bank failures affected output via lending declines, it is important that they do not have privileged access to credit. The indicators of financial dependence that I use address this concern because they also proxy for the difficulty to obtain credit in recessions. When banks fail, even the remaining loans would be hard to obtain for the financially dependent who would be perceived as borrowers with higher bankruptcy risk.

A standard measure of financial dependence is the external dependence devised by Rajan and Zingales (1998). It is equal to the percentage of capital expenditure that cannot be financed by the cash flow from operations. Rajan and Zingales argue that external dependence is determined by the industry's technology. The initial project scale, gestation period, cash harvest period, and the requirement for continuing investment are all technology-driven; this results in differences in dependence across industries. Because it measures dependence for investment purposes, external dependence is well suited for periods of expansion. Such were the twenties and the years following the Depression. The indicator must also matter in the Great Depression to the extent that investment is undertaken in recessions.

But, during the Depression significant productive capacities were idle and investment was not a priority. For this reason, I chose to use another measure of financial dependence that ought to better predict financing needs during recessions. I collect new data on the financing structure of U.S. industries in the 1920s to construct an indicator of short term borrowing needs on the eve of the Great Depression. This is the interest cover ratio, and it equals the earnings (before interest and taxes) divided by interest expense due in the same year. The interest cover is firstly an indicator of pressing current financing needs. When less earnings remain after interest payments, a firm is more likely to borrow. Investment is indeed not the first concern in recessions. But, an industry in debt would still have to borrow to finance working capital and debt rollover. The short maturities of the interwar loans render rollover even harder to avoid. The interwar commercial banks specialized in short term loans by "law and tradition" (White, 2000); their maturity was usually six months. Debt created prior to the Great Depression would hence typically be due during the crisis. Secondly, it is a measure of the difficulty to obtain credit in recessions. As a flow-side measure of assets and liabilities, a low interest cover could raise concerns of potential bankruptcy among the creditors. In recessions, the lenders redirect credit away from the high-risk borrowers (Bernanke, Gertler and Gilchrist, 1996); the "flight to quality" makes it difficult for them to compete even for the credit remaining after bank failures.

Interest cover is not considered an inherent industry property. Unlike external dependence, it is not necessarily driven by technology; it could differ across industries for a myriad of historical reasons. I construct it as the seven-year industry group average from the period 1922-1928. Averaging over seven years ought to add stability to the measure and enable its use over the several years that followed. The indicator captures the variation across industries at a key moment – the onset of the Great Depression. I use it in regressions that start with the year 1929. The short regression period (1929-1937) lessens the concern that interest cover could have changed greatly over the sample. The yearly Statistics of Income (U.S. Internal Revenue Service, 1922-1928) served as the source. Our eighteen industries were matched to the ten Statistics of Income industry groups, resulting in an indicator with ten distinct values. Interest cover (an inverse measure of financial dependence) was inverted. Panel A of Table 3 lists the values of the inverse interest cover and the corresponding industry groups.

[Table 3]

As a robustness check of my novel indicator, I use the standard external dependence measure of Rajan and Zingales (1998). Since it measures the fraction of investment that is externally financed, it is directly relevant in recessions only to the extent that investment is still undertaken. I argue that, even in the absence of new investment, external dependence could be a relevant indicator of financial dependence in the Great Depression too. It would matter by determining how leveraged an industry is at the onset of the Depression because the externally dependent must have invested and borrowed more in the 1920s.

Just like for the interest cover indicator, the debt burden would result in two difficulties in the Depression: a higher need to borrow and increased difficulty to obtain external financing. Leveraged industries require a part of their earnings to service the existing debt. Less internal financing is then available for any other necessity. These may include investment, but also working capital or debt rollover. The leveraged would not only want to borrow more but also find it harder to take out new loans. When banks fail, even the remaining credit would be diverted away from them. My reasoning is in line with Caggese (2007): prior investment that turns out to be irreversible burdens a company during crisis.

Standard and Poor's Compustat data are used to construct the external dependence indicator. The sample covers U.S. publicly traded companies in the 1950-2007 period. I calculate the measure as the industry average of firm-level data, following the methodology of Rajan and Zingales (1998). The 1929

Census of Manufactures industries were first mapped into 1987 Standard Industry Classification industries. This matched my data on output growth to the Compustat sample. Panel B of Table 3 summarizes the resulting indicator. Unlike for interest cover, the data used allowed us to calculate a distinct value of external dependence for each of the sampled industries.

The Compustat sample allows us to better capture the technology-driven demand for external financing. Rajan and Zingales reason that in modern times the supply of finance for large U.S. companies is almost unconstrained; their use of external finance directly relates to their demand. The actual level of debt across industries depends however on both the demand for credit and the availability of credit. The indebtedness would thus be changing over the interwar years with the aggregate availability of loans. Size, age and other firm characteristics would also affect the supply constraint. But, the inherent need for external financing determined by technology would remain unaltered. By resulting from a sample of large companies in recent times, our indicator of external dependence ought to capture this need.

That I use data from the second half of the twentieth century does leave one concern: the pattern of external dependence across industries could have changed since the interwar years. In this respect, the interest cover indicator has a clear advantage. Notice however that applying the U.S. indicator of modern external dependence to the interwar period resembles Rajan and Zingales (1998). They apply it across countries, while the modern companies around the world resemble their counterparts from the U.S. past (by the technology they use and the financing constraints they face).

Finally, both measures of financial dependence were transformed to make the results convenient for interpretation. Each indicator's median was set to zero and the maximum to one. Equations (1) and (2) give the linear transformations of both measures. The interest cover was not only rescaled but also inverted.

$$T(IC) = \frac{IC_{MEDIAN} - IC}{IC_{MEDIAN} - IC_{MIN}} \qquad (1)$$

$$T(ED) = \frac{ED - ED_{MEDIAN}}{ED_{MAX} - ED_{MEDIAN}} \quad (2)$$

c. Bank Failures and Their Determinants

The chosen measures of bank failures and the determinants of bank failures are the same as those used in the first chapter of this thesis. I use deposits suspended as an indicator of bank failures. Deposits of all commercial banks are obtained from the Banking and Monetary Statistics 1914-1941 (U.S. Board of Governors of the Federal Reserve System, 1943), while the total deposits of suspended banks are sourced from All Bank Statistics 1896-1955 (U.S. Board of Governors of the Federal Reserve System, 1959). The ratio of the two measures gives the percentage of deposits in commercial banks suspended, calculated by state and by biannual period. A unit of observation is, for example, the percentage of deposits in Arizona's banks suspended in 1928 and 1929. As argued in the first chapter of this thesis, because of the distinct character of March 1933 bank failures, the deposit suspensions in the two year period spanning 1932 and 1933 are excluded from the analysis. This still leaves in my sample three out of four banking crises of the Great Depression as classified by Friedman and Schwartz, since they occurred in 1930 and 1931. Moreover, the first chapter of this thesis presents evidence based on monthly data, consistent with Wicker (1996), that bank failures of March 1933 also had real effects.

I use two instruments of bank failures that vary at the state level: percentage of branch offices in the year 1920 and the increase in the value of farmland during the 1910s. They are summarized in Panel C of Table 2. The data on branch banking are obtained from the Banking and Monetary Statistics 1914-1941 (U.S. Board of Governors of the Federal Reserve System, 1943). They include the number of banks in a state that operate branches and the total number of branches for selected years. Combining the number of banks in a state that operate branches with the total number of banks, I constructed the state-specific branching indicator shown in equation (1):

$$branching_s = \frac{Nbranchbanks_s + Nbranches_s}{Nallbanks_s + Nbranches_s} \in [0,1] \quad (3)$$

It measures the ability to share the risk between bank offices within a state. The other instrument, the change in the value of farmland over the decade of the Great War, is constructed using data from Pressley and Scofield (2001). The higher had been the agricultural expansion in the 1910s, the more leveraged were the local farmers after the war-time demand was gone, and the more likely the local banks would fail following any economic shock.

2.5 Method and Main Results

In this section I first explain the rationale behind the main regression and its several modifications. The regression model is designed to test the predictions derived in section 2.3. The regression model examines how industrial output growth correlates with bank suspensions conditional on financial dependence. It is used to verify whether bank failures resulted in output declines, and whether the pattern of output decline across industries is consistent with a reduction in credit to producers. The OLS analysis gives the conditional correlations while the instrumental variable analysis attempts to measure the effect of bank failures on output. I interpret the economic significance of all the estimates obtained. I finally compare the OLS and the IV results.

a. Method

In section 2.3 I outlined several channels by which bank failures affect output. Taken together, they predict substantial real effects of bank failures. Both the workings of these channels and the narrative evidence from the Great Depression suggest that the effect of failures will be the strongest in the proximity of the failed banks. Some channels impact output unrelated to changes in lending, while others lead to declines in lending. The shortage of credit should affect the most the industries in need of external financing. This would create a two-trait pattern in states and periods with many banks failing: the industrial output would fall, and the fall in output of the financially dependent industries would be more severe. I test for the two-trait pattern in the main regression model given by equation (S1):

$$g_{sit} = \beta_0 + \beta_1 \cdot findep_i \cdot fail_{st} + \beta_2 \cdot fail_{st} + \beta_3 \cdot findep_i + a_s + u_{sit} \quad \text{(S1)}$$

The dependent variable is the growth rate of manufacturing output of industry i in state s over the biannual period t, g_{sit}. Biannual frequency, unlike monthly for instance, allows for time for any lagged effect of failures to become evident. The sample interval is 1929-1937 for regressions that involve inverse interest cover. It is 1921-1937 for regressions that use external dependence. There are three principal explanatory variables: percentage of deposits in failed banks in state s during period t ($fail_{st}$), financial dependence of industry i ($findep_i$), and their interaction. The three are complemented by state fixed effects (a_s). The coefficients β_1 and β_2 are used for our test. The β_2 will be negative if bank failures cause output of the industry with the zero score of dependence to fall, while β_1 will be negative if the financially dependent experience larger output declines. The measures of financial dependence were transformed to have the median of zero and the maximum of one. When measures are rescaled, β_2 represents the predicted reduction in growth of the median-dependent industry in states and periods with one percent of suspended deposits. The β_1 represents the difference in growth rates, in localities with one percent of failures, between the industry of median and the industry of maximum financial dependence. The sum of β_1 and β_2 then represents the predicted reduction in growth for the industry with the maximum level of financial dependence.

In addition to the main regression model, I estimate three other specifications. They differ by the included fixed effects. The fixed effects control for unobserved factors that influence both financial and real sectors, but lead to conservative coefficient estimates. The main model in specification (S1) includes only the state fixed effects (a_s). They capture the unobserved state characteristics which influence output growth. Specification (S2) also includes time fixed effects (a_t), intended to control for any omitted factors that simultaneously operate across all states. I nevertheless expect time fixed effects to capture in part the effect of the bank failures themselves. Two factors are responsible. First, in some years failures were widespread across states. Second, the effect of failures could also be felt in the neighboring states through a spatial spillover effect. Bank failures would in part be indistinguishable from a nationwide shock in either case; such a shock would be absorbed by the time fixed effects included in specifications (S2) and (S3), or state-time fixed effects included in specification (S4). With this in mind, I interpret the estimates in specifications (S2) - (S4) as the lower bound of the relationship between bank failures and growth.

$$g_{sit} = \beta_0 + \beta_1 \cdot findep_i \cdot fail_{st} + \beta_2 \cdot fail_{st} + \beta_3 \cdot findep_i + a_s + a_t + u_{sit} \quad \text{(S2)}$$

Specifications (S1) and (S2) allow us to measure β_1, the relationship between financial dependence and growth in the absence of bank failures; they do not include the industry fixed effects. An economically insignificant β_3 would suggest that financial dependence does not matter for growth in the absence of failures. A significant β_3 would instead cause concern. It would mean that the growth pattern across industries in the absence of failures could be biasing β_1, the interaction coefficient between financial dependence and failures.

Specification (S3) adds industry fixed effects to specification (S2). They prevent bias in the estimates of β_1 from factors that vary at the industry level. The final specification (S4) also includes industry and introduces state-time fixed effects. Bank failures vary across states and periods. State-time fixed effects are to eliminate any bias in β_1 from factors that could be confounded with bank failures. Specification (S4) however cannot estimate the effect of bank failures on the median-dependent industry, measured by β_2. It is only informative about the difference between the effect of bank failures on median and maximum-dependent industries, measured by β_1.

$$g_{sit} = \beta_0 + \beta_1 \cdot findep_i \cdot fail_{st} + \beta_2 \cdot fail_{st} + a_s + a_i + a_t + u_{sit} \quad \text{(S3)}$$

$$g_{sit} = \beta_0 + \beta_1 \cdot findep_i \cdot fail_{st} + a_{st} + a_i + u_{sit} \quad \text{(S4)}$$

Fixed effects do help control for unobservables, but they are expected to remove in part the effect of the failures itself. The time fixed effects should capture it the most, leading to conservative coefficient estimates for the effect of failures on growth. On the other hand, any OLS estimates could be biased by reverse causality. Banks failing as a result of output declines would lead to a negative β_2. Even more banks failing because of difficulties of their financially-dependent clients would lead to a negative β_1. The section 2.5.c addresses the concern that results could be driven by reverse causality by instrumenting bank failures. Notice, nonetheless, that even an OLS estimate of a negative β_1 renders unlikely that both banks and firms are suffering independently of each other. Their interaction must instead matter.

b. OLS Results – Inverse Interest Cover

The results of OLS regressions that use inverse interest cover as the indicator of financial dependence are given in Panel A of Table 4. The industry group average in the 1922-1928 period serves as the indicator, while the four specifications are estimated over the 1929-1937 sample period. The estimates are economically and statistically significant. Bank failures are associated to lower output growth, and even lower growth of the worse covered industries (those that have a high inverse interest cover). These results are consistent with the conjecture that bank failures had important real effects, felt the most in the proximity of the failed banks, and that at least a part of the effect worked through a reduction in lending.

All four specifications confirm that worse covered industries contract more than others during failures. The estimates of β_1 are statistically and economically significant. The worst covered industries grow on average 0.8 percent less than the median covered industries in states and periods with one percent of suspended deposits. While β_1 is stable across the regressions, the extent to which median covered industries are expected to contract varies across specifications. The estimates of β_2 change from -5.0 in specification (S1) to -0.8 in specifications (S2) and (S3) that include time fixed effects and specification (S4) that includes state-time fixed effects. This was expected for two reasons: the years when bank suspensions were widespread across states, and a spatial spillover in the effect of failures. Both factors make failures resemble a nationwide shock captured by the time fixed effects. This creates a tradeoff. Time fixed effects do control for omitted determinants of output in effect across states; it would be improperly bold to associate the whole effect estimated in specification (S1) to bank failures. It could nevertheless be equally misleading to claim that time fixed effects do not capture any effect of failures. But, with β_1 stable at -0.8 and β_2 changing from -5.0 to -0.8 we can at best obtain the predicted range of reduction in output growth in the presence of one percent of suspended deposits. The median covered industries then experience 0.8 to 5.0 percent of lower growth, while the least covered (most dependent) industries experience 1.6 to 5.8 percent of lower growth. While the range is broad, the pattern of decline (measured by β_1) is consistent with a fall in bank lending.

[Table 4]

Although worse covered industries contract more when banks fail, the estimates of β_3 suggest they perform like others in the absence of failures. Specifications (S1) and (S2) that do not include industry fixed effects estimate the coefficient on inverse interest cover, β_3. The worst covered industries (with the maximum score of inverse interest cover of one) grew 3 basis points less than median covered industries (with the score of inverse interest cover of zero). The difference is not economically significant - it leads to a mere percent of less growth over more than sixty years. Inverse interest cover does not seem to matter for growth in the absence of failures. If so, the pattern of output decline across industries in the presence of failures (measured by β_1) should not be biased by the distribution of growth over industries in the absence of failures.

The OLS results do not contradict a causal effect of bank failures on output growth. The results also strongly suggest that bank and firm difficulties did not directly result from any third factor. Their interaction must have instead mattered - bank failures are associated to worse performance of the financially dependent industries. Although consistent with a causal effect, the OLS estimates cannot however rule out reverse causality. Banks could be failing in response to output declines (resulting in a negative coefficient of bank failures, β_2), and even more in those periods and states where their financially dependent clients suffer (resulting in a negative coefficient of interaction between financial dependence and bank failures, β_1). The coefficient on the interaction term could be driven by reverse causality because, just as the financially dependent industries rely on banks, the banks rely on the same industries for business. To establish that bank failures indeed caused output contractions, I proceed to use instrumental variables.

c. IV Results – Inverse Interest Cover

The same two indicators of fragility of each state's banking system which were introduced in the first chapter of this thesis serve as instruments of bank failures. The percentage of branch offices in the year 1920 ($bstructure_s$) and the increase in the value of farmland over the 1910s ($\Delta farmvalue_s$) are summarized in Panel C of Table 2. The percentage of branch offices indicates the extent to which risk could be shared between branches of a single bank. In both of our samples, 1929-1937 for inverse interest cover and 1921-1937 for external dependence, states with more branched banking systems experienced fewer failures. Branching was determined by differences in regulation which long predated the Great Depression; I assume that it is not systematically related to growth in output other than through bank failures. The change in the value of farmland during the 1910s, the second instrument, was greater in states that expanded their agricultural output more to satisfy the war-time demand from Europe. The expansion was fueled by bank credit to farmers. After the Europeans came back to producing their own food, and food prices started declining, the same states were left banks sensitive to any shock to income of their highly leveraged agricultural borrowers. While a negative shock to farmers' income would make them demand fewer manufacturing products, it would also make them ready to work for local manufactures for lower salaries. With goods markets better integrated than labor markets, using changes in the value of farmland as instrument would make it even harder to find an effect of bank failures.

Because the two indicators of bank failures vary only across states, they are not able to predict the variation of bank failures over time. Moreover, they cannot be used in any regression which includes state fixed effects. For this reason, I interact them with period specific national level of deposit suspensions ($USfail_t$) to obtain two complex instruments which vary by states and periods. Their logic is as follows: more bank failures will result in states with less branched banks and more leveraged farmers given any shock at the national level. The ability of these complex instruments to predict deposit suspensions is demonstrated in Table 5.

[Table 5]

My instruments are significant predictors of bank failures. The smallest F-statistic of the determinants reported in Table 5 is above 17. This holds for regressions over both samples (1929-1937 and 1921-1937) and for specifications both with and without state and year fixed effects. While these estimates enable us to evaluate how well the instruments predict the bank failures, note that they do not represent the first stage regressions.

Endogenous Variables in Specifications (S1)–(S3)	Instruments
$fail_{st}$ $findep_i \cdot fail_{st}$	$bstructure_s \cdot USfail_t$ $\Delta farmvalue_s \cdot USfail_t$ $findep_i \cdot bstructure_s \cdot USfail_t$ $findep_i \cdot \Delta farmvalue_s \cdot USfail_t$

There can actually be one or two first stage regressions, depending on the number of endogenous variables. This in turn varies with the fixed effects each specification includes. There are two endogenous variables in specifications (S1), (S2), and (S3). These are deposit suspensions and financial dependence interacted with deposit suspensions. I need two first stage regressions to match them. The diagram above lists the endogenous regressors and the instruments used in the first three specifications. To explain financial dependence interacted with deposit suspensions I interact the compound instruments with financial dependence. Notice however that all four instruments need to be used in the first stage regression for each of the endogenous variables.

Specifications (S1) - (S3) require several alterations to the usual IV inference. The tests of instrument strength need to be changed and the standard errors need to be appropriately clustered. I use a compound statistic to judge the strength of instruments. It takes into account the F-statistics of excluded instruments in each of the two first stage regressions. This is Cragg-Donald statistic and, in case of heteroskedasticity robust or clustered standard errors, the Kleibergen-Paap statistic. Both are reported with each of the specifications in Table 6. Notice further that some of the variables do not span all dimensions of my dataset. Deposit suspensions and two of the instruments (those not interacted with financial dependence) vary over states and periods only. Both the first and the second stage regressions are however run over states, periods and industries. Such a structure of one first stage can give unwarranted strength to our instruments. To obtain realistic test statistics, I cluster the standard errors at the state-time level.

Endogenous Variables in Specification (S4)	Instruments
$findep_i \cdot fail_{st}$	$findep_i \cdot bstructure_s \cdot USfail_t$ $findep_i \cdot \Delta farmvalue_s \cdot USfail_t$

Unlike specifications (S1) - (S3), specification (S4) includes a single endogenous regressor - financial dependence interacted with deposit suspensions. The effect of deposits suspended themselves cannot be estimated; they vary by state and period while specification (S4) includes state-time fixed effects. A single first stage regression with two instruments (listed in the diagram above) is thus required. Because there is only one endogenous regressor, the compound F-statistics become equal to the single F-statistic of the excluded instruments. Note that, when state-time fixed effects are introduced in (S4), the number of state-time clusters becomes insufficient to match the number of variables. The heteroskedasticity robust standard errors estimator is hence invoked in place of the clustered one. The results of the first-stage regressions, corresponding to each of the IV specifications given in Table 6, are reported in Table 7. Panel A of Table 7 corresponds to regressions which condition on inverse interest cover. The first-stage results are in line with those on how the compound instruments predict state-specific deposit suspensions, presented in Table 5.

Table 6 reports the IV estimates of the causal effect of bank failures on industrial output growth. The effect of failures conditional on inverse interest cover is reported in Panel A. The IV results agree with the OLS findings: bank failures reduced output, and a good part of this effect appears to have proceeded through a decline in lending. The IV estimates predict an even stronger effect of bank failures on the worse covered industries then the OLS analysis. The β_1 parameter of the interaction between inverse interest cover and bank failures is two times larger in IV then in OLS specifications. It is statistically significant across all regressions. The industries with the highest inverse interest cover contract between 1.6 and 2.2 percent more than median covered industries as a result of one percent of deposit suspensions. Furthermore, the estimate of specification (S1) predicts a formidable seven percent decline in growth of the median covered industry in response to one percent of failed deposits. This too is larger than a β_2 of around five percent in the OLS regressions. The IV estimate of the effect on the median covered industry proves however to be more sensitive to the inclusion of time fixed effects than its OLS counterpart. It loses its size and becomes statistically insignificant in specifications (S2) and (S3). But, the time fixed effects are expected to capture in part the effect of failures themselves. The IV results also confirm the OLS finding that industries with different levels of inverse interest cover do not exhibit significant differences in growth in the absence of failures (differences measured by β_3).

[Table 6]

The tests of instrument strength raise no doubts about the reliability of the IV estimates. In specifications (S1) and (S4) I reject any concern over weak instrument inference; in regressions using inverse interest cover all test statistics remain above 18. In specifications (S2) and (S3) some concern remains when using the stricter, Kleibergen-Paap, clustered standard errors statistic. The estimated size of the coefficient on the interaction between inverse interest cover and bank failures, β_1, is however reassuringly stable across all four specifications.

d. Interpretation of the Results

As relates to the relative size of the IV and OLS estimates, it is striking that the IV results not only confirm but also reinforce the OLS ones. The IV estimates of β_1 are larger than the OLS estimates, and so are the IV estimates of β_2 in the specification without time fixed effects. In the presence of reverse causality (whereby difficulties in manufacturing lead to bank failures) the use of instruments is expected to instead reduce the obtained coefficients. As I argued in the first chapter of this thesis, two factors could however make the IV parameter estimates larger. Firstly, both of my instruments could have more predictive power in rural areas; this is especially true for the changes in the value of farmland. These areas had fewer alternatives to financing by banks, and bank failures could have mattered more. Secondly, my instruments could correct for the bias caused by measuring financial distress using deposit suspensions. In particular, I argue that deposit suspensions measure the true financial distress with an error. Figure 1 illustrates how this error could come about.

