

# Financial Frictions and Employment during the Great Depression

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Kellogg and NBER

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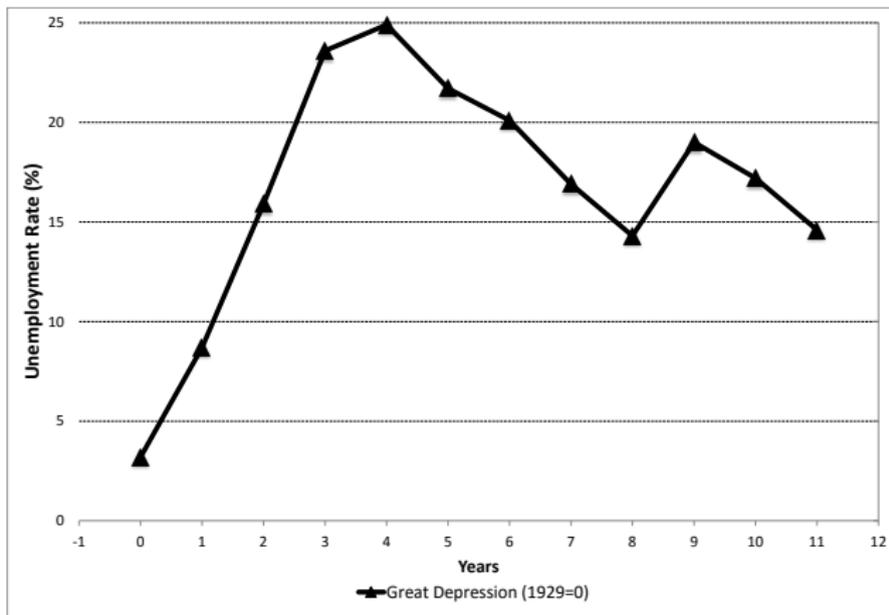
- The Great Depression was the most severe and protracted crisis in recorded American history
  - Bernanke (2000): Understanding the Great Depression is the “Holy Grail of macroeconomics”
- Yet debate on causes of the Great Depression remains unresolved
- Financial frictions likely amplified the downturn
  - Lack of firm data limits our understanding of role of access to credit on firms’ employment decisions
  - Current view is that large firms were unscathed by the crisis
- This paper: using new firm-level data, we find that financial frictions were an important driver of the contraction in employment among largest firms in the economy

# Stylized Facts on the Great Depression

Collapse of the American economy between 1929 and 1933:

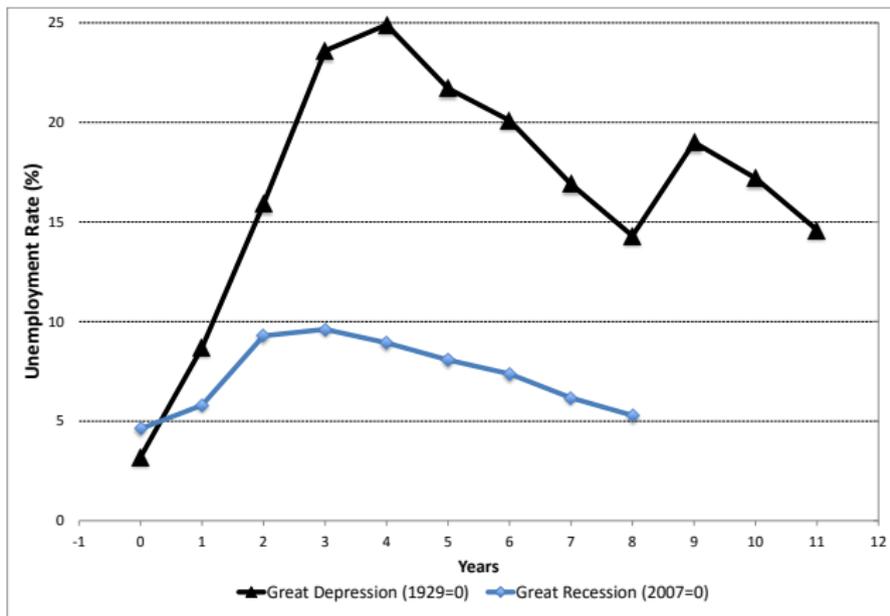
- Nominal GDP declined by 46%, from \$104.4 billion to \$56 billion, and real GDP by 37%
- By 1933 gross investment was below capital depreciation
- Unemployment rose from 3.2% to 24.9% of the labor force
- The recession was persistent:
  - GDP did not bounce back until 1936; unemployment rate was still 5x higher than 1929 level in 1940