[Figure 1]

Suppose that bank failures have two effects: a direct effect and an indirect effect. Direct effect is felt only in the state where the failures happen, while the indirect one also affects the neighboring states. Assume that a unit of failures causes a reduction in growth of δ as the direct effect and a γ as the indirect effect. Among the channels by which bank failures could affect output, outlined in section 2.3, lost lending of the failed banks (since most lending was local) would correspond to the direct effect; the various channels operating through changes in expectations of banks, depositors, firms and consumers, would correspond to the indirect effect. Figure 1 consists of two stylized maps showing states with banks failing. While the map on the left shows the direct effect only, the one on the right shows the complete effect of failures (the sum of direct and indirect effect). Since deposit suspensions are state-specific, they correspond to the direct effect only and thus measure financial distress with an error (of $-\gamma$). For this reason, the OLS estimates of the effect of bank failures (using deposit suspensions as the explanatory variable) are biased towards zero. Because the indirect effect should be stronger in states with weaker banks, even if banks fail only in the neighborhood, the indicators of fragility of each state's banking system can correct for this bias. With my instruments, the IV regressions should estimate the true and greater effect of bank failures than the OLS ones.

The results confirm my predictions from Section 2.3. As verified by the causal IV estimates, bank failures did lead to output declines. The effect on output moreover appears large. The size of the impact depends on how much of the time fixed effects we associate to bank failures. But, even if we assume the majority of the time fixed effect does not capture the impact of failures, there is evidence of amplification of the initial shock to banking - a one percent of intermediation capital lost lead output to decline by several percent.

I also find that output fell by more in those states that experienced bank failures. While this "local" effect of failures is supportive of Bernanke's emphasis on the rise in the cost of credit intermediation, I do not argue that it is inconsistent with the mechanism Friedman and Schwartz described. If more precautionary deposit withdrawals resulted in the proximity of the failed banks, then the national money supply was reduced simultaneously with local declines in lending and output. This paper instead confirms the joint prediction of Friedman-Schwartz and Bernanke that bank failures resulted in output declines, and that declines in lending were important to cause them. The relevance of declines in lending is evidenced by the worse performance of the financially dependent in the presence of bank failures. At the same time, my results cannot rule out a depressing effect of reduced money supply felt across the entire country. Any effect operating at the national level would be captured by the time fixed effects, and I do find that their inclusion significantly reduces the estimated effect of bank failures.

My findings relate to the results of Calomiris and Mason (2003). They use instruments of loan supply to find a causal effect of changes in loans and deposits, the results of bank distress, on production income across U.S. states. This paper instead uses instruments for bank failures to establish their causal effect, an impact which is different in several aspects. It is broader – bank failures can influence output in more ways than through declines in lending. When failing banks create expectations of more failures, both firms and consumers anticipate difficulties in obtaining funds in the future and alter their behavior. This reduces output in at least three ways different from loan declines: the changes in the composition of lending (whereby some firms borrow not to invest but to build cash reserves, leaving fewer funds for investment of other firms), declines in investment to retain more earnings, and delayed consumption in the uncertainty created by the bank failures. Most other effects of bank failures that do result in lending declines, outlined in Section 2.3, are also driven by the failures' effect on expectations. Given that bank failures are an evident driver of banking distress, not just its manifestation, measuring their causal effect ought to be relevant for policy making. At the same time, using the whole interwar sample is to make sure the effect of bank failures is not confounded with a multitude of other shocks present in the Great Depression.

My results matter quantitatively – bank failures can explain at least a third of decline in manufacturing output during the Great Depression. The manufacturing sector accounted for about a third of U.S. output at the time. My sample covers 40 percent of manufacturing output in 1929, and should not respond to bank failures differently from the rest of manufacturing. The effect on the median dependent industry predicted by the OLS regressions is on average 2.75 percent of decline in growth for each percent of deposit suspensions. The corresponding figure for the IV estimates is 3.75. (These numbers associate half of the time fixed effect to the effect of failures.) Given that my instruments have greater predictive power in the rural part of the sample where there are fewer alternatives to banks, it is conservative to use 3.0 in the rest of the calculation. In the years of three out of four banking crises of the Depression, 1930 and 1931, somewhat more than 5% of deposits were suspended in total. This predicts a 15% decline in output as a consequence of bank failures (3.0*5%). At the same time, the biannual growth rate of manufacturing output changed from 8% in the twenties to -32% in the Great Depression, a decline of 40%. 15% of this decline can thus be associated to failures in the deepening phase of the Depression (1930 and 1931)[9] – more than one third.

2.6 Robustness

In this section I present several robustness checks. I first verify that the main results hold if the standard measure of financial dependence, the external dependence of Rajan and Zingales (1998), is used instead of the inverse interest cover. I then confirm the main results in the period of only the Great

[9] 1932 confirms this result since its deposits suspensions are comparable to the average of 1930 and 1931. 1933 is not considered because of the distinct character of its suspensions.

Depression. Another check confirms that the results are not driven by the differences in firm size across industries, while the following one verifies the robustness of the findings to the cyclical behavior of durable output.

a. Alternative Measure of Financial Dependence

Panel B of Table 4 presents the results of OLS regressions that use external dependence of Rajan and Zingales (1998) as the indicator of financial dependence. The results agree with those for inverse interest cover. Bank failures are associated with lower output growth and they are associated with even lower growth of the externally dependent industries. Just like for inverse interest cover, the results are consistent with large real effects of bank failures, via reduction in lending and with local impact.

Regression estimates of all four specifications suggest that the externally dependent contract the most in the presence of failures. The β_1 coefficient of interaction between external dependence and deposits suspended is furthermore stable across the regressions. The most dependent industry contracts on average 1.5 percent more than the median dependent industry in the presence of one percent of deposit suspensions. That this is almost double the 0.8 percent difference estimated using inverse interest cover should perhaps be no surprise; external dependence measure varies over the full set of 18 sampled industries while inverse interest cover measure only varies over 10 industry groups. The median dependent industries contract too, but the estimates of β_2 vary across the specifications. They change from - 4.5 in specification (S1) to -1.0 after time fixed effects are included in specifications (S2) and (S3), or state-time fixed effects are included in specification (S4). As explained in the main results for inverse interest cover, I consider that a fraction of this difference ought to be attributed to the effect of bank failures themselves. But, it is not clear how large a fraction. But, with β_1 stable at -1.5 and β_2 changing from - 4.5 to -1.0 we can at best obtain a range of predicted decline in output growth. At least 1.0 percent of lower growth for the industry of median external dependence and 2.5 percent of lower growth for the industry of maximum external dependence is related to one percent of failures. The corresponding figures are at most 4.5 percent for the median-dependent and

6.0 percent for the maximum-dependent industry. The estimated range of output decline associated to bank failures is thus broad. But, its distribution over industries is suggestive of real effects which worked through lending declines.

There is moreover evidence that the pattern of growth decline is not biased by the distribution of growth across industries in the absence of bank failures. Although externally dependent industries contract more when banks fail, the estimates of β_3 suggest they perform like others in the absence of failures. Specifications (S1) and (S2) estimate the coefficient on external dependence, β_3; these specifications do not include industry fixed effects. The coefficient β_3 of 0.04 means that industries with the maximum score of external dependence (score of one) grew four basis points more than those with the median score of external dependence (score of zero). The difference is not economically significant – it results in one percent of additional growth in fifty years. This too agrees with the findings for inverse interest cover.

The IV estimates of the causal effect of bank failures on industrial output growth, conditional on external dependence, are given in Panel B of Table 6. (Panel B of Table 7 reports the results of the corresponding first stage regressions.) The IV results both confirm the OLS findings for external dependence, and they agree with the IV findings for the inverse interest cover. Bank failures caused output declines, and the externally dependent industries were particularly affected. The IV coefficient estimates for the differential effect on high external dependence industries, measured by β_1, are larger than the OLS ones. The most externally dependent industries contract between 2.8 and 3.4 percent more than median dependent industries as a result of one percent of deposit suspensions. The estimate of specification (S1) predicts a seven percent decline in growth of the median dependent industry, given by β_2, in response to one percent of failed deposits. This is equally large as the estimate in regressions using inverse interest cover, and larger than the OLS estimates. With the inclusion of time fixed effects, it turns out to be more sensitive than its OLS counterpart; it loses its size and becomes statistically insignificant in specifications (S2) and (S3). But, I expect the time fixed effects to capture in part the effect of the bank failures themselves. The IV results also confirm the OLS finding that external dependence does not seem to matter for growth in the absence of failures (differences measured by coefficient β_3). If anything, the externally dependent grow somewhat more when there are no suspensions.

The tests of instrument strength suggest the IV estimates are reliable. In specifications (S1) and (S4) I reject any concern over the weakness of instruments; all test statistics remain above 17. In specifications (S2) and (S3) some concern remains when using the stricter, Kleibergen-Paap, clustered standard errors statistic. The estimated size of the coefficient on the interaction between external dependence and bank failures, β_1, is nonetheless reassuringly stable across all four specifications.

All the main results using inverse interest cover are thus confirmed using external dependence. Output declines of the financially dependent in the presence of bank failures are more severe in each case. The variation predicted by external dependence is even larger. This can be because of the greater variation of this indicator across the sampled industries.

b. Only the Sample of the Great Depression

I based the main results on the full interwar sample to make the estimates more reliable. The Great Depression had many shocks and their effects could be mistaken for those of the bank failures. While the results from the interwar sample defend an important role of bank failures in reducing output, I want to confirm that the results are not driven only by the part of the sample that excludes the Depression. This section provides evidence that bank failures led to output declines during the Great Depression itself, and that a large part of their effect resulted from declines in lending. Two tests confirm the finding using data from that period only. I first plot distributions of output growth, conditional on financial dependence and the intensity of local bank failures. I then perform OLS and IV regression analysis using only the Great Depression sample.

In the first chapter of this thesis, I showed that corporation income in the Great Depression correlates negatively with bank failures, in spite of the probable presence of spatial spillover effects which blur identification. This, however, is not telling of the mechanism by which bank failures had their effect. If bank failures led to output declines through a fall in lending, we would also expect output declines in states with failures to be larger for the financially dependent industries. Figures 2 and 3 plot the distribution of manufacturing growth over the Great Depression conditional on financial dependence. Figure 2 looks at growth across all states while Figure 3 divides the states by low and high incidence of bank failures. The observation points are specific to state and industry. Two relationships are evident for both inverse interest cover and external dependence. First, the Great Depression (a period with many bank failures) is associated with worse performance of the financially dependent industries. Figure 2 illustrates this by using observations from all states; growth distributions of the financially dependent appear shifted towards lower values of growth. High and low financial dependence in all the plots designate the top and the bottom third of industries. Second, Figure 3 shows that financially dependent industries suffered substantially more in high failure states. The subplots in the column on the left condition industry growth on financial dependence in states with few failures. The subplots in the column on the right do the same in states with many failures. High and low failures designate the top and the bottom third of states. The majority of the worst performers in high failure states are evidently the financially dependent. The low growth tail of the distribution is particularly thick for the financially dependent in states with many bank failures. The effect is more evident for the high inverse interest cover industries, but it is also apparent for high external dependence industries. Figures 2 and 3 thus demonstrate that financially dependent did badly during the Great Depression in all states, and that they did even worse in high failure states. This suggests that no third factor was likely directly driving the plight of both the firms and the banks. Either troubled banks caused their clients to suffer, or they suffered themselves because of difficulties of their clients.

[Figure 2]

[Figure 3]

I proceed to establish that bank failures indeed caused output declines in the Great Depression; I apply IV regression analysis only to that period. The state-specific change in farm value over the 1910s serves as the instrument of bank failures. There is no need to interact it with time-variant national failures -- the sample is now the cross section of states in the Depression. The growth period of 1932 and 1933 is excluded because it corresponds to the distinct failures of 1933. This still leaves the most relevant period in the sample. The failures of 1930 and 1931 include three out of four Friedman-Schwartz banking crises; they allegedly transformed a recession into the Great Depression. Figure 4 demonstrates how the instrument correlates with deposit suspensions during 1930 and 1931. The greater was the increase in the value of farmland in the 1910s, the more banks failed in the Great Depression.

The first column of Table 8 reports estimates of the effect of bank failures on the growth of total output of all sampled industries. Panel A presents the OLS results while Panel B gives the IV results. The effect of bank failures is negative and not statistically significant. It becomes larger when instrumented. The upper plot in Figure 5 illustrates this - the dotted line representing the IV regression is steeper. The second column of Table 8 gives the estimates of the effect of bank failures on the growth of total output of the third of industries with the highest inverse interest cover. The effect of bank failures is not statistically significant, although it becomes more negative when instrumented. The bottom left plot in Figure 5 reveals more details about this relationship. It appears that the mass of points still suggests a negative relationship between growth and bank failures. Nevertheless, there is a number of exceptions in the upper right part of the graph that counters this. The results for externally dependent sample, on the other hand, exhibit the expected pattern. The third column of Table 8 gives the estimates of the effect of bank failures on the growth of total output of the most externally dependent third of industries. The effect of bank failures is negative, statistically significant, and larger than in the full industry sample; it becomes even larger when instrumented. The bottom right plot in Figure 5 corresponds to the externally dependent sample. Its dotted IV regression line is steeper both from its OLS counterpart and from the IV line for the complete industry sample. Overall, the evidence presented in Figures 4 and 5 and in Table 8 suggests that the main finding that bank failures resulted in output declines is confirmed in the sample of only the Great Depression. At the same time, most of the evidence also confirms that declines of output of financially dependent industries were even larger (consistent with a fall in lending).

[Figure 4]

[Table 8]

[Figure 5]

c. Financial Dependence and Industry-Average Establishment Size

Bernanke (1983) proposes firm size as a proxy for the agency costs of lending. In a similar manner, Bernanke, Gertler and Gilchrist (1996) argue that the premium on external financing is inversely proportional to borrower's net worth. If this is so, industries populated with larger companies should have done better in the Depression, the period when bank failures impaired the intermediation capital. Temin (2000) finds the opposite. Using a cross-section of industries he demonstrates that, if anything, the industries with larger average firm size did worse in that period.

[Table 9]

I argue that, even if the big companies experience a smaller rise in the external financing premium during financial distress, the industries with many large firms could still suffer more if they are at the same time financially dependent. Table 9 compares the effects of bank failures on industries with varying average establishment size and financing needs. The size indicator is constructed as a state specific average establishment size per industry from the 1920s, measured by its output. Using a national size average for each industry instead gives similar results. Panel A uses inverse interest cover as a measure of financial dependence, while Panel B uses external dependence. Contrary to what was expected, the industries with higher average firm size perform worse in the presence of bank failures. The effect is both economically and statistically significant in regressions that use inverse interest cover, although it is not statistically significant in regressions involving external dependence. Importantly, the variation of the effect of failures across industries of different financial dependence is barely changed. This is true for both measures of financial dependence. The interaction terms between financial dependence and bank failures, across the specifications that involve different fixed effects, are almost the same as in regressions without size controls in Table 4. My results are therefore robust to controlling for the effect of average firm size. The negative effect on performance of larger average company size during financial distress however remains unexplained.

d. Durables and Uncertainty

This robustness check is to verify that my findings do not confound the effect of financial distress on producers with a consumer-side explanation as in Romer (1990) or Mishkin (1978). Romer (1990) is credited with the most prominent consumer-side explanation, both for the onset and deepening of the Great Depression. She argues that the general uncertainty about future income, caused by the collapse of the stock prices in October 1929 and their continued gyrations during 1930, led to a decline in consumption of the durable goods in particular. If purchases of durable goods are irreversible, waiting to realize the actual level of future income avoids a too high or too low level of consumption. This stops consumption in times of uncertainty. While Romer's explanations rest upon a rise in general uncertainty, Mishkin (1978) argues that a deterioration in the household balance sheet also led to a more pronounced decline in consumption of durables. The decline in financial wealth caused by the stock market crash led consumers to postpone the purchases of durables and housing so as to remain solvent. The importance that Romer and Mishkin give to durables is consistent with the unprecedented increase in their output in the 1920s, resulting from a demand shift driven by the rise in consumer credit and advertising (Olney, 1987). If the consumption of durables rose so much prior to the crisis, an abrupt decline in demand for durables could have indeed deepened the Depression.

[Table 10]

Table 10 gives the details of the robustness check. In Panel A, I use the biannual growth of total output to predict the contemporaneous growth in the output of durables, semidurables, and perishables. This gives cyclicality betas for each of the industry groups. As Romer (1993), I use Shaw (1947) as the source of output data. The estimation comes from the period 1889-1928, excluding 1914-1920 as the disturbances of WWI[10]. I then adjust the growth rates of state-specific output for each of the eighteen industries in my sample as shown in specification (S5). The $\hat{\beta}_1, \hat{\beta}_2$, and $\hat{\beta}_3$ in (S5) are the cyclicality estimates from Panel A. The adjustment removes from our dependent variable any variation that can be associated with the historical comovements between the output of its industry group and the aggregate output (g_t). The classification of our eighteen industries into the durable, semidurable and perishable groups is given in Panel C of Table 3.

$$gadjusted_{sit} = g_{sit} - \hat{\beta}_1 \cdot durable_i \cdot g_t - \hat{\beta}_2 \cdot semidurable_i \cdot g_t \quad \text{(S5)}$$
$$- \hat{\beta}_2 \cdot semidurable_i \cdot g_t$$

The panels B and C of Table 10 estimate our basic specifications with only state and both state and time fixed effects, using both the original g_{sit} (columns 1 and 3) and the adjusted $gadjusted_{sit}$ (columns 2 and 4) growth rate of industry output. The adjustment does change our results quantitatively, but does not alter them qualitatively - the financially dependent are still doing worse then others in the presence of failures. The coefficient next to the bank failures themselves either decreases (in regressions with inverse interest cover in Panel B) or disappears (in regressions with external dependence in Panel C). Notice however that this could be expected - the effect of failures in the years when they were nationally widespread is already removed from the adjusted growth rate. The coefficient of the interaction between inverse interest cover and deposits suspended both remains statistically significant and increases. This reinforces the evidence for real effects of bank failures through lending declines. For external dependence the interaction is still negative and significant but somewhat decreases. This suggests that a part of the variation of growth across industries of different external dependence could be explained by their cyclical behavior even in the absence of bank failures. Both measures suggest the same - more dependent suffer more in the presence of failures, even after we control for the differences in cyclicality.

[10] Keeping 1914-1920 in the sample nevertheless does not substantially alter any of the results.

Alternatively, one may suggest that the effect of the Great Crash was such that the pattern of consumption behavior had no precedent, and a backward-looking cyclicality is an inappropriate control. A way to address this concern would be to include as a control the interaction between industry group (durables, semidurables, and perishables) and the Great Depression dummy. In this case, the coefficients on the interactions between both measures of financial dependence and failures barely change. Similarly, the use of a forward looking cyclicality adjustment, benefiting from longer time series (the second half of the century) and a higher (yearly) frequency data, results in much slighter changes to the results than the backward looking cyclicality adjustment. This is true irrespective of whether HP or linear output gap is used.

2.7 Conclusion

In the view of Ben Bernanke, understanding the Great Depression is the key to understanding macroeconomics. This paper attempts to take one step towards this goal. It does so by evaluating the importance of bank failures for output between 1929 and 1933. I use an interwar panel of U.S. states and exploit the differences in financial dependence between manufacturing industries. My sample covers 40% of manufacturing output in 1929. Based on the narrative evidence from the Great Depression and the theoretical literature, I present a set of channels by which bank failures can affect real output. My results agree with the predictions of these channels: bank failures caused manufacturing output declines; these declines were more severe in the proximity of the failed banks (in the same states), and they were greater for the financially dependent industries (consistent with declines in lending). The findings are supported by two distinct measures of financial dependence: inverse interest cover and external dependence. Inverse interest cover, based on new hand-collected data from the 1920s, reflects the actual short term financing needs. I chose it as appropriate for recessions when new investment is not priority. External dependence of Rajan and Zingales (1998) captures technologically driven investment needs, but in recessions it can also proxy for borrowing needs to service the existing debt. To establish causality, I instrument bank failures. Two indicators of pre-determined fragility of the state banking systems serve as the instruments: percentage of branch offices in the year 1920 and the increase in the value of farmland during the 1910s. The branching indicator measures the risk sharing within a state's banking system, while the changes in farm values in the 1910s are telling of the state-specific exposure to the demand shock for food during WWI. My IV results confirm the OLS estimates. I find that one percent of suspended deposits reduced output growth of the median dependent industry by three percent on average. The findings suggest that at least a third of the decline in manufacturing output can be associated to bank failures in the deepening phase of the Great Depression (prior to February and March 1933).

Several tests confirm the robustness of my findings. The main results were obtained from the whole interwar sample. This helps us not to confound the effects of bank failures with those of a multitude of economic shocks abundant in the Great Depression. But, the results obtained in subsample of only the Great Depression give a consistent story. The pattern of output decline across states during the Depression, and the contemporaneous performance of industries with different financial dependence, suggest that bank failures caused declines in output that in part proceeded through a fall in lending. I further find that financial dependence matters even after we control for the average establishment size within an industry, a measure of agency costs of lending consistent with Bernanke's interpretation. Moreover, I show that the variation of output across industries with different financial dependence is not driven by the differences in the cyclical sensitivity of their output. This is confirmed by estimates of cyclicality from different samples (prior and after the Great Depression) and several ways to test the robustness.

How this paper changes what we thought of the Great Depression? While many authors have argued that bank failures deepened the Depression, their role has remained a hotly contested topic. This paper gives new evidence that bank failures did matter. It also demonstrates that at least a part of the transmission mechanism operated through declines in lending, as confirmed by the differences in sensitivity to bank failures of industries with different needs for external financing. The paper further shows that the impact of bank failures was strongly felt locally (in the same state). Because most bank lending was local, the local effects are consistent with Bernanke (1983) who emphasized the rise in the cost of credit intermediation following bank failures. Friedman and Schwartz (1963) instead stressed the importance of the fall in the money supply for the national output. But to the extent that bank failures caused more precautionary deposit withdrawals in their proximity (reducing the money multiplier and the money supply, and impairing the lending ability of the local banks), national declines in the stock of money are inseparable from local lending declines. This paper thus verifies the joint prediction of Bernanke and Friedman-Schwartz that bank failures made output fall, and that declines in lending were an important transmission mechanism. It finally also allows for the importance of the monetary effects operating at the national level; their impact is captured by the time fixed effects whose inclusion does reduce the estimated effect of failures.

My paper estimates large real effects of bank failures, consistent with the multitude of channels by which they can affect output. These channels describe bank failures as a driver of financial distress, rather than its mere manifestation. The relevance of my findings for contemporary research and policy goes beyond this. The recent global recession spurred much work able to explain how financial crises result in temporary real effects. But, how they turn into a lost decade is not clarified. Whether the cumulative losses of the banking system in the Depression could be held responsible for a delayed recovery remains to be answered.

2.8 Figures

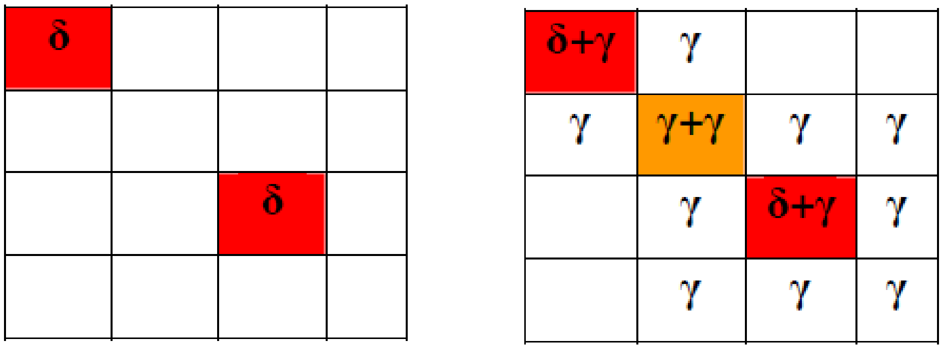

Figure 1

Direct and Indirect Effect of Bank Failures in a Cross-Section of States

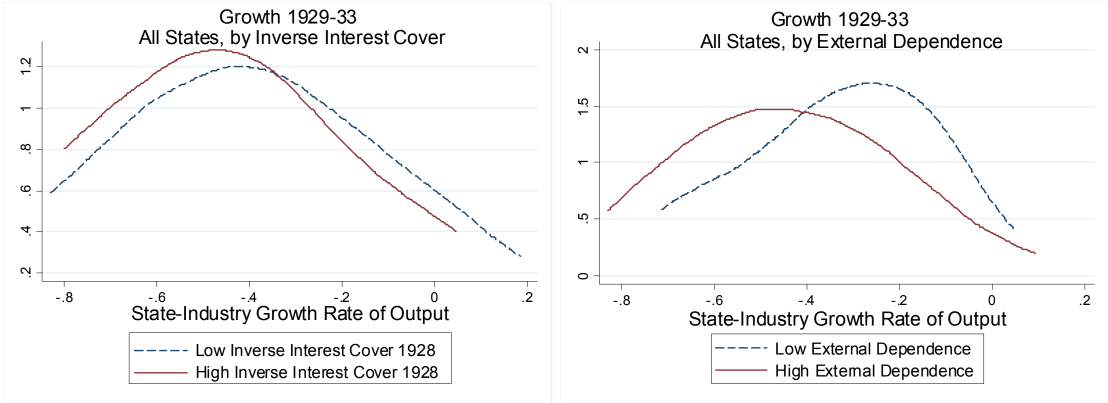

Figure 2

Output Growth During the Great Depression - Conditional on Financial Dependence

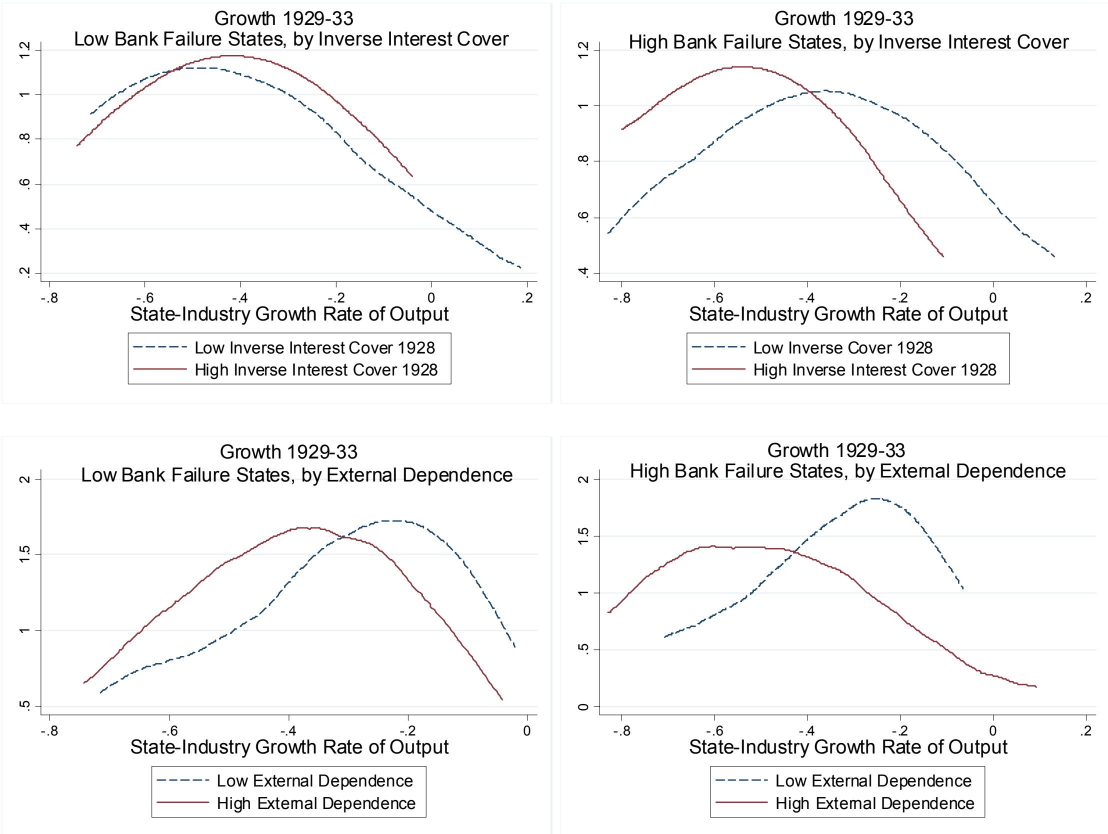

Figure 3

Output Growth During the Great Depression - Conditional on Financial Dependence and Intensity of Failures

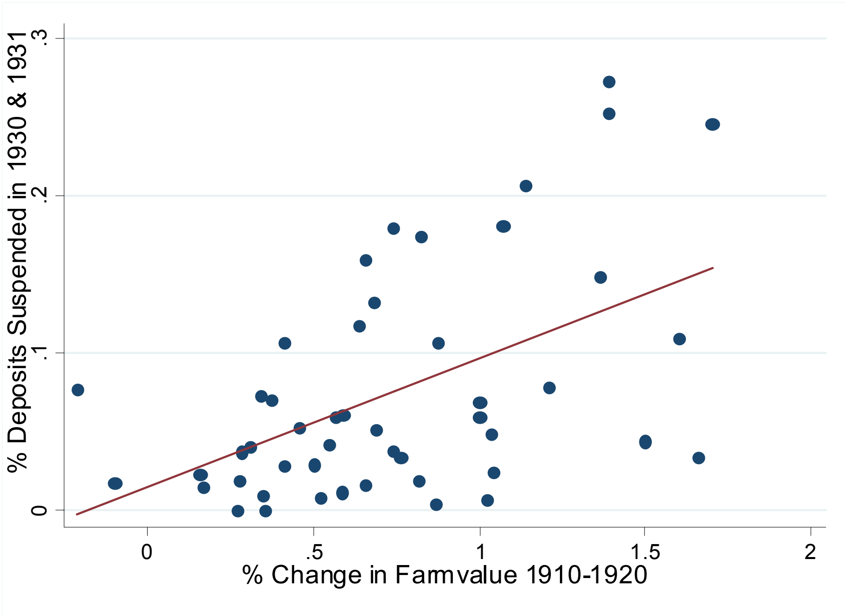

Figure 4

Predictive Power of the Farm Value Instrument during the Great Depression

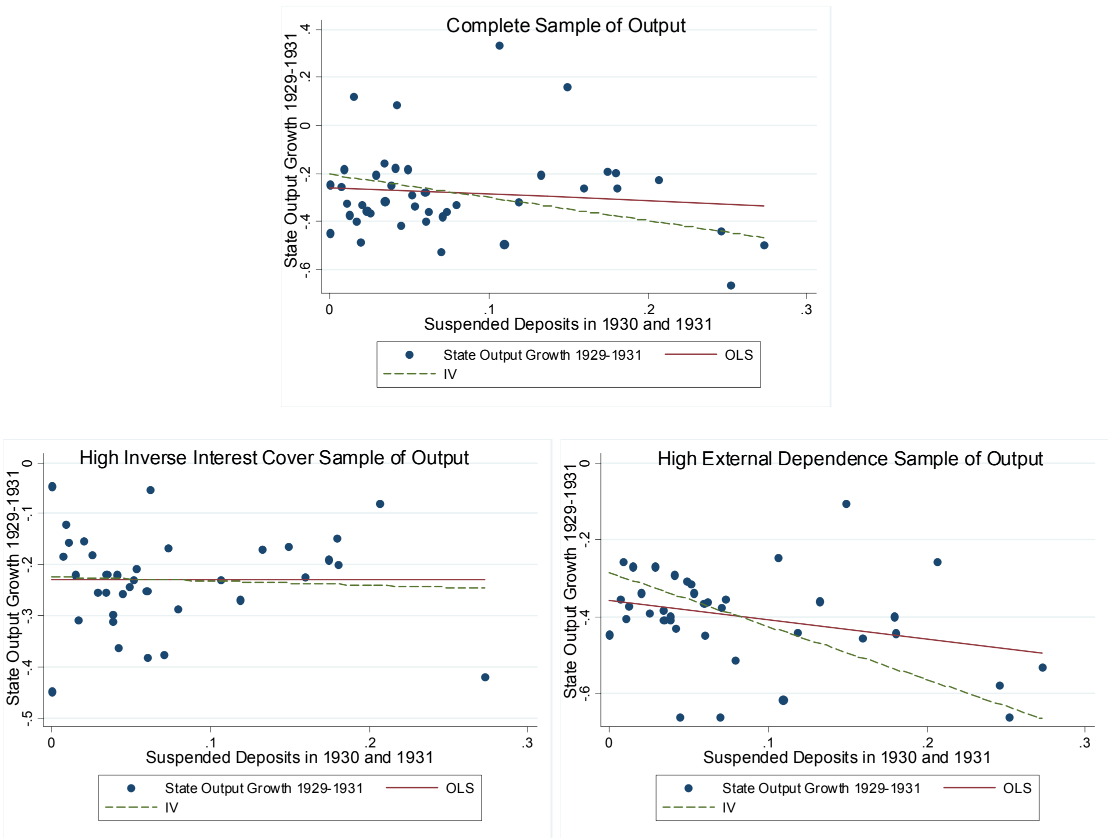

Figure 5

Output Growth in the Great Depression - Full and Financially Dependent Samples

2.9 Tables

TABLE 1
THE EFFECTS OF BANK FAILURES ON OUTPUT

	Lending-Related	
	• Lost lending to firms of failed banks • Lending declines to firms of the surviving banks - Loss of loans to failed banks - Precautionary effects * Increase in the reserve-deposit ratio * Precautionary deposit withdrawals - Loss of information	• Composition of lending effect • Lending declines to consumers
Impact:	Output Declines - More Pronounced for Financially Dependent Industries	Output Declines
	Not Lending-Related	
		• Uncertainty effects - On firms - On consumers
Impact:		Output Declines

TABLE 2
DESCRIPTIVE STATISTICS

This table presents sample statistics, for all variables except industry characteristics which are shown in Table 3. Panel A shows the state-period-industry specific biannual growth rates of output. The first column covers the whole sample (1922-1937) while the other columns divide it by sub-periods. The source of the data are the contemporary US Censuses of Manufactures. Observations with few establishments per state are excluded so as to leave at least 95% of an industry's product value in a given year. Output values used for calculation of output growth were deflated using "CPI for all Urban Consumers, All Items" from the U.S. Bureau of Labor Statistics. Output growth observations below the 1st percentile and above the 99th percentile were recoded to the values of the 1st and 99th percentile. The biannual period 1932-1933 was excluded from the sample. Panel B summarizes state-period specific biannual percentage of deposits in suspended banks. The first column covers the whole sample (1922-1937) while the other columns divide it by sub-periods. The variable was obtained by combining deposits in all commercial banks sourced from "Banking and Monetary Statistics 1914-1941" with the total deposits of suspended banks from "All Bank Statistics 1896-1955". The biannual period 1932-1933 was excluded from the sample. Panel C shows two state specific predictors of bank failures: branch bank offices as a percentage of the total number of offices in the year 1920 and the change in farm value over 1910s. The data on branch banking are sourced from the "Banking and Monetary Statistics 1914-1941". The data on values of farmland come from the ICPSR dataset 9, Pressley and Scofield (2001).

	Panel A Biannual Manufacturing Growth Rates			
	1922-1937	1922-1929	1930-1931	1934-1937
Output growth$_{sit}$ (%)				
Mean	15.46	17.52	-26.09	32.36
Standard deviation	(36.72)	(33.31)	(35.56)	(26.50)
Number of state-period-industries	1928	1097	279	552
	Panel B Percentage of Deposits in Suspended Banks			
	1922-1937	1922-1929	1930-1931	1934-1937
Deposits suspended$_{st}$ (biannual %)				
Mean	2.48	2.37	7.50	0.17
Standard deviation	(4.99)	(4.66)	(7.16)	(0.71)
Number of state-periods	336	192	48	96
	Panel C Banking Structure and Farmland Value Change			
Branch offices in 1920$_s$ (%)				
Mean	8.27			
Standard deviation	(12.08)			
Number of states	48			
Farm value change over 1910s$_s$ (%)				
Mean	73.31			
Standard deviation	(44.95)			
Number of states	48			

TABLE 3
INDUSTRY CHARACTERISTICS

This table shows characteristics for the industries in the sample. The complete names of the industries from the 1929 Census of Manufactures are: 1. Canning and preserving: Fruits and vegetables; pickles, jellies, preserves and sauces; 2. Motor vehicles, not including motor cycles; 3. Iron and steel: Steel works and rolling mills - including all departments, such as bolt and nut, wire, tinplate, etc.; 4. Meat packing, wholesale; 5. Lumber and timber products, not elsewhere classified; and Planing-mill products - including general mill-work - not made in planing mills connected with sawmills; 6. Paper; 7. Chemicals, not elsewhere classified; 8. Cotton goods; 9. Glass; 10. Petroleum Refining; 11. Rubber tires and inner tubes; 12. Motor-vehicle bodies and motor-vehicle parts; 13. Bread and other bakery products; 14. Nonferrous-metal alloys and products, not including aluminum products; 15. Furniture, including store and office fixtures; 16. Confectionery; 17. Boots and shoes other than rubber; 18. Printing and Publishing - Newspaper and Periodical. Panel A gives inverse interest cover. Industries are listed in decreasing order of the indicator. The yearly IRS Statistics of Income served as the source. Eighteen industries from our sample were matched to the ten Statistics of Income industry groups, resulting in an indicator with ten distinct values. The ten industry groups are: Rubber and rubber products; Leather and leather products; Food products, beverages and tobacco; Textiles and textile products; Lumber and wood products; Paper, pulp and products; Metal and metal products; Chemicals and allied substances; Printing and publishing; and Stone, clay, and glass products. The measure is the seven-year industry group average from the period 1922-1928. Panel B summarizes external dependence. Industries are listed in decreasing order of the indicator. I used judgment to match 1929 Census of Manufactures industries into 1987 Standard Industry Classification. Standard and Poor's Compustat database then served as the source. The sample covered US publicly traded companies in the 1950-2007 period. The measure was calculated as the industry average of firm-level data, following the methodology of Rajan and Zingales (1998). Panel C shows a measure of durability of each industry's product. Industries are listed by decreasing durability. The definitions for durable, semidurable and perishable goods are taken from Shaw (1947). These are: "Durables - Commodities that, without marked change and retaining their essential physical identity, are ordinarily employed in their ultimate use three or more years. Semidurables - from six months to three years. Perishables - less than three months". I used judgment to allocate each sampled industry into one of the three categories.

Industry	Score	Industry	Score	Industry	Score
		Panel A Inverse Interest Cover (IIC)			
rubber	1.00	cotton goods	0.09	motor vehicles	-1.18
boots	0.33	furniture	0.06	nonferrous metal	-1.18
bread	0.27	lumber and planing mill	0.06	chemicals	-1.55
canning	0.27	paper	-0.06	petroleum refining	-1.55
confectionery	0.27	iron	-1.18	printing	-1.58
meat packing	0.27	motor vehicle parts	-1.18	glass	-2.03
		Panel B External Dependence (ED)			
canning	1.00	chemicals	0.24	bread	-0.20
motor vehicles	0.80	cotton goods	0.04	nonferrous metal	-0.36
iron	0.72	glass	0.00	furniture	-0.40
meat packing	0.68	petroleum refining	0.00	confectionery	-1.00
lumber and planing mill	0.48	rubber	-0.04	boots	-2.52
paper	0.44	motor vehicle parts	-0.08	printing	-3.00
		Panel C Durability (Durable, Semidurable or Perishable)			
furniture	dur	nonferrous metal	dur	chemicals	perish
glass	dur	boots	semidur	confectionery	perish
iron	dur	cotton goods	semidur	meat packing	perish
lumber and planing mill	dur	rubber	semidur	paper	perish
motor vehicles	dur	bread	perish	petroleum refining	perish
motor vehicle parts	dur	canning	perish	printing	perish

TABLE 4
THE EFFECT OF BANK FAILURES ON OUTPUT GROWTH, CONDITIONAL ON FINANCIAL DEPENDENCE - OLS ESTIMATES

This table presents the results from estimating ordinary least squares models to measure the effect of bank failures on output growth, conditional on financial dependence. The dependent variable is the biannual output growth of 18 manufacturing industries (summarized in Table 2). The explanatory variables are percentage of suspended deposits (summarized in Table 2), financial dependence (summarized in Table 3) and their interaction. The regressions reported in each of the four columns differ by the set of fixed effects included. The biannual period 1932-1933 is excluded from the sample because of the special character of 1933 bank failures. Panel A regressions are run over the 1929-1937 sample; they use inverse interest cover as the measure of financial dependence. Panel B regressions are run over the 1921-1937 sample; they use external dependence as the measure of financial dependence. Constants were calculated but were not reported. Heteroskedasticity-robust standard errors are in parentheses: * $p < 10\%$, ** $p < 5\%$. If state-time clustered standard errors are used instead (in the first three specifications where there are enough clusters to match the number of variables), the p-value range does not change for any of the coefficients.

Dependent variable is Output growth$_{sit}$	Panel A (1929-1937) Inverse Interest Cover (IIC)			
	(1)	(2)	(3)	(4)
IIC$_i$ X Deposits suspended$_{st}$	-0.78	-0.72	-0.74	-0.90
	(0.40)*	(0.39)*	(0.41)*	(0.41)**
Deposits suspended$_{st}$	-4.94	-0.81	-0.83	
	(0.26)**	(0.30)**	(0.30)**	
IIC$_i$	-0.03	-0.03		
	(0.01)**	(0.01)**		
Fixed effects				
State	Yes	Yes	Yes	No
Time	No	Yes	Yes	No
State X Time	No	No	No	Yes
Industry	No	No	Yes	Yes
Obs	1092	1092	1092	1092
R^2	0.29	0.48	0.50	0.56

Dependent variable is Output growth$_{sit}$	Panel B (1921-1937) External Dependence (ED)			
	(1)	(2)	(3)	(4)
ED$_i$ X Deposits suspended$_{st}$	-1.44	-1.34	-1.32	-1.73
	(0.33)**	(0.37)**	(0.37)**	(0.35)**
Deposits suspended$_{st}$	-4.53	-0.99	-0.99	
	(0.25)**	(0.30)**	(0.31)**	
ED$_i$	0.04	0.04		
	(0.01)**	(0.01)**		
Fixed effects				
State	Yes	Yes	Yes	No
Time	No	Yes	Yes	No
State X Time	No	No	No	Yes
Industry	No	No	Yes	Yes
Obs	1928	1928	1928	1928
R^2	0.20	0.44	0.48	0.57

TABLE 5
DETERMINANTS OF BANK FAILURES

This table presents the results from estimating ordinary least squares regressions to evaluate the ability of two compound instruments to predict the percentage of deposits suspended. The dependent variable is the state specific biannual percentage of deposits suspended. Explanatory variables are the state specific percentage of branch bank offices in the year 1920 interacted with the national percentage of deposits suspended and the change in farm value over 1910s interacted with the national percentage of deposits suspended. The regressions reported in the first column include no fixed effects, while the regressions reported in the second column include state and time fixed effects. Panel A gives regressions run over the 1929-1937 period that corresponds to the sample used in regressions with inverse interest cover. Panel B gives regressions run over the 1921-1937 period that corresponds to the sample used in regressions with external dependence. Constants were calculated but were not reported. Standard errors are in parentheses: * p < 10%,** p < 5%.

Dependent variable is Deposits suspended$_{st}$	Panel A (1929-1937)	
	(1)	(2)
Branch offices in 1920$_s$ (%)	-1.35	-1.82
X US Deposits suspended$_t$ (%)	(0.71)*	(0.94)*
Farm value change over 1910s$_s$ (%)	1.86	1.39
X US Deposits suspended$_t$ (%)	(0.13)**	(0.25)**
Fixed effects	None	State and Time
Obs	192	192
R^2	0.52	0.67
F-test of of determinants	103.42	19.48

Dependent variable is Deposits suspended$_{st}$	Panel B (1921-1937)	
	(1)	(2)
Branch offices in 1920$_s$ (%)	-1.88	-1.36
X US Deposits suspended$_t$ (%)	(0.85)**	(1.09)
Farm value change over 1910s$_s$ (%)	1.77	1.59
X US Deposits suspended$_t$ (%)	(0.16)**	(0.29)**
Fixed effects	None	State and Time
Obs	336	336
R^2	0.27	0.48
F-test of determinants	62.74	17.22

TABLE 6
THE EFFECT OF BANK FAILURES ON OUTPUT GROWTH, CONDITIONAL ON FINANCIAL DEPENDENCE - IV ESTIMATES

This table presents results from estimating two-stage least squares regressions to measure the effect of bank failures on output growth, conditional on financial dependence. The dependent variable is the biannual output growth of 18 manufacturing industries (summarized in Table 2). The explanatory variables are percentage of suspended deposits (summarized in Table 2), financial dependence (summarized in Table 3) and their interaction. The regressions reported in each of the four columns differ by the set of fixed effects included. The biannual period 1932-1933 is excluded from the sample because of the special character of 1933 bank failures. Panel A regressions are run over the 1929-1937 sample; they use inverse interest cover as the measure of financial dependence. The corresponding first-stage regressions are reported in Panel A of the appendix Table 7. Panel B regressions are run over the 1921-1937 sample; they use external dependence as the measure of financial dependence. The corresponding first-stage regressions are reported in Panel B of the appendix Table 7. Constants were calculated but were not reported. State-Time clustered standard errors are in parentheses in the first three specifications; heteroskedasticity robust standard errors are in parentheses in the fourth specification: * p < 10%,** p < 5%.

Dependent variable is Output growth$_{sit}$	Panel A (1929-1937) Inverse Interest Cover (IIC)			
	(1)	(2)	(3)	(4)
IIC$_i$ X Deposits suspended$_{st}$	-2.24	-1.62	-1.67	-2.09
	(0.57)**	(0.54)**	(0.54)**	(0.59)**
Deposits suspended$_{st}$	-7.25	0.37	0.38	
	(0.86)**	(0.80)	(0.82)	
IIC$_i$	0.01	-0.01		
	(0.02)	(0.01)		
Fixed effects				
State	Yes	Yes	Yes	No
Time	No	Yes	Yes	No
State X Time	No	No	No	Yes
Industry	No	No	Yes	Yes
Obs	1092	1092	1092	1092
Clusters	169	169	169	
Centered R^2	0.24	0.46	0.48	0.55
F-statistics				
Cragg-Donald	330.63	68.55	67.42	667.19
Kleibergen-Paap	18.58	6.58	6.53	78.14

TABLE 6 - *Continued*

Dependent variable is Output growth$_{sit}$	Panel B (1921-1937) External Dependence (ED)			
	(1)	(2)	(3)	(4)
ED$_i$ X Deposits suspended$_{st}$	-2.83	-3.43	-3.46	-3.26
	(0.50)**	(0.58)**	(0.59)**	(0.45)**
Deposits suspended$_{st}$	-6.96	0.58	0.61	
	(0.98)**	(0.81)	(0.81)	
ED$_i$	0.07	0.08		
	(0.01)**	(0.01)**		
Fixed effects				
State	Yes	Yes	Yes	No
Time	No	Yes	Yes	No
State X Time	No	No	No	Yes
Industry	No	No	Yes	Yes
Obs	1928	1928	1928	1928
Clusters	299	299	299	
Centered R^2	0.13	0.37	0.40	0.55
F-statistics				
Cragg-Donald	296.03	77.30	77.04	778.91
Kleibergen-Paap	17.22	4.83	5.20	42.92

TABLE 7
FIRST STAGE REGRESSIONS

This table reports the first stage regressions that correspond to the specifications estimated in Table 6. Panel A regressions are run over the 1929-1937 sample; they correspond to the second stage regressions that use inverse interest cover as the measure of financial dependence. One first stage regression predicts IIC_i X Deposits $suspended_{st}$. The other first stage regression predicts Deposits $suspended_{st}$. Panel B regressions are run over the 1921-1937 sample; they correspond to the second stage regressions that use external dependence as the measure of financial dependence. One first stage regression predicts ED_i X Deposits $suspended_{st}$. The other first stage regression predicts Deposits $suspended_{st}$. The biannual period 1932-1933 is excluded from the sample because of the special character of 1933 bank failures. Constants were calculated but were not reported. State-Year clustered standard errors are in parentheses in the first three specifications; heteroskedasticity robust standard errors are in parentheses in the fourth specification: * p < 10%,** p < 5%.

PANEL A - INVERSE INTEREST COVER (IIC)

Fixed effects				
State	Yes	Yes	Yes	No
Time	No	Yes	Yes	No
State X Time	No	No	No	Yes
Industry	No	No	Yes	Yes
First Stage Regression 1	IIC_i X Deposits $suspended_{st}$			
	(1)	(2)	(3)	(4)
IIC_i X Branch offices in 1920_s (%)	-4.14	-4.04	-4.11	-4.08
X US Deposits $suspended_t$ (%)	(1.96)**	(1.89)**	(1.89)**	(0.76)**
IIC_i X Farm value change over $1910s_s$ (%)	2.48	2.43	2.44	2.41
X US Deposits $suspended_t$ (%)	(0.39)**	(0.39)**	(0.39)**	(0.20)**
Branch offices in 1920_s (%)	0.22	0.98	0.96	
X US Deposits $suspended_t$ (%)	(0.20)	(0.26)**	(0.26)**	
Farm value change over $1910s_s$ (%)	-0.14	0.27	0.28	
X US Deposits $suspended_t$ (%)	(0.05)**	(0.14)**	(0.14)**	
IIC_i	0.00	0.00		
	(0.00)*	(0.00)**		
Obs	1092	1092	1092	1092
Clusters	169	169	169	
Centered R^2	0.70	0.71	0.71	0.77
F-statistic				
of excluded instruments	12.58	14.77	14.98	78.14
Angrist-Pischke, of excluded instruments	14.77	19.66	19.83	78.14

TABLE 7 - *Continued*

PANEL A - INVERSE INTEREST COVER (IIC)

Fixed effects				
State	Yes	Yes	Yes	No
Time	No	Yes	Yes	No
State X Time	No	No	No	Yes
Industry	No	No	Yes	Yes

First Stage Regression 2	Deposits suspended$_{st}$		
	(1)	(2)	(3)
IIC$_i$ X Branch offices in 1920$_s$ (%)	1.06	0.83	0.87
X US Deposits suspended$_t$ (%)	(0.52)**	(0.34)**	(0.34)**
IIC$_i$ X Farm value change over 1910s$_s$ (%)	-0.42	-0.30	-0.30
X US Deposits suspended$_t$ (%)	(0.15)**	(0.11)**	(0.11)**
Branch offices in 1920$_s$ (%)	-1.62	-3.38	-3.37
X US Deposits suspended$_t$ (%)	(1.02)	(1.01)**	(1.01)**
Farm value change over 1910s$_s$ (%)	1.82	0.88	0.88
X US Deposits suspended$_t$ (%)	(0.27)**	(0.39)**	(0.39)**
IIC$_i$	0.00	0.00	
	(0.00)*	(0.00)*	
Obs	1092	1092	1092
Clusters	169	169	169
Centered R^2	0.68	0.72	0.72
F-statistic			
of excluded instruments	24.00	8.51	8.36
Angrist-Pischke, of excluded instruments	31.34	6.35	6.24

TABLE 7 - *Continued*

PANEL B - EXTERNAL DEPENDENCE (ED)

Fixed effects				
State	Yes	Yes	Yes	No
Time	No	Yes	Yes	No
State X Time	No	No	No	Yes
Industry	No	No	Yes	Yes

First Stage Regression 1	ED_i X Deposits suspended$_{st}$			
	(1)	(2)	(3)	(4)
ED_i X Branch offices in 1920$_s$ (%)	-2.43	-2.43	-2.32	-2.24
X US Deposits suspended$_t$ (%)	(1.16)**	(1.16)**	(1.20)*	(0.82)**
ED_i X Farm value change over 1910s$_s$ (%)	2.01	2.01	2.00	2.00
X US Deposits suspended$_t$ (%)	(0.32)**	(0.32)**	(0.32)**	(0.22)**
Branch offices in 1920$_s$ (%)	-0.66	-0.60	-0.58	
X US Deposits suspended$_t$ (%)	(0.25)**	(0.28)**	(0.27.)**	
Farm value change over 1910s$_s$ (%)	0.11	0.14	0.14	
X US Deposits suspended$_t$ (%)	(0.08)	(0.12)	(0.12)	
ED_i	0.00	0.00		
	(0.00)**	(0.00)**		
Obs	1928	1928	1928	1928
Clusters	299	299	299	
Centered R^2	0.58	0.58	0.58	0.74
F-statistic				
of excluded instruments	13.15	11.57	11.14	42.92
Angrist-Pischke, of excluded instruments	16.98	13.12	12.81	42.92

First Stage Regression 2	Deposits suspended$_{st}$		
	(1)	(2)	(3)
ED_i X Branch offices in 1920$_s$ (%)	-0.25	-0.18	-0.19
X US Deposits suspended$_t$ (%)	(0.16)	(0.16)	(0.16)
ED_i X Farm value change over 1910s$_s$ (%)	0.05	0.09	0.09
X US Deposits suspended$_t$ (%)	(0.06)	(0.06)	(0.06)**
Branch offices in 1920$_s$ (%)	-1.78	-3.63	-3.63
X US Deposits suspended$_t$ (%)	(1.28)	(1.23)**	(1.23)**
Farm value change over 1910s$_s$ (%)	1.93	0.89	0.89
X US Deposits suspended$_t$ (%)	(0.33)**	(0.46)*	(0.47)*
ED_i	0.00	0.00	
	(0.00)	(0.00)**	
Obs	1928	1928	1928
Clusters	299	299	299
Centered R^2	0.60	0.64	0.64
F-statistic			
of excluded instruments	11.45	3.70	3.67
Angrist-Pischke, of excluded instruments	14.63	4.63	4.60

TABLE 8
BANK FAILURES IN THE GREAT DEPRESSION

This table presents the estimates that evaluate the ability of the percentage of deposits suspended to predict the variation in sampled manufacturing output across US states during the 1929-1931 period. The dependent variable in the first column is state output growth aggregated over all sampled industries. The dependent variable in the second column is state output growth aggregated over the top third of industries by inverse interest cover. The dependent variable in the third column is state output growth aggregated over the top third of externally dependent industries. Explanatory variable is deposits suspended over 1930 and 1931. Panel A reports the OLS estimates while Panel B gives the IV estimates. Constants were calculated but were not reported. Standard errors are in parentheses: * $p < 10\%$,** $p < 5\%$.

Dependent variable is Output growth$_s$	Panel A - OLS (1929-1931)		
	(1) All output growth	(2) IIC-high output growth	(3) ED-high output growth
Deposits suspended$_s$	-0.28	0.01	-0.50
	(0.39)	(0.24)	(0.26)*
States	43	36	38

Dependent variable is Output growth$_s$	Panel B - IV (1929-1931)		
	(1) All output growth	(2) IIC-high output growth	(3) ED-high output growth
Deposits suspended$_s$	-0.96	-0.08	-1.39
	(0.73)	(0.56)	(0.56)**
States	43	36	38

TABLE 9
FINANCIAL DEPENDENCE AND INDUSTRY-AVERAGE ESTABLISHMENT SIZE

This table presents ordinary least squares estimates that evaluate the robustness of the main findings (the estimated effect of bank failures on output growth, conditional on financial dependence) to controlling for state specific industry-average size of establishment. The dependent variable is the biannual output growth of 18 manufacturing industries (summarized in Table 2). The explanatory variables are percentage of suspended deposits (summarized in Table 2), financial dependence (summarized in Table 3) and their interaction. More controls include: the average establishment size within an industry (estimated over 1919-1929 period for each state, and expressed in units of 10 million dollars of output) and its interaction with percentage of suspended deposits. The regressions reported in each of the four columns differ by the set of fixed effects included. The biannual period 1932-1933 is excluded from the sample because of the special character of 1933 bank failures. Panel A regressions are run over the 1929-1937 sample; they use inverse interest cover as the measure of financial dependence. Panel B regressions are run over the 1921-1937 sample; they use external dependence as the measure of financial dependence. Constants were calculated but were not reported. Heteroskedasticity-robust standard errors are in parentheses: * p < 10%,** p < 5%.

Dependent variable is Output growth$_{sit}$	Panel A (1929-1937) Inverse Interest Cover (IIC)				
	(1)	(2)	(3)	(4)	(5)
IIC$_i$ X Deposits suspended$_{st}$	-0.78	-0.92	-0.85	-0.86	-0.98
	(0.40)*	(0.42)**	(0.40)**	(0.42)**	(0.40)**
SIZE$_{si}$ X Deposits suspended$_{st}$		-3.17	-2.77	-3.03	-3.61
		(1.06)**	(0.88)**	(0.89)**	(0.97)**
Deposits suspended$_{st}$	-4.94	-4.57	-0.53	-0.52	
	(0.26)*	(0.28)*	(0.32)*	(0.32)	
IIC$_i$	-0.03	-0.03	-0.03		
	(0.01)**	(0.01)**	(0.01)**		
SIZE$_{si}$		0.05	0.05		
		(0.04)	(0.03)		
Fixed effects					
State	Yes	Yes	Yes	Yes	No
Time	No	No	Yes	Yes	No
State X Time	No	No	No	No	Yes
Industry	No	No	No	Yes	Yes
Obs	1092	1082	1082	1082	
R^2	0.29	0.30	0.48	0.51	0.58

TABLE 9 - *Continued*

Dependent variable is Output growth$_{sit}$	Panel B (1921-1937) External Dependence (ED)				
	(1)	(2)	(3)	(4)	(5)
ED$_i$ X Deposits suspended$_{st}$	-1.44	-1.40	-1.31	-1.27	-1.65
	(0.33)**	(0.33)**	(0.38)**	(0.37)**	(0.35)**
SIZE$_{si}$ X Deposits suspended$_{st}$		-0.88	-0.66	-0.85	-1.10
		(0.76)	(0.52)	(0.56)	(0.59)*
Deposits suspended$_{st}$	-4.53	-4.40	-0.90	-0.87	
	(0.25)**	(0.28)**	(0.31)**	(0.31)**	
ED$_i$	0.04	0.04	0.04		
	(0.01)**	(0.01)**	(0.01)**		
SIZE$_i$		0.03	0.03		
		(0.03)	(0.02)		
Fixed effects					
State	Yes	Yes	Yes	Yes	No
Time	No	No	Yes	Yes	No
State X Time	No	No	No	No	Yes
Industry	No	No	No	Yes	Yes
Obs	1928	1918	1918	1918	1918
R^2	0.20	0.20	0.44	0.48	0.57

TABLE 10
FINANCIAL DEPENDENCE AND CYCLICALITY CONTROLS (1889-1928)

This table presents ordinary least squares estimates that evaluate the robustness of the main findings (the estimated effect of bank failures on output growth, conditional on financial dependence) to controlling for the cyclicality of product-group's output. Panel A estimates the cyclicality betas for durables, semidurables and perishables. The estimation period is 1889-1928, excluding the WWI disturbances (1914-1920). Total output is the sum of output of consumer and producer durables, semidurables, perishables and construction materials. Shaw (1947) is the source. In Panels B and C, the dependent variable is the biannual output growth of 18 manufacturing industries (summarized in Table 2). In columns 1 and 3 the dependent variable was used unaltered while in columns 2 and 4 the change predicted by the cyclical product-group movement was first subtracted. The explanatory variables are percentage of suspended deposits (summarized in Table 2), financial dependence (summarized in Table 3) and their interaction. The columns 1 and 2 include state fixed effects while the columns 3 and 4 include both state and time fixed effects. The biannual period 1932-1933 is excluded from the sample because of the special character of 1933 bank failures. Panel B regressions are run over the 1929-1937 sample; they use inverse interest cover as the measure of financial dependence. Panel C regressions are run over the 1921-1937 sample; they use external dependence as the measure of financial dependence. Constants were calculated but were not reported. Heteroskedasticity-robust standard errors are in parentheses: * $p < 10\%$,** $p < 5\%$.

	Panel A - (1889-1928) Estimating Cyclicality Betas		
Dependent variable is:	Biannual growth of durables	Biannual growth of semidurables	Biannual growth of perishables
Biannual growth of total output	2.99	0.47	0.19
	(0.31)**	(0.21)**	(0.15)
Obs	15	15	15
R^2	0.88	0.29	0.12

	Panel B - (1929-1937) Inverse Interest Cover (IIC) - Adjusted for Cyclicality			
	Baseline	Adjusted	Baseline	Adjusted
IIC_i X Deposits suspended$_{st}$	-0.78	-1.65	-0.72	-1.64
	(0.40)*	(0.39)**	(0.39)*	(0.39)**
Deposits suspended$_{st}$	-4.94	-0.58	-0.81	-0.26
	(0.26)**	(0.21)**	(0.30)**	(0.34)
IIC_i	-0.03	0.00	-0.03	0.00
	(0.01)**	(0.01)	(0.01)**	(0.01)
Fixed effects:				
State	Yes	Yes	Yes	Yes
Time	No	No	Yes	Yes
Obs	1092	1092	1092	1092
R^2	0.29	0.08	0.48	0.10

TABLE 10 - *Continued*

	Panel C - (1921-1937) External Dependence (ED) - Adjusted for Cyclicality			
	Baseline	Adjusted	Baseline	Adjusted
ED_i X Deposits $suspended_{st}$	-1.44	-0.56	-1.34	-0.58
	(0.33)**	(0.31)*	(0.37)**	(0.32)*
Deposits $suspended_{st}$	-4.53	-0.06	-0.99	-0.01
	(0.25)**	(0.21)	(0.30)**	(0.32)
ED_i	0.04	-0.01	0.04	-0.01
	(0.01)**	(0.01)	(0.01)**	(0.01)
Fixed effects:				
State	Yes	Yes	Yes	Yes
Time	No	No	Yes	Yes
Obs	1928	1928	1928	1928
R^2	0.20	0.04	0.44	0.07

3. THE EFFECT OF BANK FAILURES ON LABOR PRODUCTIVITY DURING THE GREAT DEPRESSION

3.1 Introduction

In 2008, the U.S. GDP declined by almost 5 percent. While labor productivity followed GDP by showing a slight but steady decline in the first three quarters, it turned decisively upwards following the escalation of the financial crisis in the fall of 2008. This is not consistent with real business cycle models in which productivity movements drive the cycle. Petrosky-Nadeau (2012) proposes to explain the countercyclical movement of productivity by a concurrent rise in the costs of financial intermediation. Building on Mortensen and Pissarides (1994), he models the costs of the financial sector as determinants of the least productive active production units in the economy. In his theoretical framework, tighter credit market conditions, described by higher lenders' screening costs, require larger flow transfers from entrepreneurs to creditors within each of the existing jobs. When, as a consequence of a financial crisis, the real costs of credit intermediation rise (Bernanke, 1983), the job destruction threshold increases and the least productive jobs are terminated. While his model fits the data from the recent crisis well, the empirical evidence is based on a single national time series.

Was the behavior of productivity during the other major financial recession, the Great Depression, similar to the behavior of productivity in the current crisis? The pattern of productivity movement in the Great Depression appears to depend on the sample and the measure of productivity. Total factor productivity declined significantly between 1929 and 1933 (Ohanian, 2001). This fall in productivity is usually explained by changes in unobserved factor inputs (e.g. labor hoarding or use of capital). On the other hand, there is evidence that labor productivity was countercyclical at least in several manufacturing sectors (Bordo and Evans, 1995). The proposed explanation is a series of negative demand shocks which pushed the economy down a static, neoclassical production function. Even the explanations which get the predicted direction of productivity changes right find it hard to explain their observed magnitude (Ohanian, 2001).

As a consequence, the behavior of productivity during the Great Depression remains unexplained at least in part.

In this paper, I give evidence that labor productivity of a substantial part of U.S. manufacturing did move against the cycle during the Great Depression; the other rare financial disaster of the last 100 years resembles in this the current crisis. Using a sample of 18 industries covering 40 percent of U.S. manufacturing output, I demonstrate that the Great Depression was moreover the only interwar period when labor productivity was countercyclical. But, I also show that bank failures are not likely to account for the observed movement of labor productivity against the cycle; the evidence in favor of a “cleansing” effect as in Petrosky-Nadeau (2012) is weak. My findings are based on an interwar panel of states and manufacturing industries. The panel I use allows for a more robust empirical test of an effect of bank failures on productivity than a single national time series. The local banking feature of the interwar United States, the local borrower-lender relationships, creates variation in financial market conditions across the U.S. states. As a consequence, whatever the effect of bank failures, the productivity should be more affected in states with more intense failures. The additional variation across states of my dataset does not come without a cost; the data I use only account for the extensive margin of work, the number of employees, but not the intensive margin, the number of hours worked. This paper is related to Field (2011) who documents a substantial rise in productivity over the 1930s. It is also related to Ziebarth (2012) who argues that restrictions in bank lending associated with financial crises, restrictions affecting even the most productive plants, result in factor misallocation and lower aggregate productivity.

I proceed as follows. Section 3.2 describes my dataset and presents the aggregate facts on the behavior of labor productivity during the Great Depression. In Section 3.3 I explain the method used and present the empirical results. Section 3.4 includes two robustness checks, while the last section concludes.

3.2 Data

This section explains my dataset. I start with introducing my dependent variable, labor productivity of a number of interwar manufacturing industries. I then proceed to describe the growth rates of GDP and value added by manufacturing, as well as the associated rates of output gap; all are used to study the movement of labor productivity with the cycle. I proceed to explain the indicator of bank failures I use, as well as the measures of sensitivity to bank failures – two measures of financial dependence. After describing the instruments for bank failures, I conclude by explaining the procedures used in cleaning and deflating the data.

a. Labor Productivity

The dependent variable is the labor productivity in manufacturing industries. The interwar biannual U.S. Censi of Manufactures served as the source (U.S. Bureau of the Census, 1919-1941). The original variables in the Censi used in calculating labor productivity are the value of product, cost of materials, and the number of wage earners. Labor productivity was calculated as the ratio of value added and the number of wage earners, where value added was calculated by subtracting the cost of materials from the value of product. My measure of labor productivity varies across states, industries, and biannual periods. I also performed a number of tests for the purpose of which labor productivity was aggregated across states, industries, or both. The sample I use is based on modifying the dataset of Rosenbloom and Sundstrom (1999). Their dataset consists of twenty one out of thirty one manufacturing industries which were the largest employers in 1929; the choice of the twenty one industry was based on insuring that industry definition in successive censi did not change. I exclude two of these industries: rayon (with very few observations), and cigars (an outlier by external dependence). Because I map them into a single score of external dependence, I also merged lumber industry and planning mills industry. This resulted in a dataset of eighteen industries, covering 8 biannual periods between 1921 and 1937 (1921-1923, 1923-1925, 1925-1927, 1927-1929, 1929-1931, 1931-1933, 1933-1935 and 1935-1937). My sample accounts for 40 percent of manufacturing output in 1929 (U.S. Bureau of the Census, 1929). Given that in the same year manufacturing participated with 45 percent in the gross income of American establishments filing tax returns (U.S. Internal Revenue Service, 1929), my sample ought to cover manufacturing industries contributing with 15-20 percent to total U.S. corporate income on the eve of the Great Depression. Descriptive statistics by period for the growth in labor productivity are given in Panel A of Table 1.

[Table 1]

b. Growth Rates and Output Gaps Based on Output and on Value Added

To study the cyclical behavior of labor productivity I relate it to a number of measures of output, and value added, both at the national and at the state level. A variety of measures of output was used for robustness purposes, while a prevailing pattern was identified for both the national and the state-specific measures of productivity.

In regressions run at the national level the dependent variable is industry and period specific labor productivity, and it is explained by one of the following simultaneous variables:

- Growth rate of the gross domestic product
- Rate of output gap based on GDP
  - Estimated as linear gap
  - Estimated using HP filter with 100 smoothing parameter
  - Estimated using HP filter with 6.5 smoothing parameter
- Growth rate of the value added by manufacturing at the national level
- Rate of output gap based on the value added by manufacturing at the national level
  - Estimated as linear gap
  - Estimated using HP filter with 100 smoothing parameter
  - Estimated using HP filter with 6.5 smoothing parameter

In regressions which are also run across the U.S. states, the dependent variable is the state, industry, and period specific labor productivity, and it is explained by one of the following simultaneous variables:

- Growth rate of the value added by manufacturing in the same state

- Rate of output gap based on the value added by manufacturing at the state level
  - Estimated as linear gap
  - Estimated using HP filter with 100 smoothing parameter
  - Estimated using HP filter with 6.5 smoothing parameter

All the growth rates and output gaps, besides those based on GDP, were constructed from the various issues of the U.S. Census of Manufactures. Growth rate of the same industry's output, both at the national and at the state level, is calculated using the value of product variable sourced from the U.S. Censi of Manufactures (U.S. Bureau of the Census, 1919-1941). Value added by manufacturing, at the state level and at the national level, as well as the related measures of output gap, were obtained from the summary table for the interwar period in the 1947 U.S. Census of Manufactures. Growth rate of the gross domestic product, and the related measures of output gap, are sourced from Kendrick (1961). Rates of gap were obtained by dividing the estimated output (or value added) gaps with the estimated output (or value added) trend.

c. Exposure and Sensitivity to Bank Failures

Whatever may have been the effect of bank failures on productivity during the Great Depression, it ought to have been felt more in localities with many bank failures and in industries more dependent on bank financing. I use deposits suspended as a measure of bank failures[11]. Deposits of all commercial banks[12] are coded from the Banking and Monetary Statistics 1914-1941 (U.S. Board of Governors of the Federal Reserve System, 1943) and total deposits of banks suspended are sourced from All Bank Statistics 1896-1955 (U.S. Board of Governors of the Federal Reserve System, 1959). Dividing suspended by total deposits gives the percentage of deposits in suspended commercial banks. An

[11] Notice that even those suspensions which do not result in failures create uncertainty and expectations of bank closings in the future, and could therefore lead to disintermediation.

[12] Commercial banks include all banks other than the mutual savings banks (U.S. Board of Governors of the Federal Reserve System, 1943). In the whole period 1921-1937 there were only 13 failures of mutual savings banks in the whole country, and I exclude them from the analysis. Commercial banks thus include the national banks and two categories of state commercial banks: those that are members of the Federal Reserve System, and those that are not.

observation is, for example, the percentage of deposits suspended in Arizona's banks over 1930 and 1931. Deposit suspensions are described in Panel B of Table 1.

My measure of bank failures thus varies across states. For the use in tests which do not vary across states, I construct an indicator of industry-specific exposure to bank failures at the national level. The measure is equal to the weighted average of the bank failures (fractions of deposits suspended) across U.S. states during the Great Depression, where the weight for the failures in each state is the fraction of industry i's national output produced in that state in 1929, as shown in equation (1). The resulting indicator is summarized in Panel D of Table 1.

$$bank\ \ failures_{i,1929-33} = \sum_s \left(\frac{output_{is,1929}}{output_{i,1929}} \right) \cdot bank\ \ failures_{s,1929-33} \qquad (1)$$

When banks fail, industries which depend more on external financing ought to be more affected. In this paper, I use both the novel measure of inverse interest cover, introduced in the second chapter of this thesis, as well as the standard external dependence of Rajan and Zingales (1998). Inverse interest cover is equal to the earnings (before interest and taxes) divided by interest expense due in the same year. When few earnings are left after interest is paid, a firm is more likely to borrow. It thus measures the current financing needs, relevant both in expansions and severe contractions. The external dependence of Rajan and Zingales (1998) equals the percentage of capital expenditure which is not covered by the cash flow from operations. It thus measures the reliance on external financing for the purpose of investment. Because new investment was not a priority during the Great Depression, large capacities stayed unused, I use inverse interest cover as the main measure and external dependence as a robustness check.

The annual Statistics of Income (U.S. Internal Revenue Service, 1922-1928) were the source for the inverse interest cover. The indicator was obtained as the seven-year (1922-1928) industry-group average. Standard and Poor's Compustat was used to construct the external dependence indicator as industry-average for the 1950-2007 period. 1929 Census of Manufactures industries were first matched with 1987 Standard Industry Classification industries used in Compustat. For the ease of interpretation of regression results, both measures were transformed to set their median to zero and their maximum to one, as shown in equations (2) and (3) below. To make it into a measure of dependence, the interest cover was not only rescaled but also inverted. The resulting indicators are summarized in Panels E and F of Table 1.

$$T(IC) = \frac{IC_{MEDIAN} - IC}{IC_{MEDIAN} - IC_{MIN}} \quad (2)$$

$$T(ED) = \frac{ED - ED_{MEDIAN}}{ED_{MAX} - ED_{MEDIAN}} \quad (3)$$

d. Instruments of Bank Failures

To identify a causal effect of bank failures on labor productivity and its movement with the cycle, I use two state-specific instruments of bank failures. The two indicators of the vulnerability of the local banking system were introduced in the first chapter of this thesis. They are the percentage of branch bank offices in the year 1920 and the increase in the value of farmland over the 1910s. The logic behind their use is further explained in the subsection 3.3.c of this paper. The data on branch banking are sourced from the Banking and Monetary Statistics 1914-1941 (U.S. Board of Governors of the Federal Reserve System, 1943), while the data on values of farmland is taken from Pressley and Scofield (2001). The summary statistics for the instruments are given in Panel C of Table 1.

e. Data Cleaning

In order to clean the data sourced from the Censi of Manufactures, I marked as missing the observations with a small number of establishments in an industry per state, where small was defined so as to leave at least 95 percent of the national product value of the industry in the sample. Following this, the bottom and the top 1 percent of the growth rates of output and of labor productivity, which vary by state, industry and period, were recoded to the 1st and the 99th percentile. For the growth rates of national output and of labor productivity, which vary by industry and period only, no recoding was done; the national output within a period varies only over industries (not across states) and no justification thus remains for any data point to be considered as an outliers at the national level.

f. Deflation of Data

Prior to calculating the growth rate of productivity, the underlying variables of the value of product and the cost of materials were deflated. This was performed using a CPI[13] of the U.S. Bureau of Labor Statistics (U.S. Bureau of Labor Statistics, 2010). The measures of output gap and the output growth rates were also used in deflated form. Here, two types of measures were used - based on GDP and based on (state and national) value added by manufacturing. GDP was already deflated in the source (Kendrick, 1961), expressed in billions of 1929 dollars, while the value added by manufacturing was deflated using the same CPI of the Bureau of Labor Statistics. On the other hand, there was no need to deflate the measures of bank failures and the indicators of financial dependence. Bank failures were expressed as a percentage of deposits failed over a two year period. The measures of financial dependence were constructed as the average over years of ratios of nominal variables, where the ratio in each year has a real interpretation.

3.3 Method and Results

This section presents the method I use and the results of both graphical and regression analysis. Graphical analysis examines the relationship between labor productivity and output during the whole interwar period. It also looks at differences in labor productivity between industry groups with different exposure and sensitivity to bank failures. Regression analysis first documents the movement of labor productivity with the cycle. It then proceeds to examine how bank failures affected labor productivity. The initial regression specifications measure an unconditional effect while the final specifications enrich the

[13] This was the "Consumer Price Index for All Urban Consumers: All Items. Not Seasonally Adjusted (1919=1)".

inference by measuring the effect of failures conditional on industry-specific financial dependence.

a. Graphical Analysis

There is a disagreement in the literature over whether productivity was positively or negatively correlated with output during the Great Depression. Literature presenting the real business cycle view of the Great Depression, for instance Ohanian (2001), documents that total factor productivity was procyclical; it declined significantly over the Depression. On the other hand, Bordo and Evans (1995) show that labor productivity was countercyclical in at least a number of manufacturing sectors. For this reason, it becomes essential to determine how labor productivity moved with the cycle in my sample of 18 manufacturing industries. Figure 1 describes the movement of labor productivity and output over the interwar period. Both series are indices at the national level constructed from the used sample of manufacturing industries. Figure 1 illustrates that labor productivity moved with the cycle in all periods besides the 1931-1933 biannual period; over these two years output continued to decline while productivity started recovering.

[Figure 1]

The evidence from 1931-1933, shown in Figure 1, does not contradict the existence of a "cleansing" effect described by Petrosky-Nadeau (2012). Higher cost of credit could have forced firms to abolish the least productive jobs, moving the labor productivity against the cycle. Moreover, the fact that productivity did not move against the cycle during the other biannual period in the sample which corresponds to the Great Depression, 1929-1931, also cannot be taken as evidence against the hypothesized effect of banking failures. This is because there are many possible reasons for business cycle fluctuations. For a "cleansing" effect to matter, it is sufficient that the decline in aggregate productivity is limited by the shock to the financial system. In other words, it is sufficient if the decline in productivity is smaller than it would be in the absence of the banking shock. A way to test for an effect of bank failures on productivity is to compare the levels of labor productivity and output. Figure 2 plots labor productivity against output and includes a linear fit for the relationship between the two, a fit estimated excluding the Great Depression (biannual periods 1929-1931 and 1931-1933).

[Figure 2]

Figure 2 demonstrates that labor productivity in both 1929-1931 and 1931-1933 was higher than that expected from a linear relationship with output estimated using the other interwar years. This however cannot be taken as conclusive evidence that disruption in credit intermediation, widespread during the Great Depression, limited the decline in labor productivity. It is possible that the movement in labor productivity simply has a lower amplitude than that in output, so output and productivity move apart the most in strong booms or busts. For further evidence, I proceed to compare the movement of labor productivity for groups of industries differing by their exposure to bank failures and their pre-determined sensitivity to bank failures.

[Figure 3]

Figure 3 shows the movement of labor productivity for three groups of industries: i) group with low exposure to bank failures in the Great Depression (boots, bread, canning, chemicals, petroleum refining, and printing); ii) group with high exposure to bank failures in the Great Depression (motor vehicle parts, motor vehicles, furniture, iron, meat packing, and rubber), and iii) group with both high exposure to bank failures in the Great Depression and with high financial dependence (measured by interest cover) (cotton goods, furniture, lumber and planing mill, meat packing, and rubber). Note that the measure of exposure to bank failures in the Great Depression is equal to the weighted average of the bank failures (fraction of deposits suspended) in U.S. states during the Great Depression, where the weight for the failures in each state is the fraction of each industry's national output produced in that state in 1929. Comparing the groups with high and low exposure to bank failures, it is evident that the initial decline in productivity of the highly exposed group is more limited (1929-1931 period). This agrees with bank failures that force the least productive jobs to terminate. But, by the end of the Great Depression, the pattern reverses. In the whole 1929-1933 period, the overall fall in productivity for the industry-group highly exposed to bank failures is larger than that for the least exposed industries. The comparison between the performance of the highly exposed group to that of the group which is both highly exposed to failures and is intrinsically more sensitive to bank failures (measured by inverse interest cover) also remains open for interpretation. While the decline in productivity for the two industries is almost the same in the 1929-1931 period, the productivity of the more sensitive group starts to recover thereafter, which could suggest a “cleansing” effect was in operation.

Overall, the graphical analysis provides evidence that labor productivity in the Great Depression was at least less procyclical than in the other interwar periods, while it was even countercyclical in 1931-1933. On the other hand, it does not give clear evidence on how bank failures can be related to the observed pattern of movement in labor productivity.

b. Cyclicality of Labor Productivity over the Interwar Period

As the first step in regression analysis, I observe the comovement of labor productivity with several measures of output and output gap. Their relationship is examined in the following three interwar periods: before, during, and after the Great Depression. Table 2 gives the results. Regressions in Panel A have as the dependent variable a measure of national labor productivity variant by industry, while those in Panel B explain a measure of labor productivity which is both industry and state specific. Each row in Table 2 corresponds to a single regression using one of the explanatory variables described in the subsection 3.2.b. The regressions can be of the following two types:

$$gproductivity_{(s)it} = \alpha + \beta \cdot goutput_{(s)t} + f.e. + u_{(s)it} \qquad \text{(S1)}$$

$$gproductivity_{(s)it} = \alpha + \beta \cdot routputgap_{(s)t} + f.e. + u_{(s)it} \qquad \text{(S2)}$$

where the explanatory variable $goutput_{(s)t}$ corresponds to the growth rate of either the GDP (not variant by state, s) or the value added by manufacturing (variant by state, s), $routputgap_{(s)t}$ represents the rate of output gap (either based on the GDP or on the state-specific value added by manufacturing), while *f.e.* denotes a set of fixed effects. In the regressions reported in Panel B the variation across states is added for all variables which have an "s" in their name marked in brackets. The three columns of Table 2 correspond to the following three periods: before (1921-1929), during (1929-1933), and after the Great Depression (1933-1937). Each field in the table thus corresponds to a regression over a single period and using a single explanatory variable. However, for each period-variable pair, several regression specifications including different fixed effects were run[14]. As long as at least one of the specifications for a given period and explanatory variable gave a statistically significant relationship, the field was marked as statistically significant. Statistically significant relationships are given in bold, while the insignificant ones are given in brackets. Each field reports the sign of the relationship between labor productivity and a measure of output.

[Table 2]

The results reported in Table 2 show that labor productivity followed output the least during the Great Depression, less than in the twenties and less than in the recovery period. The regressions across industries at the national level (Panel A), and the regressions across both industries and states (Panel B), agree in most cases. Moreover, specifications with different fixed effects rarely differ in sign. Labor productivity in the Great Depression was on average countercyclical in my sample. In the period after the Great depression, labor productivity was strongly procyclical. It is in the twenties that the national and state-specific estimates somewhat differ. Labor productivity is usually estimated as procyclical, although it is countercyclical in some specifications.

What can we conclude from the results in Table 2? First, just like in the recent crisis, the productivity of many manufacturing industries, the majority of those in my sample, moved against the cycle during the Great Depression. The countercyclical pattern of labor productivity was stronger than both before and

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[14] These are the specifications different by fixed effects: A) For the national measure of industry-level productivity: 1. Four specifications for the growth rate of the same industry (without year and industry fixed effects, with year but without industry fixed effects, without year but with industry fixed effects, and with both year and industry fixed effects); and 2. two specifications for all other explanatory variables (one without and the other one with industry fixed effects); B) For the state-specific measure of industry-level productivity, for all variables, four specifications were run: first, with no fixed effects, second, with state fixed effects only, third, with state and industry fixed effects, and finally fourth with state, industry and year fixed effects.

after the crisis. While severe depressions must share many features, given that both crises also had a strong financial component, it is possible that bank failures could account for this pattern. Figure 4 shows the incidence of bank failures. Bank failures were the most intense in the 1929-1933 period of the Great Depression. While they were almost non-existent in the period after the Depression (1933-1937), they were also present in the 1920s (1921-1929), although roughly five times less intense than during the Great Depression. The results from Table 2 are thus consistent with a "cleansing" effect of bank failures; the behavior of productivity in the twenties, being between that observed in the Great Depression (countercyclical) and that observed in its aftermath (procyclical), agrees with the medium intensity of the 1920s' bank failures. To examine whether bank failures could really account for the observed pattern of cyclicality of labor productivity in the interwar period, I proceed to test for their effect directly.

c. The Effect of Bank Failures on Labor Productivity

The first two chapters of this thesis show that bank failures cause both value added and output in the same state to fall. Thus, for the bank failures to account for the countercyclical movement of labor productivity during the Great Depression, they would have to cause labor productivity to rise. Table 3 examines the impact of bank failures ($fail_{st}$) on labor productivity estimated using specification (S3).

$$gproductivity_{sit} = \alpha + \gamma \cdot fail_{st} + f.e. + u_{sit} \quad \text{(S3)}$$

[Table 3]

Panel A gives the OLS results, while Panel B estimates the causal effect of bank failures using a set of instruments. The eight regressions in each panel correspond to four different periods, with two regressions per period different by the fixed effects used. Columns one and two give regression results from the whole interwar period (1921-1937), columns three and four give regression results from the twenties (1921-1929), columns five and six give regression results from the Great Depression (1929-1933), while columns seven and eight give regression results from the single biannual period of the Great Depression which excludes the 1933 bank failures (1929-1931). For the whole interwar period, the twenties, and the Great Depression the first specification includes industry and state fixed effects, while the second one adds to them the period fixed effects. For the 1929-1931 period, the first specification includes no fixed effects while the second one includes industry fixed effects.

Columns 5 and 6 of Panel A give some evidence that bank failures were associated with a rise in labor productivity during the Great Depression (1929-1933) and its movement against the cycle. The specification without period fixed effects, shown in column 5, reports a positive and statistically significant relationship, which however disappears when period fixed effects are included in column 6. Given that period fixed effects could in part capture the effect of bank failures themselves, the finding from column 5 that bank failures are associated with countercyclical movement of labor productivity retains its relevance. The examination of the estimates from other periods however casts a doubt on the result from column 5. Firstly, if the 1931-1933 biannual period is excluded, leaving us with the cross section of states and industries in the 1929-1931 period, the relationship between bank failures and labor productivity moves to negative and statistically insignificant (shown in columns 7 and 8). To be careful about our results, we might want to exclude the 1931-1933 period; bank failures of March 1933 were associated with the government's intervention which restored the trust in the banking system, and most of 1933 was a strong recovery after these failures. Secondly, the coefficient estimates from the 1920s given in columns 3 and 4 are negative, this means bank failures were associated with cyclical movement of labor productivity. The finding is robust by magnitude, stability across specifications using different fixed effects, as well as by statistical significance. In a similar vein, the estimates from the whole interwar period shown in columns 1 and 2 are negative, and the one without period fixed effects is statistically significant. Moreover, the weakness of these two estimates compared to those from the 1920s turns out to be driven by the 1931-1933 biannual period. If this period is excluded from the interwar sample, both the estimates in columns 1 and 2 remain negative, become statistically significant and their magnitude approaches that from the 1920s (they change to -1.67 and -0.62, respectively).

The OLS estimates could however be biased by reverse causality. Suppose that a decline in productivity occurs for some other reason. This would make firms less profitable and could lead some of them to stop servicing their loans, causing banks to fail. In such a setting, a negative and significant γ from specification 3 would not reflect a causal effect of bank failures on productivity. To address this concern, I use a set of instruments of bank failures. These are the percentage of branch bank offices in the year 1920 and the increase in the value of farmland over the 1910s, both state-specific. They were introduced in the first chapter of this thesis and serve as indicators of fragility of the local banking system. Branched systems are more resilient to shocks than unit-banking systems because of the risk sharing between the branches of a given bank. Similarly, the states which experienced a boom in agricultural land prices, due to the European demand for food during WWI, had banks more vulnerable in the aftermath of the war when falling food prices caused farmers to miss on their mortgage payments. To make possible the use of these state-specific instruments in specifications using state fixed effects, I interact them with the time-variant national measure of bank failures. The logic is the following: whatever is the incidence of failures at the national level in a given year, the way they are going to be spread across states will depend on the robustness of the local banking system.

The estimates of the causal impact of bank failures on labor productivity obtained using the described set of instruments are presented in Panel B of Table 3. While they differ in size from their OLS counterparts, they are not qualitatively different. Bank failures move labor productivity against the cycle only during the Great Depression. This finding is not robust to the exclusion of the period containing the bank failures of unique character from March 1933 (estimates in columns 7 and 8). Moreover, bank failures cause labor productivity to fall in the 1920s (estimates in columns 3 and 4). The same is true for the whole interwar period (columns 1 and 2), and even more so if the 1931-1933 period is excluded when obtaining these estimates (the interwar coefficients change to -2.40 and -0.79, respectively). Overall, the results from Table 3 indicate that, while bank failures of the Great Depression are associated with a rise in labor productivity and its movement against the cycle, this finding is both dependent on the inclusion of the unique failures of March 1933 and contrary to the estimated effect of failures in any other interwar period.

It is possible that bank failures in specification (S3) are being loaded with a part of the effect of omitted variables which drive the cycle. That would explain the observed pattern: in periods when labor productivity is countercyclical bank failures, as the only explanatory variable, appear to move it against the cycle; in periods when labor productivity is procyclical bank failures appear to move it with the cycle. While the fixed effects in specification (S3) ought to prevent this at least in part, specifications (S4) and (S5) take a more direct way of addressing this concern. The coefficient β in these specifications is capturing the movement of labor productivity with the cycle in the absence of bank failures and coefficient γ is measuring the additional change in labor productivity which results from the bank failures. Note that γ in (S4) and (S5) would not capture the whole effect of bank failures on labor productivity; to the extent that bank failures affect aggregate output some of it would be captured by β too. But, γ measures how bank failures affect labor productivity differently from any other factor which also moves aggregate output.

$$gproductivity_{sit} = \alpha + \beta \cdot goutput_{st} + \gamma \cdot fail_{st} + f.e. + u_{sit} \qquad \text{(S4)}$$

$$gproductivity_{sit} = \alpha + \beta \cdot routputgap_{st} + \gamma \cdot fail_{st} + f.e. + u_{sit} \qquad \text{(S5)}$$

[Table 4]

Table 4 has a similar structure to Table 3. Panel A gives the OLS results, while Panel B presents the IV results. There are four estimation periods and two specifications using different fixed effects for each period. The fixed effects used per period are the same as those in Table 3. What is different is that we now have three sets of regressions which differ by the measure of aggregate state output used as the control. These are growth in value added by manufacturing, rate of linear gap in value added by manufacturing and rate of HP gap with smoothing parameter 100 in value added by manufacturing[15].

[15] A fourth set of regressions using rate of HP gap in value added by manufacturing with a smoothing parameter of 6.5 was also run, but never gave results which were qualitatively different from those using smoothing parameter 100.

While the estimated coefficients γ differs from those in Table 3 quantitatively, there is little qualitative change. This holds both for the OLS and IV results. Bank failures are associated with a rise in labor productivity, moving it against the cycle, only in the period of the Great Depression. But, this finding is not robust to excluding the subperiod containing the bank failures of 1933. At the same time, bank failures cause labor productivity to decline in the 1920s. The results for the whole interwar period (1921-1937) vary, but they also turn negative if the subperiod containing the unique failures of 1933 is excluded from the analysis.

As the final test for the effect of bank failures on labor productivity, I condition the effect of bank failures on industry-specific financial dependence as shown in specifications (S6) and (S7). The logic is the following: whatever is the effect of bank failures on labor productivity, it ought to be more expressed for those industries which rely more on external financing. Recall that financial dependence was rescaled to have a value of zero for the median dependent industry and the value of one for the maximum dependent industry. This implies that coefficient γ_2 measures the effect of bank failures on labor productivity of the median dependent industry, while the effect of bank failures on labor productivity of the maximum dependent industry is given by the sum of coefficients γ_1 and γ_2. As the measure of financial dependence, I use the inverse interest cover constructed using data from the 1920s. The industries which have fewer earnings compared to their interest payments ought to be more affected when banks fail. The results are presented in Table 5. The structure of the table is the same as Table 4, with the difference that no industry fixed effects were used in any of the regressions; for this reason the period of 1929-1931 now has a single specification with no fixed effects, given in column 7. Excluding the industry fixed effects allows us to estimate the effect of differences in financial dependence on labor productivity in the absence of bank failures.

$$gproductivity_{sit} = \alpha + \beta \cdot goutput_{st} + \gamma_1 \cdot findep_i \cdot fail_{st} + \\ + \gamma_2 \cdot fail_{st} + \gamma_3 \cdot findep_i + f.e. + u_{sit} \qquad \text{(S6)}$$

$$gproductivity_{sit} = \alpha + \beta \cdot routputgap_{st} + \gamma_1 \cdot findep_i \cdot fail_{st} +$$
$$+ \gamma_2 \cdot fail_{st} + \gamma_3 \cdot findep_i + f.e. + u_{sit} \qquad \text{(S7)}$$

[Table 5]

The results presented in Table 5 suggest that during the Great Depression bank failures reduced labor productivity, moving it against the cycle. The effect of bank failures on labor productivity of the median dependent industry during the Great Depression, measured by γ_2 in columns 5 and 6, is insignificant and mostly negative in the OLS regressions. The IV regressions only reinforce the change compared to Table 4 – the effect of bank failures on the median dependent industry becomes negative and statistically significant. The finding is confirmed by the results given in column 7 when the bank failures of March 1933 are excluded. This suggests that bank failures moved the productivity of the median dependent industry with the cycle during the Great Depression. Importantly, the difference in the effect of bank failures on the median and the maximum dependent industry, measured by γ_1, is negative and statistically significant across all specifications in the Great Depression period. Bank failures reduced the labor productivity of financially dependent industries more than that of their less dependent counterparts, moving it with the cycle. In the absence of bank failures, more financially dependent industries are not doing any worse than others, evidenced by a positive and significant γ_3 in IV regressions.

But, the evidence from the periods other than the Great Depression is now not uniformly supporting the claim that bank failures reduced labor productivity. The evidence from the 1920s (given in columns 3 and 4) suggests that failures were reducing labor productivity of the median dependent industry, consistent with the findings from the regressions in Table 4 which did not condition the effect of bank failures on financial dependence. However, the variation across industries does not suggest that more financially dependent industries were affected more – the estimated interaction coefficient γ_1 is statistically insignificant and its sign varies. In a similar vein, the effect on the median dependent industry in the whole interwar period (given in columns 1 and 2) is associated with statistically insignificant causal estimates of γ_2 obtained in the IV regressions. While the variation across industries shows bank failures reduced labor productivity of the more financially dependent industries more (γ_1 is negative), this finding is not robust to the exclusion from the sample of the biannual period containing the bank failures of March 1933.

d. Interpretation of the Results

What can we conclude from the graphical and the regression analysis? First, just like in the recent financial crisis, labor productivity moved less with the cycle during the Great Depression than in any other interwar period. For the majority of industries in my sample, it was even countercyclical. This is confirmed by both the graphical analysis (Figures 1 and 2) and the results presented in Table 2. Given that the Great Depression was a period with many bank failures, the rise in the cost of credit intermediation associated to failures could have resulted in the termination of the least productive jobs and a rise in labor productivity. But, the direct tests of the effect of bank failures presented in Tables 3, 4 and 5 do not support a “cleansing” effect interpretation. Some evidence does suggest that a cleansing effect could have been in operation during the Great Depression; results in Tables 3 and 4 (without and with aggregate output as a control for the cycle) show that bank failures of the Great Depression are associated with a rise in labor productivity and its movement against the cycle. But, this finding turns out to be both dependent on the inclusion of the unique failures of March 1933 and contrary to the estimated effect of failures in any other interwar period. Moreover, conditioning the effect of bank failures on the industry-specific financial dependence, measured by inverse interest cover, tells a different story for the Great Depression. Bank failures are associated with declines in labor productivity, and even larger declines for more dependent industries. Should we then conclude that bank failures instead led to declines in labor productivity? Most of the results from the whole interwar period, the twenties, and the Great Depression would be consistent with this interpretation. However, some of the presented evidence should make us cautious. For instance, labor productivity of the more financially dependent industries, both in the twenties and in the whole interwar period (when the failures of 1933 are excluded), did not decline more in states and periods where banks failed.

3.4 Robustness

This section presents two robustness checks. The first one re-estimates the effect of bank failures on labor productivity conditional on industry-specific financial dependence by using another measure of dependence. The second one examines how my findings could be affected by also accounting for the intensive margin of work.

Repeating the regressions from Table 5, but replacing the inverse interest cover with the external dependence of Rajan and Zingales (1998), gives a qualitatively similar pattern of coefficients. The estimates are presented in Table 6. The evidence that bank failures led to declines in labor productivity of the median dependent industry is now weaker. The evidence in support of a cleansing effect in the Great Depression, present in some specifications, is however not robust to the exclusion of the bank failures of 1933.

[Table 6]

A potential concern for my findings could come from the fact that the state level dataset which I used covers only the extensive margin of work, the number of employees, but not the intensive margin, the hours of work. Figure 5 examines how hours and the number of employees moved together, at least at the national level. The source is Bernanke and Parkinson (1991).

[Figure 5]

Figure 5 shows that the interwar hours worked and the number of employees moved very close together at the national level. However, they did diverge in part during the Great Depression, with the number of employees declining more than the hours worked. This would suggest that, if hours were to be accounted for, the observed decline in productivity during the Great Depression (e.g. shown in Figures 1 and 3) would be more pronounced. Whether this is enough to change the pattern of comovement between productivity and output from countercyclical (shown in Table 2) to procyclical in my sample, is not certain. Moreover, what also remains to be examined is the difference in the effect of bank failures on employment on the one hand and the number of hours worked per continuing worker on the other.

3.5 Conclusion

In the recent financial crisis, output fell while productivity rose. This does not agree with the real business cycle theory which predicts that TFP should drive the cycle, and productivity should be procyclical. One explanation relates this atypical behavior of productivity to bank failures; banks that fail lead to a rise in the costs of credit intermediation and make the least efficient jobs unprofitable, leading to their termination. Petrosky-Nadeau (2012) provides a model of this "cleansing" effect of bank failures which fits data well for the current crisis. In this paper, using a sample which covers around 40% of U.S. manufacturing output, I first verify that the Great Depression as the other major financial crisis of the last 100 years is also related to countercyclical movement of labor productivity for a number of industries. However, I then demonstrate that it is hard to associate this phenomenon to bank failures. I use a panel of interwar states and industries, exploit the local banking feature of the interwar United States, and condition the effect of bank failures on financial dependence of each industry. My analysis thus provides a more robust test for the role of bank failures then would a single national time series. While the evidence is inconclusive, it gives some more support for bank failures which reduce labor productivity, moving it with the cycle.

My findings are based on following the contemporaneous co-movement between bank failures and labor productivity, with causal identification using instrumental variables. It could be improved on in two principal areas. First, the use of a state panel does not come without a cost. I identified no data on hours of work at the state level and the measure of labor productivity only accounts for the extensive margin, the number of employees. It is possible that controlling for the number of hours the pattern of countercyclical labor productivity during the Great Depression would be reduced, if not reversed. Second, an equally if not more important question is what happens within a longer period after bank failures. Could it be that banks failing resulted in areas with limited access to external financing where firms had to liquidate the least efficient jobs? Could bank failures after all help explain the major productivity improvements of the 1930s (Field, 2011)? This remains as a question for further investigation.

3.6 Figures

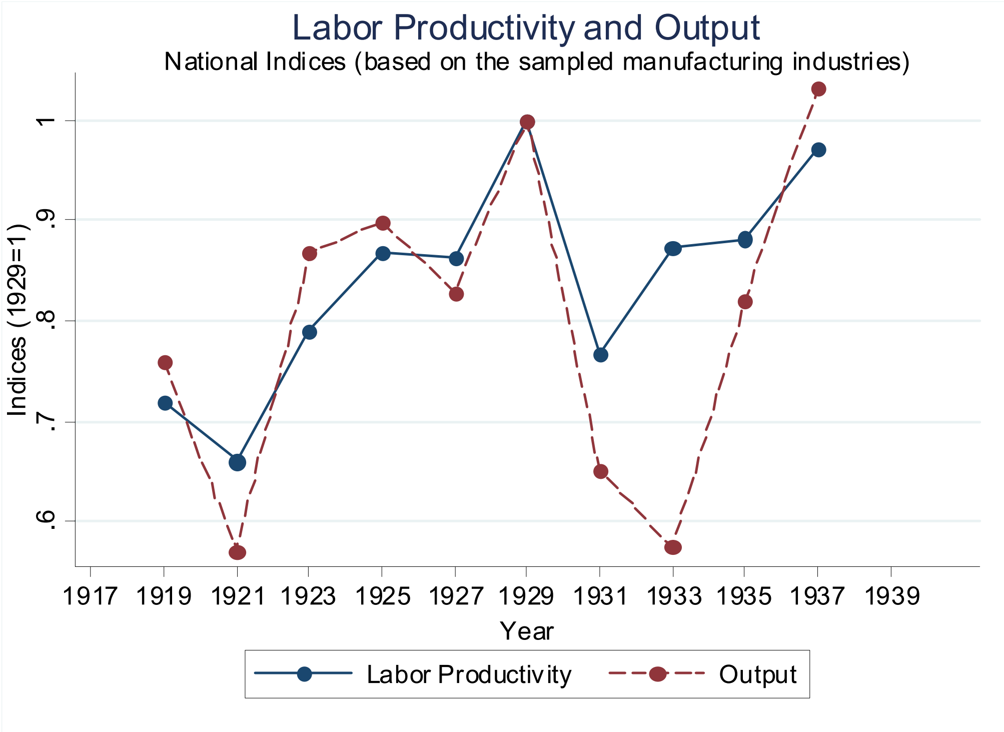

Figure 1

Labor Productivity and Output – Interwar Trends

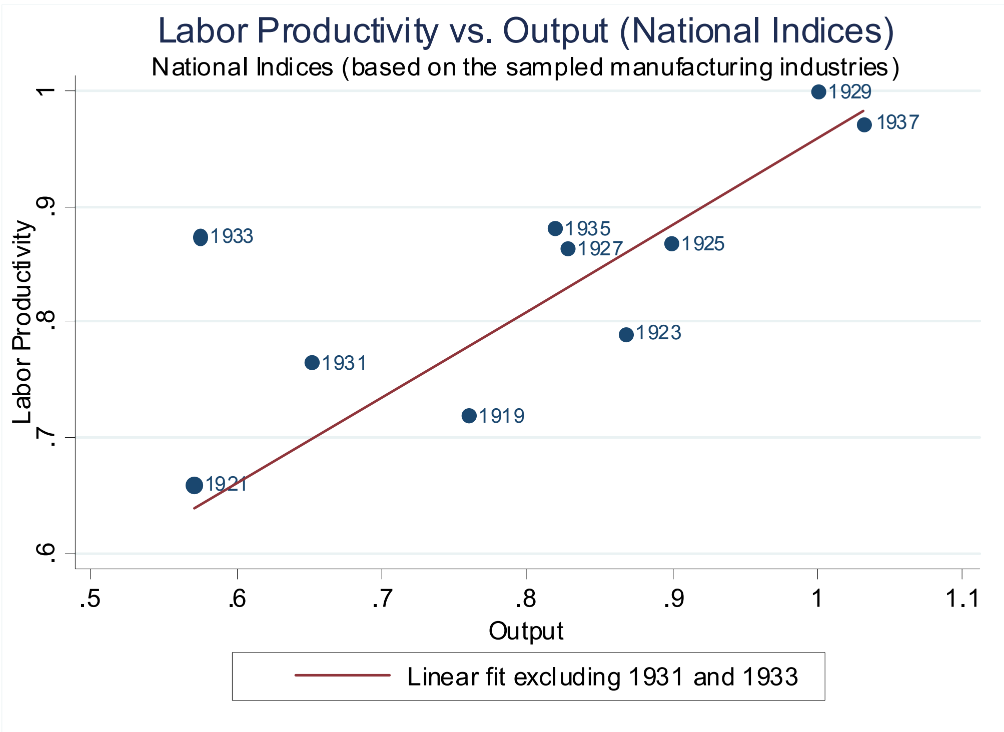

Figure 2

Labor Productivity against Output

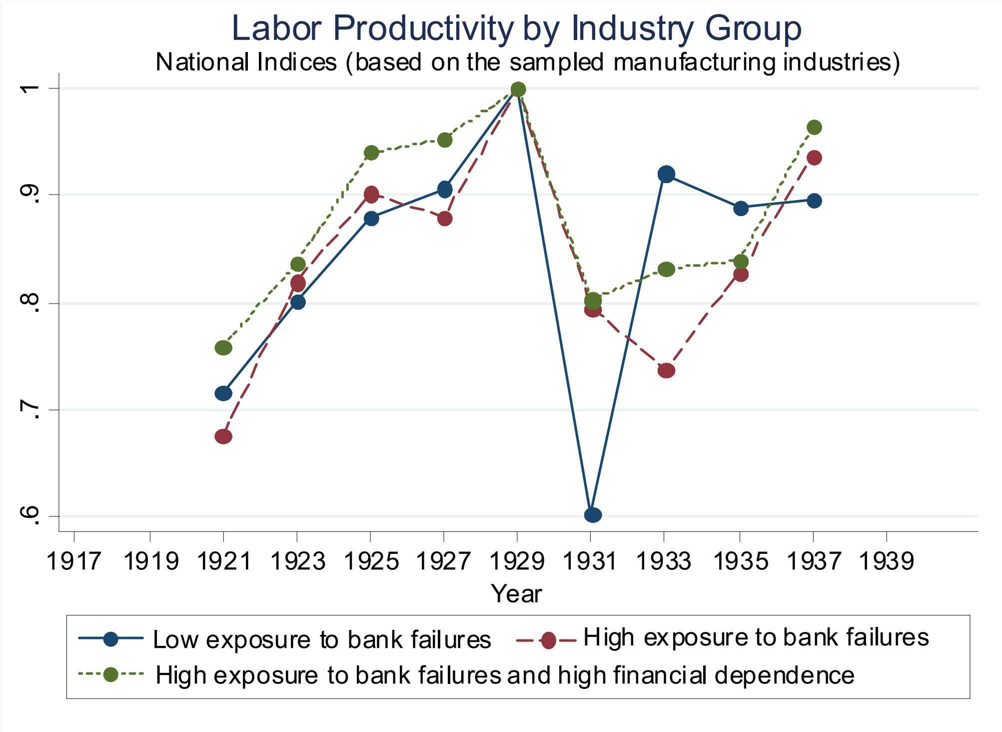

Figure 3

Labor Productivity by Industry Group[16] – Interwar Trends

[16] The composition of the three industry groups shown in Figure 3 is as follows: i)Low exposure to bank failures (bottom third of industries: boots, bread, canning, chemicals, petroleum refining, and printing); ii) High exposure to bank failures (top third of industries: motor vehicle parts, motor vehicles, furniture, iron, meat packing, and rubber); iii) High exposure to bank failures and high financial dependence (intersection of the top halves, since intersection of top thirds would consist of only two industries: cotton goods, furniture, lumber and planing mill, meat packing, and rubber).

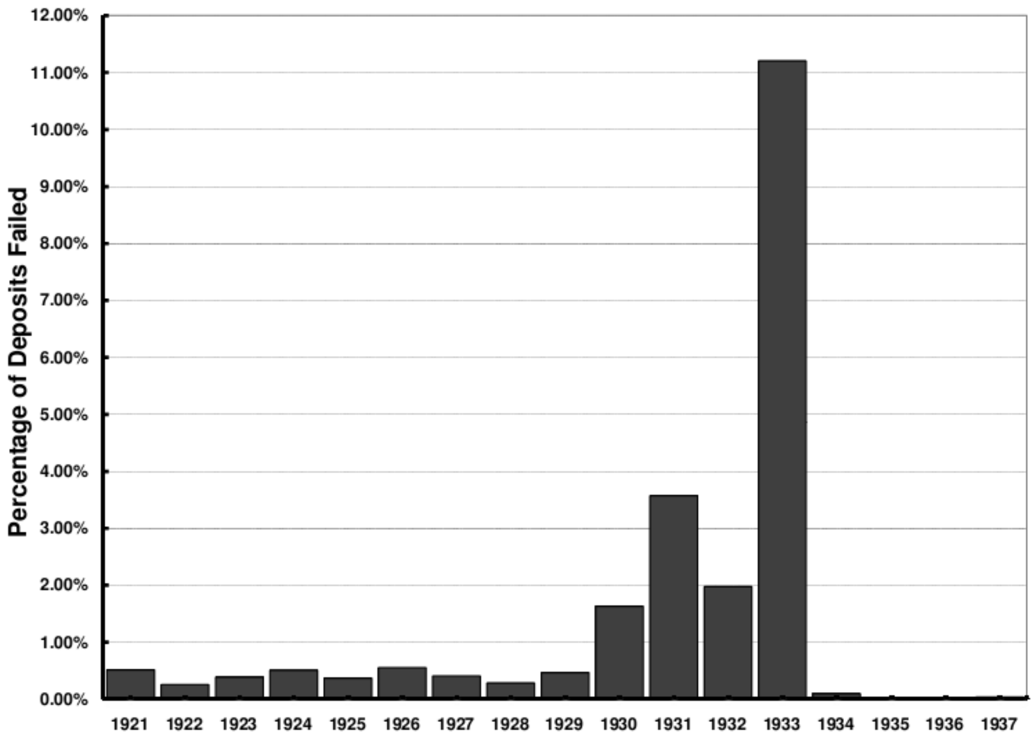

Figure 4

U.S. Interwar Bank Failures

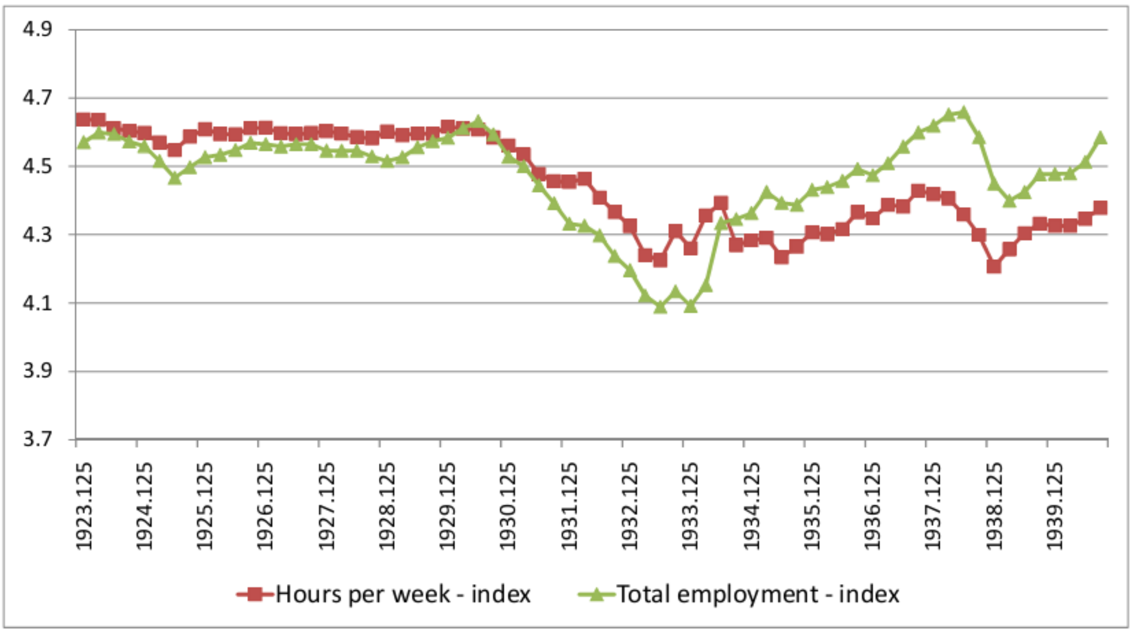

Figure 5

Employment and Hours Worked

3.7 Tables

TABLE 1

DESCRIPTIVE STATISTICS AND INDUSTRY CHARACTERISTICS

Panels A, B and C of Table 1 present sample statistics, for all variables except industry characteristics which are shown in Panels D, E and F of Table 1. Panel A shows the state-period-industry specific biannual growth rates of labor productivity. The first column covers the whole sample (1921-1937) while the other columns divide it by sub-periods. The source of the data are the contemporary US Censuses of Manufactures. Observations with few establishments per state are excluded so as to leave at least 95% of an industry's product value in a given year. Values of output and cost of materials used for calculation of growth in labor productivity were deflated using "CPI for all Urban Consumers, All Items" from the U.S. Bureau of Labor Statistics. Observations with values of labor productivity below the 1st percentile and above the 99th percentile were recoded to the values of the 1st and 99th percentile. Panel B summarizes state-period specific biannual percentage of deposits in suspended banks. The first column covers the whole sample (1921-1937) while the other columns divide it by sub-periods. The variable was obtained by combining deposits in all commercial banks sourced from "Banking and Monetary Statistics 1914-1941" with the total deposits of suspended banks from "All Bank Statistics 1896-1955". Panel C shows two state specific predictors of bank failures: branch bank offices as a percentage of the total number of offices in the year 1920 and the change in farm value over 1910s. The data on branch banking are sourced from the "Banking and Monetary Statistics 1914-1941". The data on values of farmland come from the ICPSR dataset 9, Pressley and Scofield (2001).

	Panel A Labor Productivity Growth$_{sit}$				
	1921-1937	1921-1929	1929-1933	1929-1931	1933-1937
Labor Productivity Growth$_{sit}$(%)					
Mean	5.95	10.00	-2.11	-9.79	5.87
Standard deviation	(28.86)	(28.82)	(34.19)	(25.43)	(20.28)
Number of state-period-industries	2194	1097	545	279	552
	Panel B Percentage of Deposits in Suspended Banks				
	1921-1937	1921-1929	1929-1933	1929-1931	1933-1937
Deposits suspended$_{st}$ (biannual %)					
Mean	4.52	2.37	13.36	7.50	0.17
Standard deviation	(9.33)	(4.66)	(14.26)	(7.16)	(0.71)
Number of state-periods	384	192	96	48	96
	Panel C Banking Structure and Farmland Value Change				
Branch offices in 1920$_s$ (%)					
Mean	8.27				
Standard deviation	(12.08)				
Number of states	48				
Farm value change over 1910s$_s$ (%)					
Mean	73.31				
Standard deviation	(44.95)				
Number of states	48				

TABLE 1 - CONTINUED
DESCRIPTIVE STATISTICS AND INDUSTRY CHARACTERISTICS

Panels D, E and F of Table 1 describe characteristics of the industries in the sample. The complete names of the industries from the 1929 Census of Manufactures are: 1. Canning and preserving: Fruits and vegetables; pickles, jellies, preserves and sauces; 2. Motor vehicles, not including motor cycles; 3. Iron and steel: Steel works and rolling mills - including all departments, such as bolt and nut, wire, tinplate, etc.; 4. Meat packing, wholesale; 5. Lumber and timber products, not elsewhere classified; and Planing-mill products - including general mill-work - not made in planing mills connected with sawmills; 6. Paper; 7. Chemicals, not elsewhere classified; 8. Cotton goods; 9. Glass; 10. Petroleum Refining; 11. Rubber tires and inner tubes; 12. Motor-vehicle bodies and motor-vehicle parts; 13. Bread and other bakery products; 14. Nonferrous-metal alloys and products, not including aluminum products; 15. Furniture, including store and office fixtures; 16. Confectionery; 17. Boots and shoes other than rubber; 18. Printing and Publishing - Newspaper and Periodical. Panel D shows a measure of exposure of industry i to bank failures during the Great Depression. The measure is equal to the weighted average of the bank failures (fraction of deposits suspended) in US states during the Great Depression, where the weight for the failures in each state is the fraction of industry i's national output produced in that state in 1929. Panel E gives inverse interest cover. Industries are listed in decreasing order of the indicator. The yearly IRS Statistics of Income served as the source. Eighteen industries from our sample were matched to the ten Statistics of Income industry groups, resulting in an indicator with ten distinct values. The ten industry groups are: Rubber and rubber products; Leather and leather products; Food products, beverages and tobacco; Textiles and textile products; Lumber and wood products; Paper, pulp and products; Metal and metal products; Chemicals and allied substances; Printing and publishing; and Stone, clay, and glass products. The measure is the seven-year industry group average from the period 1922-1928. Panel F summarizes external dependence. Industries are listed in decreasing order of the indicator. I used judgment to match 1929 Census of Manufactures industries into 1987 Standard Industry Classification. Standard and Poor's Compustat database then served as the source. The sample covered US publicly traded companies in the 1950-2007 period. The measure was calculated as the industry average of firm-level data, following the methodology of Rajan and Zingales (1998).

Industry	Score	Industry	Score	Industry	Score
		Panel D Exposure to Bank Failures of the Great Depression			
motor vehicle parts	40.3%	cotton goods	23.6%	bread	19.4%
motor vehicles	34.5%	paper	23.4%	chemicals	18.4%
rubber	25.5%	lumber and planning mill	23.2%	printing	18.1%
furniture	26.1%	glass	21.8%	canning	15.9%
iron	24.5%	confectionery	21.0%	boots	15.5%
meat packing	23.8%	nonferrous metal	19.9%	petroleum refining	12.9%
		Panel E Inverse Interest Cover (IIC)			
rubber	1.00	cotton goods	0.09	motor vehicles	-1.18
boots	0.33	furniture	0.06	nonferrous metal	-1.18
bread	0.27	lumber and planing mill	0.06	chemicals	-1.55
canning	0.27	paper	-0.06	petroleum refining	-1.55
confectionery	0.27	iron	-1.18	printing	-1.58
meat packing	0.27	motor vehicle parts	-1.18	glass	-2.03
		Panel F External Dependence (ED)			
canning	1.00	chemicals	0.24	bread	-0.20
motor vehicles	0.80	cotton goods	0.04	nonferrous metal	-0.36
iron	0.72	glass	0.00	furniture	-0.40
meat packing	0.68	petroleum refining	0.00	confectionery	-1.00
lumber and planing mill	0.48	rubber	-0.04	boots	-2.52
paper	0.44	motor vehicle parts	-0.08	printing	-3.00

TABLE 2

CYCLICALITY OF LABOR PRODUCTIVITY BY PERIOD

This table describes the comovement of labor productivity with various measures of output and output gap. Panel A has as the dependent variable a measure of national labor productivity variant by industry, while Panel B has a measure of labor productivity which is both industry and state specific. Each row in Table 2 corresponds to one of the explanatory variables described in the Data section, subsection "Growth Rates and Output Gaps of Output and Value Added". The three columns correspond to the following three periods: before (1921-1929), during (1929-1933), and after the Great Depression (1933-1937). Each field in the table thus corresponds to a single period and a single explanatory variable. However, for each period-variable pair, several regression specifications including different fixed effects were run. These are the specifications different by fixed effects: A) For the national measure of industry-level productivity: two specifications, one without and the other one with industry fixed effects; B) For the state-specific measure of industry-level productivity four specifications were run: first, with no fixed effects, second, with state fixed effects only, third, with state and industry fixed effects, and finally fourth with state, industry and year fixed effects. As long as at least one of the specifications for a given period and explanatory variable gave a statistically significant relationship, the field was marked as statistically significant. Statistically significant relationships are given in bold, while the insignificant ones are given in brackets. Each field reports the sign of the relationship between labor productivity and a measure of output.

	Panel A		
Dependent variable is	Regressions at the National Level		
Labor Productivity Growth$_{it}$	1921-29	1929-33	1933-37
GDP growth$_t$	**Positive**	(Negative)	(Negative)
Rate of GDP gap linear $_t$	**Negative**	(Negative)	(Positive)
Rate of GDP gap HP100$_t$	(Negative)	(Negative)	(Positive)
Rate of GDP gap HP6.25$_t$	(Negative)	(Negative)	(Positive)
Value added by manufacturing growth$_t$	**Positive**	(Positive)	(Positive)
Rate of value added by manufacturing gap linear$_t$	(Positive)	(Negative)	(Positive)
Rate of value added by manufacturing gap HP100$_t$	(Negative)	(Negative)	(Positive)
Rate of value added by manufacturing gap HP6.25$_t$	(Negative)	(Negative)	(Positive)
Number of observations	70	36	36

	Panel B		
Dependent variable is	Regressions Across States		
Labor Productivity Growth$_{sit}$	1921-29	1929-33	1933-37
Value added by manufacturing growth$_{st}$	**Positive**	**Positive**	**Positive**
Rate of value added by manufacturing gap linear$_{st}$	**Positive**	**Negative**	**Positive**
Rate of value added by manufacturing gap HP100$_{st}$	**Positive**	**Negative**	**Positive**
Rate of value added by manufacturing gap HP6.25$_{st}$	**Positive**	**Negative**	**Positive**
Number of observations	1097	545	552

TABLE 3

THE EFFECT OF BANK FAILURES ON LABOR PRODUCTIVITY

Table 3 describes how labor productivity is affected by bank failures. Panel A gives OLS regressions, while Panel B gives IV regressions with bank failures instrumented. Columns one and two give regression results from the whole interwar period (1921-37), columns three and four give regression results from the twenties (1921-1929), columns five and six give regression results from the Great Depression (1929-1933), while columns seven and eight give regressions results from the single biannual period of the Great Depression which excludes the 1933 bank failures (1929-31). The two specifications for each period differ by the fixed effects, indicated at the bottom of each panel. For the whole interwar period, the twenties, and the Great Depression the first specification includes industry and state fixed effects, while the second one adds to them the period fixed effects. For the 1929-31 period, the first specification includes no fixed effects while the second one includes industry fixed effects. Constants were calculated but were not reported. Standard errors are in parentheses: *p<0.10, **p<0.05, ***p<0.01.

Dependent variable is Labor Productivity Growth$_{sit}$	**Panel A** OLS Regressions							
	(1) 1921-37	(2) 1921-37	(3) 1921-29	(4) 1921-29	(5) 1929-33	(6) 1929-33	(7) 1929-31	(8) 1929-31
Deposits suspended$_{st}$	-0.232***	-0.112	-2.402***	-1.853***	0.513***	0.0453	-0.269	-0.145
	(0.0736)	(0.103)	(0.631)	(0.620)	(0.146)	(0.180)	(0.253)	(0.191)
Fixed effects								
Time	No	Yes	No	Yes	No	Yes	No	No
Industry	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
State	Yes	Yes	Yes	Yes	Yes	Yes	No	No
R-squared	0.031	0.103	0.066	0.115	0.163	0.194	0.004	0.484
Number of observations	2194	2194	1097	1097	545	545	279	279

TABLE 3 - CONTINUED

THE EFFECT OF BANK FAILURES ON LABOR PRODUCTIVITY

The predictors for state and period variant bank failures are the state-variant percentage of branch offices in the year 1920 and the state-variant increase in the value of farmland over the 1910s, both interacted with the period-specific national level of deposit suspensions.

Dependent variable is Labor Productivity Growth$_{sit}$	Panel B IV Regressions							
	(1) 1921-37	(2) 1921-37	(3) 1921-29	(4) 1921-29	(5) 1929-33	(6) 1929-33	(7) 1929-31	(8) 1929-31
Deposits suspended$_{st}$	-0.317***	0.308	-18.20***	-6.506**	1.053***	-0.552	-0.581	-0.212
	(0.105)	(0.710)	(3.502)	(2.661)	(0.236)	(0.616)	(0.490)	(0.364)
Fixed effects								
Time	No	Yes	No	Yes	No	Yes	No	No
Industry	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
State	Yes	Yes	Yes	Yes	Yes	Yes	No	No
F-statistic of excluded instruments	1021.2	22.9	28.4	31.3	158.7	23.2	50.6	49.2
Number of observations	2194	2194	1097	1097	545	545	279	279

TABLE 4
THE EFFECT OF BANK FAILURES ON LABOR PRODUCTIVITY
(CONTROLLING FOR THE CYCLE)

Table 4 describes how labor productivity is affected by bank failures, controlling for the movement of labor productivity with the cycle. Panel A gives OLS regressions, while Panel B gives IV regressions with bank failures instrumented. Each panel gives three different regressions, using different measures of output and output gap as the explanatory variable. These are growth in value added by manufacturing, rate of linear gap in value added by manufacturing and rate of HP gap with smoothing parameter 100 in value added by manufacturing. Columns one and two give regression results from the whole interwar period 1921-37, columns three and four give regression results from the twenties (1921-1929), columns five and six give regression results from the Great Depression (1929-1933), while columns seven and eight give regressions results from the single biannual period of the Great Depression which excludes the 1933 bank failures (1929-31). The two specifications for each period differ by the fixed effects, which are indicated in the bottom of the table. For the whole interwar period, the twenties, and the Great Depression the first specification includes industry and state fixed effects, while the second one adds to them the period fixed effects. For the 1929-31 period, the first specification includes no fixed effects while the second one includes industry fixed effects. Constants were calculated but were not reported. Standard errors are in parentheses: *p<0.10, **p<0.05, ***p<0.01.

Dependent variable is Labor Productivity Growth$_{sit}$	Panel A - Regression 1 OLS Regressions							
	(1) 1921-37	(2) 1921-37	(3) 1921-29	(4) 1921-29	(5) 1929-33	(6) 1929-33	(7) 1929-31	(8) 1929-31
Value added by manufacturing growth$_{st}$	0.313***	0.263***	0.301***	0.212***	0.672***	0.510**	0.640***	0.529***
	(0.0253)	(0.0564)	(0.0384)	(0.0800)	(0.137)	(0.200)	(0.176)	(0.134)
Deposits suspended$_{st}$	0.164**	-0.0732	-1.868***	-1.837***	0.0373	-0.0237	-0.0831	0.00125
	(0.0779)	(0.103)	(0.617)	(0.619)	(0.173)	(0.181)	(0.253)	(0.189)
R-squared	0.097	0.112	0.118	0.121	0.202	0.204	0.050	0.514
Fixed effects								
Time	No	Yes	No	Yes	No	Yes	No	No
Industry	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
State	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Number of observations	2194	2194	1097	1097	545	545	279	279

TABLE 4 - CONTINUED
THE EFFECT OF BANK FAILURES ON LABOR PRODUCTIVITY
(CONTROLLING FOR THE CYCLE)

Dependent variable is Labor Productivity Growth$_{sit}$	**Panel A - Regressions 2 and 3** OLS Regressions							
	(1) 1921-37	(2) 1921-37	(3) 1921-29	(4) 1921-29	(5) 1929-33	(6) 1929-33	(7) 1929-31	(8) 1929-31
Rate of value added by manufacturing gap linear$_{st}$	0.187***	0.209***	0.487***	0.205*	-0.378**	0.743**	0.374***	0.358***
	(0.0257)	(0.0643)	(0.0916)	(0.112)	(0.183)	(0.308)	(0.130)	(0.0974)
Deposits suspended$_{st}$	0.0388	-0.0477	-2.147***	-1.815***	0.341**	0.0180	-0.198	-0.0806
	(0.0816)	(0.104)	(0.625)	(0.620)	(0.168)	(0.180)	(0.251)	(0.187)
R-squared	0.055	0.108	0.091	0.118	0.170	0.203	0.033	0.510
Rate of value added by manufacturing gap HP100$_{st}$	0.294***	0.376***	0.210**	0.356**	-0.378*	0.749**	0.577***	0.538***
	(0.0416)	(0.0913)	(0.0903)	(0.160)	(0.225)	(0.331)	(0.181)	(0.136)
Deposits suspended$_{st}$	0.0905	-0.033	-2.420***	-1.802***	0.396**	0.00223	-0.144	-0.0333
	(0.0859)	(0.104)	(0.630)	(0.620)	(0.162)	(0.181)	(0.252)	(0.188)
R-squared	0.054	0.11	0.071	0.119	0.168	0.202	0.039	0.514
Fixed effects								
Time	No	Yes	No	Yes	No	Yes	No	No
Industry	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
State	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Number of observations	2194	2194	1097	1097	545	545	279	279

TABLE 4 - CONTINUED
THE EFFECT OF BANK FAILURES ON LABOR PRODUCTIVITY
(CONTROLLING FOR THE CYCLE)

The predictors for state and period variant bank failures are the state-variant percentage of branch offices in the year 1920 and the state-variant increase in the value of farmland over the 1910s, both interacted with the period-specific national level of deposit suspensions.

Dependent variable is Labor Productivity Growth$_{sit}$	**Panel B - Regression 1** IV Regressions							
	(1) 1921-37	(2) 1921-37	(3) 1921-29	(4) 1921-29	(5) 1929-33	(6) 1929-33	(7) 1929-31	(8) 1929-31
Value added by manufacturing growth$_{st}$	0.349***	0.264***	0.253***	0.206**	0.666***	0.589***	0.594***	0.517***
	(0.0284)	(0.0635)	(0.0463)	(0.0828)	(0.220)	(0.222)	(0.187)	(0.141)
Deposits suspended$_{st}$	0.433***	-0.0478	-8.876***	-7.001***	0.0509	-0.505	-0.408	-0.0856
	(0.125)	(0.66)	(3.244)	(2.655)	(0.423)	(0.595)	(0.498)	(0.367)
F-statistic of excluded instruments:	692.0	26.19	21.9	31.7	48.4	25.0	48.0	46.8
Fixed effects								
Time	No	Yes	No	Yes	No	Yes	No	No
Industry	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
State	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Number of observations	2194	2194	1097	1097	545	545	279	279

TABLE 4 - CONTINUED
THE EFFECT OF BANK FAILURES ON LABOR PRODUCTIVITY
(CONTROLLING FOR THE CYCLE)

Dependent variable is Labor Productivity Growth$_{sit}$	Panel B - Regressions 2-3 IV Regressions							
	(1) 1921-37	(2) 1921-37	(3) 1921-29	(4) 1921-29	(5) 1929-33	(6) 1929-33	(7) 1929-31	(8) 1929-31
Rate of value added by manufacturing gap linear$_{st}$	0.201***	0.222**	0.347***	0.175	-0.0368	0.822**	0.353***	0.350***
	(0.0297)	(0.0965)	(0.114)	(0.117)	(0.258)	(0.320)	(0.133)	(0.0987)
Deposits suspended$_{st}$	0.137	0.0573	-14.55***	-6.918***	0.974***	-0.710	-0.609	-0.257
	(0.133)	(0.624)	(3.402)	(2.624)	(0.374)	(0.626)	(0.483)	(0.354)
F-statistic of excluded instruments:	641.1	30.5	25.2	32.5	63.3	22.4	51.6	50.27
Rate of value added by manufacturing gap HP100$_{st}$	0.345***	0.372***	0.236**	0.307*	0.0119	0.890**	0.534***	0.522***
	(0.0529)	(0.133)	(0.112)	(0.167)	(0.283)	(0.357)	(0.188)	(0.140)
Deposits suspended$_{st}$	0.289*	-0.0597	-17.27***	-6.984***	1.047***	-0.727	-0.527	-0.185
	(0.153)	(0.605)	(3.322)	(2.624)	(0.322)	(0.636)	(0.488)	(0.357)
F-statistic of excluded instruments:	492.6	32.3	30.2	32.6	85.2	21.9	50.6	49.5
Fixed effects								
Time	No	Yes	No	Yes	No	Yes	No	No
Industry	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
State	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Number of observations	2194	2194	1097	1097	545	545	279	279

TABLE 5

THE EFFECT OF BANK FAILURES ON LABOR PRODUCTIVITY

(CONTROLLING FOR THE CYCLE AND CONDITIONAL ON INVERSE INTEREST COVER)

Table 5 describes how labor productivity is affected by bank failures, conditional on inverse interest cover and controlling for the movement of labor productivity with the cycle. Panel A gives OLS regressions, while Panel B gives IV regressions with bank failures instrumented. Each panel gives three different regressions, using different measures of output and output gap as the explanatory variable. These are growth in value added by manufacturing, rate of linear gap in value added by manufacturing and rate of HP gap with smoothing parameter 100 in value added by manufacturing. Columns one and two give regression results from the whole interwar period (1921-37), columns three and four give regression results from the twenties (1921-1929), columns five and six give regression results from the Great Depression (1929-1933), while column seven gives regressions results from the single biannual period of the Great Depression which excludes the 1933 bank failures (1929-31). For the whole interwar period, the twenties, and the Great Depression the first specification includes state fixed effects, while the second one adds to them the period fixed effects. The one specification for the 1929-31 period includes no fixed effects. Constants were calculated but were not reported. Standard errors are in parentheses: *p<0.10, **p<0.05, ***p<0.01.

Dependent variable is Labor Productivity Growth$_{it}$	**Panel A - Regressions 1 and 2** OLS Regressions						
	(1) 1921-37	(2) 1921-37	(3) 1921-29	(4) 1921-29	(5) 1929-33	(6) 1929-33	(7) 1929-31
Value added by manufacturing growth$_{st}$	0.315***	0.281***	0.298***	0.210***	0.689***	0.538***	0.573***
	(0.0250)	(0.0560)	(0.0387)	(0.0806)	(0.136)	(0.198)	(0.167)
IIC$_i$ X Deposits suspended$_{st}$	-0.605***	-0.611***	-0.0757	-0.0577	-0.776***	-0.772***	-0.899***
	(0.0861)	(0.0856)	(0.521)	(0.521)	(0.135)	(0.135)	(0.301)
Deposits suspended$_{st}$	-0.0739	-0.331***	-1.969***	-1.927**	-0.235	-0.290	-0.328
	(0.0842)	(0.108)	(0.747)	(0.750)	(0.179)	(0.186)	(0.261)
IIC$_i$	-0.00318	-0.00310	-0.0109	-0.0109	0.0177	0.0169	0.159***
	(0.00844)	(0.00838)	(0.0124)	(0.0124)	(0.0262)	(0.0262)	(0.0293)
R-squared	0.105	0.122	0.092	0.095	0.188	0.190	0.154
Rate of value added by manufacturing gap linear$_{st}$	0.188***	0.228***	0.484***	0.208*	-0.343*	0.873***	0.397***
	(0.0254)	(0.0638)	(0.0922)	(0.113)	(0.182)	(0.307)	(0.123)
IIC$_i$ X Deposits suspended$_{st}$	-0.591***	-0.605***	-0.245	-0.0806	-0.747***	-0.793***	-0.984***
	(0.0881)	(0.0859)	(0.528)	(0.522)	(0.138)	(0.136)	(0.302)
Deposits suspended$_{st}$	-0.195**	-0.300***	-2.381***	-1.922**	0.107	-0.257	-0.445*
	(0.0881)	(0.109)	(0.755)	(0.751)	(0.173)	(0.185)	(0.257)
IIC$_i$	-0.00474	-0.00355	-0.0108	-0.0106	0.0132	0.0198	0.169***
	(0.00864)	(0.00841)	(0.0126)	(0.0124)	(0.0268)	(0.0262)	(0.0294)
R-squared	0.063	0.117	0.065	0.092	0.153	0.191	0.150
Fixed effects							
Time	No	Yes	No	Yes	No	Yes	No
Industry	No	No	No	No	No	No	No
State	Yes	Yes	Yes	Yes	Yes	Yes	No
Number of observations	2194	2194	1097	1097	545	545	279

TABLE 5 - CONTINUED
THE EFFECT OF BANK FAILURES ON LABOR PRODUCTIVITY
(CONTROLLING FOR THE CYCLE AND CONDITIONAL ON INVERSE INTEREST COVER)

Dependent variable is Labor Productivity Growth$_{it}$	**Panel A - Regression 3** OLS Regressions						
	(1) 1921-37	(2) 1921-37	(3) 1921-29	(4) 1921-29	(5) 1929-33	(6) 1929-33	(7) 1929-31
Rate of value added by manufacturing gap HP100$_{st}$	0.296***	0.417***	0.213**	0.368**	-0.328	0.885***	0.601***
	(0.0412)	(0.0907)	(0.0905)	(0.161)	(0.224)	(0.330)	(0.171)
IIC$_i$ X Deposits suspended$_{st}$	-0.596***	-0.617***	-0.333	-0.103	-0.749***	-0.791***	-0.945***
	(0.0882)	(0.0858)	(0.533)	(0.522)	(0.139)	(0.136)	(0.301)
Deposits suspended$_{st}$	-0.143	-0.287***	-2.721***	-1.926**	0.161	-0.275	-0.376
	(0.0919)	(0.109)	(0.761)	(0.751)	(0.167)	(0.186)	(0.258)
IIC$_i$	-0.00487	-0.00273	-0.0103	-0.0103	0.0135	0.0195	0.167***
	(0.00864)	(0.00839)	(0.0127)	(0.0124)	(0.0268)	(0.0263)	(0.0292)
R-squared	0.062	0.120	0.046	0.094	0.150	0.190	0.155
Fixed effects							
Time	No	Yes	No	Yes	No	Yes	No
Industry	No	No	No	No	No	No	No
State	Yes	Yes	Yes	Yes	Yes	Yes	No
Number of observations	2194	2194	1097	1097	545	545	279

TABLE 5 - CONTINUED
THE EFFECT OF BANK FAILURES ON LABOR PRODUCTIVITY
(CONTROLLING FOR THE CYCLE AND CONDITIONAL ON INVERSE INTEREST COVER)

The predictors for state and period variant bank failures are the state-variant percentage of branch offices in the year 1920 and the state-variant increase in the value of farmland over the 1910s, both interacted with the period-specific national level of deposit suspensions. The instruments for the state and period variant bank failures interacted with inverse interest cover are the above described predictors of failures interacted with the inverse interest cover.

Dependent variable is Labor Productivity Growth$_{it}$	**Panel B** IV Regressions						
	(1) 1921-37	(2) 1921-37	(3) 1921-29	(4) 1921-29	(5) 1929-33	(6) 1929-33	(7) 1929-31
Value added by manufacturing growth$_{st}$	0.364***	0.316***	0.256***	0.205**	0.705***	0.680***	0.490***
	(0.0283)	(0.0628)	(0.0462)	(0.0831)	(0.251)	(0.251)	(0.178)
IIC$_i$ X Deposits suspended$_{st}$	-0.959***	-0.952***	0.627	0.624	-2.474***	-2.451***	-0.741
	(0.130)	(0.131)	(1.422)	(1.387)	(0.393)	(0.394)	(0.521)
Deposits suspended$_{st}$	0.144	0.0517	-8.019**	-6.341**	-0.810	-1.213*	-0.885*
	(0.133)	(0.635)	(3.235)	(2.683)	(0.506)	(0.684)	(0.526)
IIC$_i$	0.0106	0.0103	-0.0194	-0.0192	0.246***	0.243***	0.145***
	(0.00928)	(0.00923)	(0.0191)	(0.0186)	(0.0572)	(0.0573)	(0.0437)
Cragg-Donald Wald F statistic	356.5	14.74	10.15	14.21	22.67	12.89	22.79
Rate of value added by manufacturing gap linear$_{st}$	0.214***	0.306***	0.353***	0.177	0.276	1.293***	0.358***
	(0.0294)	(0.0934)	(0.113)	(0.117)	(0.298)	(0.373)	(0.127)
IIC$_i$ X Deposits suspended$_{st}$	-0.927***	-0.934***	0.635	0.622	-2.412***	-2.537***	-0.834
	(0.132)	(0.131)	(1.594)	(1.389)	(0.411)	(0.405)	(0.529)
Deposits suspended$_{st}$	-0.143	0.130	-13.68***	-6.272**	0.502	-1.529**	-1.069**
	(0.142)	(0.604)	(3.371)	(2.655)	(0.434)	(0.726)	(0.511)
IIC$_i$	0.00813	0.00933	-0.0217	-0.0191	0.238***	0.255***	0.155***
	(0.00945)	(0.00926)	(0.0214)	(0.0186)	(0.0598)	(0.0589)	(0.0441)
Cragg-Donald Wald F statistic	330.4	16.96	11.32	14.61	21.76	11.56	23.81
Rate of value added by manufacturing gap HP100$_{st}$	0.378***	0.512***	0.235**	0.313*	0.381	1.388***	0.524***
	(0.0524)	(0.129)	(0.112)	(0.169)	(0.328)	(0.416)	(0.178)
IIC$_i$ X Deposits suspended$_{st}$	-0.940***	-0.967***	0.743	0.616	-2.441***	-2.554***	-0.757
	(0.133)	(0.130)	(1.701)	(1.390)	(0.414)	(0.407)	(0.523)
Deposits suspended$_{st}$	0.0346	-0.00952	-16.43***	-6.346**	0.520	-1.552**	-0.965*
	(0.160)	(0.586)	(3.306)	(2.655)	(0.380)	(0.740)	(0.515)
IIC$_i$	0.00826	0.0110	-0.0240	-0.0190	0.242***	0.257***	0.150***
	(0.00948)	(0.00922)	(0.0228)	(0.0186)	(0.0602)	(0.0591)	(0.0437)
Cragg-Donald Wald F statistic	253.7	17.73	13.21	14.68	22.03	11.29	23.60
Fixed effects							
Time	No	Yes	No	Yes	No	Yes	No
Industry	No	No	No	No	No	No	No
State	Yes	Yes	Yes	Yes	Yes	Yes	No
Number of observations	2194	2194	1097	1097	545	545	279

TABLE 6
THE EFFECT OF BANK FAILURES ON LABOR PRODUCTIVITY
(CONTROLLING FOR THE CYCLE AND CONDITIONAL ON EXTERNAL DEPENDENCE)

Table 6 describes how labor productivity is affected by bank failures, conditional on external dependence and controlling for the movement of labor productivity with the cycle. Panel A gives OLS regressions, while Panel B gives IV regressions with bank failures instrumented. Each panel gives three different regressions, using different measures of output and output gap as the explanatory variable. These are growth in value added by manufacturing, rate of linear gap in value added by manufacturing and rate of HP gap with smoothing parameter 100 in value added by manufacturing. Columns one and two give regression results from the whole interwar period (1921-37), columns three and four give regression results from the twenties (1921-1929), columns five and six give regression results from the Great Depression (1929-1933), while column seven gives regressions results from the single biannual period of the Great Depression which excludes the 1933 bank failures (1929-31). For the whole interwar period, the twenties, and the Great Depression the first specification includes state fixed effects, while the second one adds to them the period fixed effects. The one specification for the 1929-31 period includes no fixed effects. Constants were calculated but were not reported. Standard errors are in parentheses: *p<0.10, **p<0.05, ***p<0.01.

Dependent variable is Labor Productivity Growth$_{it}$	**Panel A - Regressions 1 and 2** OLS Regressions						
	(1) 1921-37	(2) 1921-37	(3) 1921-29	(4) 1921-29	(5) 1929-33	(6) 1929-33	(7) 1929-31
Value added by manufacturing growth$_{st}$	0.316***	0.262***	0.297***	0.207**	0.668***	0.556***	0.659***
	(0.0250)	(0.0559)	(0.0387)	(0.0805)	(0.137)	(0.199)	(0.168)
ED$_i$ X Deposits suspended$_{st}$	-0.526***	-0.512***	-0.347	-0.349	-0.549***	-0.545***	-0.0261
	(0.0628)	(0.0624)	(0.301)	(0.301)	(0.0992)	(0.0994)	(0.244)
Deposits suspended$_{st}$	0.0888	-0.123	-2.263***	-2.237***	-0.0169	-0.0587	-0.157
	(0.0776)	(0.102)	(0.702)	(0.704)	(0.172)	(0.181)	(0.242)
ED$_i$	0.0147***	0.0141**	0.0118	0.0118	0.0109	0.0105	0.0730***
	(0.00566)	(0.00562)	(0.00834)	(0.00834)	(0.0185)	(0.0185)	(0.0215)
R-squared	0.109	0.124	0.093	0.096	0.185	0.186	0.139
Rate of value added by manufacturing gap linear$_{st}$	0.187***	0.201***	0.484***	0.210*	-0.323*	0.797***	0.408***
	(0.0253)	(0.0636)	(0.0921)	(0.113)	(0.182)	(0.307)	(0.125)
ED$_i$ X Deposits suspended$_{st}$	-0.516***	-0.511***	-0.481	-0.387	-0.542***	-0.543***	-0.0179
	(0.0643)	(0.0626)	(0.304)	(0.301)	(0.101)	(0.0995)	(0.246)
Deposits suspended$_{st}$	-0.0382	-0.0996	-2.682***	-2.255***	0.310*	-0.0129	-0.272
	(0.0814)	(0.103)	(0.708)	(0.705)	(0.167)	(0.179)	(0.240)
ED$_i$	0.0137**	0.0142**	0.0137	0.0122	0.0102	0.0103	0.0736***
	(0.00579)	(0.00564)	(0.00846)	(0.00835)	(0.0189)	(0.0185)	(0.0216)
R-squared	0.067	0.119	0.067	0.094	0.151	0.184	0.125
Fixed effects							
Time	No	Yes	No	Yes	No	Yes	No
Industry	No	No	No	No	No	No	No
State	Yes	Yes	Yes	Yes	Yes	Yes	No
Number of observations	2194	2194	1097	1097	545	545	279

TABLE 6 - CONTINUED
THE EFFECT OF BANK FAILURES ON LABOR PRODUCTIVITY
(CONTROLLING FOR THE CYCLE AND CONDITIONAL ON EXTERNAL DEPENDENCE)

Dependent variable is Labor Productivity Growth$_{it}$	**Panel A - Regression 3** OLS Regressions						
	(1) 1921-37	(2) 1921-37	(3) 1921-29	(4) 1921-29	(5) 1929-33	(6) 1929-33	(7) 1929-31
Rate of value added by manufacturing gap HP100$_{st}$	0.295***	0.373***	0.213**	0.374**	-0.306	0.815**	0.628***
	(0.0411)	(0.0904)	(0.0903)	(0.161)	(0.224)	(0.330)	(0.173)
ED$_i$ X Deposits suspended$_{st}$	-0.521***	-0.511***	-0.514*	-0.402	-0.544***	-0.544***	-0.00670
	(0.0643)	(0.0625)	(0.308)	(0.301)	(0.102)	(0.0996)	(0.245)
Deposits suspended$_{st}$	0.0154	-0.0831	-2.988***	-2.257***	0.362**	-0.0304	-0.214
	(0.0856)	(0.103)	(0.714)	(0.705)	(0.161)	(0.180)	(0.241)
ED$_i$	0.0140**	0.0141**	0.0140	0.0123	0.0104	0.0104	0.0731***
	(0.00579)	(0.00563)	(0.00855)	(0.00835)	(0.0189)	(0.0185)	(0.0215)
R-squared	0.065	0.122	0.048	0.095	0.149	0.183	0.132
Fixed effects							
Time	No	Yes	No	Yes	No	Yes	No
Industry	No	No	No	No	No	No	No
State	Yes	Yes	Yes	Yes	Yes	Yes	No
Number of observations	2194	2194	1097	1097	545	545	279

TABLE 6 - CONTINUED
THE EFFECT OF BANK FAILURES ON LABOR PRODUCTIVITY
(CONTROLLING FOR THE CYCLE AND CONDITIONAL ON EXTERNAL DEPENDENCE)

The predictors for state and period variant bank failures are the state-variant percentage of branch offices in the year 1920 and the state-variant increase in the value of farmland over the 1910s, both interacted with the period-specific national level of deposit suspensions. The instruments for the state and period variant bank failures interacted with external dependence are the above described predictors of failures interacted with the external dependence.

Dependent variable is Labor Productivity Growth$_{it}$	Panel B IV Regressions						
	(1) 1921-37	(2) 1921-37	(3) 1921-29	(4) 1921-29	(5) 1929-33	(6) 1929-33	(7) 1929-31
Value added by manufacturing growth$_{st}$	0.352***	0.281***	0.247***	0.195**	0.689***	0.676***	0.619***
	(0.0279)	(0.0627)	(0.0449)	(0.0812)	(0.225)	(0.226)	(0.176)
ED$_i$ X Deposits suspended$_{st}$	-0.826***	-0.822***	-0.958	-1.016	-1.421***	-1.407***	0.00529
	(0.0898)	(0.0901)	(0.848)	(0.828)	(0.222)	(0.223)	(0.446)
Deposits suspended$_{st}$	0.303**	0.231	-9.394***	-7.628***	-0.172	-0.457	-0.442
	(0.123)	(0.651)	(3.094)	(2.576)	(0.434)	(0.603)	(0.471)
ED$_i$	0.0257***	0.0256***	0.0175	0.0189	0.125***	0.123***	0.0717**
	(0.00611)	(0.00612)	(0.0136)	(0.0133)	(0.0319)	(0.0321)	(0.0334)
Cragg-Donald Wald F statistic	347.2	13.13	11.40	15.87	24.52	12.94	23.21
Rate of value added by manufacturing gap linear$_{st}$	0.198***	0.254***	0.357***	0.187	0.142	0.953***	0.390***
	(0.0291)	(0.0951)	(0.109)	(0.114)	(0.264)	(0.324)	(0.126)
ED$_i$ X Deposits suspended$_{st}$	-0.806***	-0.816***	-1.054	-0.999	-1.399***	-1.384***	0.0717
	(0.0917)	(0.0900)	(0.937)	(0.827)	(0.230)	(0.224)	(0.451)
Deposits suspended$_{st}$	-0.000696	0.316	-14.54***	-7.584***	0.957**	-0.683	-0.651
	(0.132)	(0.615)	(3.172)	(2.556)	(0.380)	(0.632)	(0.457)
ED$_i$	0.0242***	0.0256***	0.0171	0.0186	0.122***	0.120***	0.0686**
	(0.00623)	(0.00613)	(0.0151)	(0.0133)	(0.0330)	(0.0322)	(0.0338)
Cragg-Donald Wald F statistic	320.8	15.31	12.44	16.44	32.41	11.59	24.73
Rate of value added by manufacturing gap HP100$_{st}$	0.345***	0.423***	0.244**	0.341**	0.223	1.041***	0.591***
	(0.0519)	(0.131)	(0.107)	(0.165)	(0.289)	(0.362)	(0.178)
ED$_i$ X Deposits suspended$_{st}$	-0.810***	-0.811***	-1.040	-0.988	-1.404***	-1.390***	0.0519
	(0.0918)	(0.0895)	(0.996)	(0.826)	(0.230)	(0.225)	(0.448)
Deposits suspended$_{st}$	0.157	0.185	-17.19***	-7.654***	0.999***	-0.705	-0.558
	(0.151)	(0.595)	(3.106)	(2.558)	(0.327)	(0.642)	(0.461)
ED$_i$	0.0245***	0.0252***	0.0159	0.0184	0.123***	0.120***	0.0701**
	(0.00624)	(0.00610)	(0.0160)	(0.0133)	(0.0331)	(0.0323)	(0.0336)
Cragg-Donald Wald F statistic	247.2	16.26	14.49	16.50	32.90	11.32	24.33
Fixed effects							
Time	No	Yes	No	Yes	No	Yes	No
Industry	No	No	No	No	No	No	No
State	Yes	Yes	Yes	Yes	Yes	Yes	No
Number of observations	2194	2194	1097	1097	545	545	279

BIBLIOGRAPHY

Allen, Franklin, and Douglas Gale. 2000. "Financial Contagion." Journal of Political Economy, 108(1): 1-33.

Alston, Lee J., Wayne A. Grove and David C. Wheelock. 1994. "Why Do Banks Fail? Evidence from the 1920s." Explorations in Economic History, 31: 409-431.

Anari, Ali, James Kolari and Joseph Mason. 2005. "Bank Asset Liquidation and the Propagation of the Great Depression." Journal of Money, Credit, and Banking, 37(4): 753-73.

Bernanke, Ben. 1983. "Nonmonetary Effects of the Financial Crisis in the Propagation of the Great Depression." American Economic Review, 73(3): 257-276.

Bernanke, Ben. 2007. "The Financial Accelerator and the Credit Channel." http://www.federalreserve.gov/newsevents/speech/Bernanke20070615a.htm.

Bernanke, Ben and Mark Gertler. 1985. "Banking in General Equilibrium." NBER Working Paper 1647

Bernanke, Ben, and Mark Gertler. 1989. "Agency Costs, Net Worth, and Business Fluctuations." American Economic Review, 79(1): 14-31

Bernanke, Ben and Mark Gertler. 1990. "Financial Fragility and Economic Performance." Quarterly Journal of Economics, 105(1):87-114

Bernanke, Ben and Mark Gertler. 1995. "The Credit Channel of Monetary Policy Transmission." Journal of Economic Perspectives, 9(4): 27-48.

Bernanke, Ben, Mark Gertler, and Simon Gilchrist. 1996. "The Financial Accelerator and the Flight to Quality." The Review of Economics and Statistics, 78(1): 1-15.

Bernanke, Ben, Mark Gertler, and Simon Gilchrist. 1999. "The Financial Accelerator in a Quantitative Business Cycle Framework." In Handbook of Macroeconomics, ed. John B. Taylor, and Michael Woodford, 1: 1341-1393. Elsevier.

Bernanke, Ben S. and Martin L. Parkinson. 1991. "Procyclical Labor Productivity and Competing Theories of the Business Cycle: Some Evidence from Interwar U.S. Manufacturing Industries." Journal of Political Economy, 99(3): 439-59.

Bordo, Michael and Evans, Charles. 1995. "Labor Productivity during the Great Depression." Economics Letters, 47: 41-45.
Brunnermeier, Markus K. and Yuliy Sannikov. 2011. "A Macroeconomic Model with a Financial Sector.
"http://www.princeton.edu/~markus/research/papers/macro_finance.pdf

Caggese, Andrea. 2007. "Financing Constraints, Irreversibility, and Investment Dynamics." Journal of Monetary Economics, 54: 2102-2130.

Calomiris, Charles W. 1989. "Do Vulnerable Economies Need Deposit Insurance?: Lessons from the U.S. Agricultural Boom and Bust of 1920s." Working Paper Series, Issues in Financial Regulation 89-18, Federal Reserve Bank of Chicago.

Calomiris, Charles W. and Joseph R. Mason. 1997. "Contagion and Bank Failures during the Great Depression: The June 1932 Chicago Banking Panic." American Economic Review, 87(5):863-83.

Calomiris, Charles and Joseph Mason. 2001. "Causes of U.S. Bank Distress during the Depression."Proceedings, Federal Reserve Bank of Chicago, May: 530-54.

Calomiris, Charles and Joseph Mason. 2003. "Consequences of Bank Distress during the Great Depression." American Economic Review, 93(3): 937-47.

Calomiris, Charles W., and Berry Wilson. 2004. "Bank Capital and Portfolio Management: The 1930s `Capital Crunch' and the Scramble to Shed Risk." The Journal of Business, 77(3): 421-455.

Carlson, Mark and Kris James Mitchener. 2005. "Branch Banking, Competition and Financial Stability." FEDS Working Paper No. 2005-20

Carlson, Mark and Jonathan Rose. 2011. "Credit Availability and the Collapse of the Banking Sector in the 1930s." FEDS Working Paper No. 2011-38.

Chari, V.V., Patrick J. Kehoe and Ellen R. McGrattan. 2003. "Accounting for the Great Depression." American Economic Review, 92(2): 22-27.

Cole, Harold L. and Lee E. Ohanian. 1999. "The Great Depression in the United States from a Neoclassical Perspective." Federal Reserve Bank of Minneapolis, Quarterly Review, 23(1): 2--24.

Cole, Harold L. and Lee E. Ohanian. 2001. "Re-Examining the Contributions of Money and Banking Shocks to the U.S. Great Depression." NBER Chapters, in: NBER Macroeconomics Annual 2000, Volume 15, pages 183-260 National Bureau of Economic Research, Inc.

Compustat. 2010. Standard and Poor's. Via https://wrds.wharton.upenn.edu/wrdsauth/members.cgi

Dell'Ariccia, Giovanni, Enrica Detragiache, and Raghuram Rajan. 2008. "The Real Effect of Banking Crises." Journal of Financial Intermediation, 17: 89--112.

Eggertsson, Gauti. 2008. "Great Expectation and the End of the Depression". American Economic Review, 98(4): 1476-1516.

Field, Alexander. 2011. “A Great Leap Forward.” New Haven and London: Yale University Press.

Friedman, Milton and Anna Jacobson Schwartz. 1963. "A Monetary History of the United States, 1867-1960." Princeton: Princeton University Press.

Gertler, Mark. 2010. "Commentary: Banking Crises and Real Activity: Identifying the Linkages." International Journal of Central Banking, 6(34): 125-35.

Gertler, Mark, and Peter Karadi. 2011. "A Model of Unconventional Monetary Policy." Journal of Monetary Economics, 58: 17-34.

Gertler, Mark, and Nobuhiro Kiyotaki. 2010. "Financial Intermediation and Credit Policy in Business Cycle Analysis." In Handbook of Monetary Economics, ed. Benjamin Friedman and Michael Woodford, 3: 547-599. Elsevier.

Goodfriend, Marvin and Robert King. 1997. "The New Neoclassical Synthesis and the Role of Monetary Policy." NBER Macroeconomics Annual, 12: 231-96.

Graham, John R., Hazarika, Sonali and Narasimhan, Krishnamoorthy. 2011. "Financial Distress in the Great Depression". Financial Management, Forthcoming; AFA 2012 Chicago Meetings Paper. http://ssrn.com/abstract=1787245

Grossman, Richard S. 1994. "The Shoe That Didn't Drop: Explaining Banking Stability During the Great Depression." Journal of Economic History, 54 (3): 654-82.

Iacoviello, Matteo. 2011. "Financial Business Cycles." http://www2.bc.edu/~iacoviel/research_files/FBC.pdf

Inter-university Consortium for Political and Social Research (ICPSR). 197?. Historical, Demographic, Economic, and Social Data: The United States, 1790-1970 [Computer file]. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [producer and distributor], doi:10.3886/ICPSR00003

Ivashina, Victoria, and David S. Scharfstein. 2010. "Bank Lending During the Financial Crisis of 2008." Journal of Financial Economics, 97(3): 319-338.

Kashyap, Anil, Owen Lamont, Jeremy Stein. 1994. "Credit Conditions and the Cyclical Behavior of Inventories." The Quarterly Journal of Economics, 109(3): 565-92.

Kehoe, Timothy, and Edward Prescott. 2007. The Great Depressions of the Twentieth Century. Minneapolis: Federal Reserve Bank of Minneapolis.

Kendrick, John W. 1961. Productivity Trends in the United States. Princeton, N.J.: Princeton University Press (for NBER).

Kiyotaki, Nobuhiro, and John Moore. 1997. "Credit Cycles." Journal of Political Economy, 105(2): 211-248.

Kroszner, Randall, Luc Laeven, and Daniela Klingebiel. 2007. "Banking Crises, Financial Dependence, and Growth." Journal of Financial Economics, 84(1): 187-228.

Kupiec, Paul, and Carlos Ramirez. 2010. "Bank Failures and the Cost of Systemic Risk: Evidence from 1900 to 1930." http://www.frbatlanta.org/filelegacydocs/seminars/seminar_kupiec_032410.pdf.

Mishkin, Frederic S. 1978. "The Household Balance Sheet and the Great Depression." Journal of Economic History, 37: 918-37.

Mortensen, D. and C. Pissarides. 1994. "Job Creation and Job Destruction in the Theory of Unemployment." Review of Economic Studies, 61: 397--415.

National Industrial Conference Board. 1932. The Availability of Bank Credit. New York

Ohanian, Lee. 2001. "Why Did Productivity Fall So Much During the Great Depression?" American Economic Review, 91(2): 34-38.

Olney, Martha L.1987. "Advertising, Consumer Credit, and the `Consumer Durables Revolution' of the 1920s." Journal of Economic History, 47(2): 489-491.

Petrosky-Nadeau, Nicolas. 2012. "TFP during a Credit Crunch", forthcoming in the Journal of Economic Theory.

Prescott, Edward. 1986. "Theory Ahead of Business Cycle Measurement." Federal Reserve Bank of Minneapolis Quarterly Review, 10(4): 9-33.

Pressley, Thomas J., and William H. Scofield. 2001. Farm Real Estate Values in the United States, 1850-1959 [Computer file]. ICPSR ed. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [producer and distributor], 2001. doi:10.3886/ICPSR00009.

Rajan, Raghuram and Luigi Zingales. 1998. "Financial Dependence and Growth." American Economic Review, 88(3): 559-586.

Richardson, Gary. 2007. "Bank Distress During the Great Depression: The Illiquidity-Insolvency Debate Revisited." Explorations in Economic History, 44(4): 586-607.

Romer, Christina D. 1990. "The Great Crash and the Onset of the Great Depression." Quarterly Journal of Economics, 105(3): 597-624.

Romer, Christina D. 1993. "The Nation in Depression." The Journal of Economic Perspectives, 7(2): 19-39

Rosenbloom, Joshua L. and William A. Sundstrom. 1999. "The Sources of Regional Variation in the Severity of the Great Depression: Evidence from U.S. Manufacturing, 1919-1937." The Journal of Economic History, (59)3: 714-747

Shaw, William H. 1947. Value of Commodity Output since 1869. New York: NBER.

Temin, Peter. 1976. Did Monetary Forces Cause the Great Depression? New York: Norton.

Temin, Peter. 1989. Lessons from the Great Depression. Cambridge, MA: MIT Press.

Temin, Peter. 2000. "The Great Depression." In The Cambridge Economic History of the United States Vol 3: The Twentieth Century, ed. Stanley L. Engerman and Robert E. Gallman, 301-328. New York: Cambridge University Press.

Temin, Peter. 2008. "Real Business Cycle Views of the Great Depression and Recent Events: A Review of Timothy J. Kehoe and Edward C Prescott's Great Depressions of the Twentieth Century." Journal of Economic Literature, 46: 669-84.

U.S. Board of Governors of the Federal Reserve System. 1943. "Banking and Monetary Statistics 1914-1941."

U.S. Board of Governors of the Federal Reserve System. 1959. "All Bank Statistics 1896-1955."

U.S. Bureau of the Census of the Department of Commerce. 1919-1947. "Census of Manufactures."

U.S. Bureau of Labor Statistics of the Department of Labor (2010). "Consumer Price Index for All Urban Consumers: All Items." Via http://research.stlouisfed.org/fred2/data/CPIAUCNS.txt

U.S. Internal Revenue Service of the Department of Treasury, Office of Commissioner of Internal Revenue. 1922-1933. "Statistics of Income."

Walter, John R. 2005. "Depression-Era Bank Failures: The Great Contagion or the Great Shakeout?" Economic Quarterly, 91(1): 39-54.

Wheelock, David C. 1995. "Regulation, Market Structure, and the Bank Failures of the Great Depression." Federal Reserve Bank of St. Louis Review. 77(2): 27-38.

White, E.N. 1984. "A Reinterpretation of the Banking Crisis of 1930." Journal of Economic History, 44: 119-138.

White, Eugene 2000. "Banking and Finance in the Twentieth Century." In The Cambridge Economic History of the United States Vol 3: The Twentieth Century, ed. Stanley L. Engerman and Robert E. Gallman, 743-802. New York: Cambridge University Press.

Wicker, Elmus. 1996. The Banking Panics of the Great Depression. New York: Cambridge University Press.

Ziebarth, Nicolas L. 2012. "Misallocation and Productivity during the Great Depression." http://tippie.uiowa.edu/people/profile/profile.aspx?id=1250742