# Unemployment Rate in the 1930s



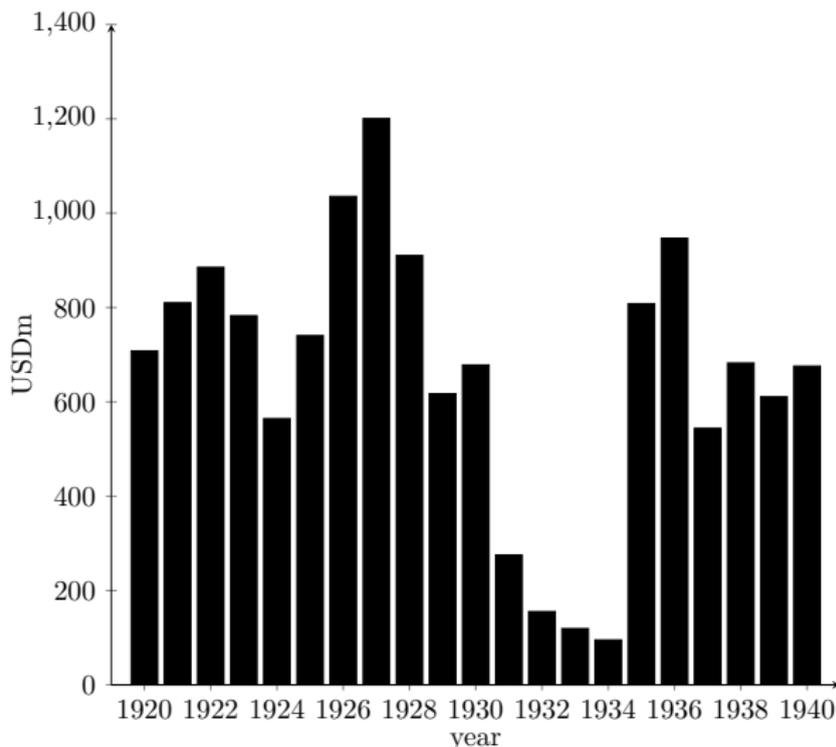
Source: Margo (1993)

# Unemployment Rate: Great Depression vs. Great Recession



Sources: Margo (1993); BLS

# Frozen Bond Markets: New Bond Offerings, Industrials.



Source: Hickman (1953)

# Assessing the Role of Finance during the Great Depression

- Construct a novel hand-collected dataset of (large) U.S. firms with listed securities from 1928 to 1933
  - Allows us to link firms' financial characteristics to their employment levels
- Identify the effect of disruptions in credit supply on employment
  - Strategy based on the maturity structure of firms' bonds and the conditions of the local banking system
  - We obtain an elasticity of firm employment to maturing debt
- Utilize a model to quantify the implied aggregate effects. Access to credit can explain about 10-30% of the contraction in employment in the firms in our sample

- Our paper relates to growing literature in modern corporate finance that study:
  - Effect of finance on firms' employment decisions
  - Impact of disruptions in financial markets on real economic outcomes
- We establish that financial frictions were important determinant of high unemployment during the Great Depression
  - Document sizable effects even among largest firms in the economy

# New Firm-Level Data

- Two cross-sections of firm financials collected from the Moody's Industrials Manuals: 1928 (prior to onset of recession) and 1933 (trough of the crisis)
- About 1,000 firms with information on employment and financials for both years
- Information on value of bonds due for each firm from 1928 to 1934 from Moody's, and bank suspensions at county level from FDIC data
- Data span a wide variety of industries
- Focus on large firms, but changes in employment representative of broader trends in the economy

# Summary Statistics

	Mean	25th %	Median	75%	Std	N
Employees, log change (1928-33)	-0.24	-0.51	-0.18	0.11	0.58	1,130
Employees, log, 1928	6.68	5.86	6.68	7.51	1.33	1,130
Employees, log, 1933	6.44	5.52	6.48	7.31	1.46	1,130
Profitability, 1928	0.09	0.03	0.07	0.12	0.07	851
Profitability, 1933	0.01	-0.03	0.01	0.12	0.05	865
Leverage, 1928	0.13	0.00	0.08	0.22	0.14	1,059
Leverage, 1933	0.12	0.00	0.05	0.19	0.15	1,040
Book Assets, log, 1928	15.55	14.68	15.45	16.31	1.18	1,059
Book Assets, log, 1933	15.34	14.43	15.24	16.06	1.26	1,040

Decline in employment positively correlated with:

- Higher leverage
- Higher number of employees (relative to assets)
- Lower profitability
- Smaller size

# Employment Change and Firm Characteristics

	$\Delta \log E$	$\Delta \log E$	$\Delta \log E$	$\Delta \log E$	$\Delta \log E$	$\Delta \log E$
Leverage <sub>1933</sub>	-0.550*** (0.133)	-0.562*** (0.127)	-0.611*** (0.121)	-0.5010*** (0.145)	-0.224** (0.095)	-0.245* (0.124)
Log E <sub>1928</sub>		-0.041** (0.016)	-0.141*** (0.039)	-0.187*** (0.045)	-0.161*** (0.047)	-0.155*** (0.045)
Log Assets <sub>1928</sub>			0.133*** (0.036)	0.172*** (0.047)	0.131** (0.049)	0.133** (0.048)
Profitability <sub>1928</sub>				1.693*** (0.438)	1.139** (0.441)	1.007** (0.402)
Profitability <sub>1933</sub>					2.627*** (0.422)	2.593*** (0.433)
log Age						-0.045* (0.025)
Adjusted R <sup>2</sup>	0.177	0.184	0.210	0.327	0.400	0.394
State + Industry FE	Yes	Yes	Yes	No	No	No
State+Industry×Region FE	No	No	No	Yes	Yes	Yes
Observations	1,039	1,039	1,009	823	787	768

We exploit the interaction of two treatment effects:

- 1 Heterogeneity in the maturity of long-term bonds across firms (based on Almeida et al., 2012)
  - Firms with higher levels of maturing debt would be more likely to need to access capital markets to refinance
  - Identification assumption: variation in the pre-determined amount of long-term bonds due in 1930-1934 is exogenous to corporate outcomes and investment opportunities at that time
- 2 Firms located in cities with branches of suspended national banks
  - Firms tend to borrow from local banks; when local banks in distress, more difficult to substitute private debt for public debt
  - Identification assumption: National banks arguably less exposed to local demand shocks

Main results using the **interaction** of the two effects

# Differences between Treated and Control Firms—Bonds Due

Bonds Due 1930-1934	0		> 0	
	Mean	Median	Mean	Median
Employees, log, 1928	6.701	6.742	6.646	6.526
Profitability, 1928	0.068	0.057	0.068	0.062
Book Assets, log, 1928	15.604	15.525	15.642	15.456
Leverage, 1928	0.176	0.141	0.233	0.220
Firms	673		140	

# Firm Funding Needs and Employment Decline

	$\Delta \log E$	$\Delta \log E$	$\Delta \log E$	$\Delta \log E$
Bonds Due <sub>1930-1934</sub>	-1.415**	-1.234**	-1.487***	-1.291**
	(0.582)	(0.505)	(0.448)	(0.605)
Adjusted R <sup>2</sup>	0.007	0.132	0.172	0.399
State FE	No	Yes	Yes	Yes
Industry FE	No	No	Yes	No
Region $\times$ Industry FE	No	No	No	Yes
Firm Characteristics	No	No	No	Yes
Observations	1,010	1,010	1,009	767

- One standard deviation increase in bonds due associated with a 3.9% to 5.3% decline in number of employees (16% to 22% of mean log change in employment in the sample)

- ① 'Good' firms anticipated the crisis, and levered up in advance

# Was the Depression Predictable?

## The New York Times.

Copyright, 1929, by The New York Times Company.

YORK, TUESDAY, OCTOBER 29, 1929.

TWO CENTS

4. CENTS THREE CENTS | FOUR CENTS Five CENTS  
New York | White Star Line | except 11c and 5c. Paid for

### THE WEATHER

Rain today and probably tomorrow;  
somewhat colder tomorrow.  
Temperature Yesterday—Max. 51, Min. 41.  
W. A. Rhea, Forecaster for United States Weather Service.

### Memory Honored Day Fete on Ships

As aid in past anniversary Navy Day sessions major land celebration held on Sunday, the 10th of the month of "Thirtieth," similar ceremonies were reserved for

a was held by ships the public was invited. Plans appropriate were broken out on all ships, and even some credit in the harbor outside in honor of legends and the new tributes and other air craft as sailors were moved out and about the Atlantic to over this city and

### T. E. BURTON DIES AT 77

Man Had Served in  
of 41 Years—First  
to the House.

### VOCATE OF PEACE

## EUROPE IS DISTURBED BY AMERICAN ACTION ON OCCUPATION DEBT

London Urges an Explanation  
of Move for Direct Payments  
by Germany.

### BANK'S PRESTIGE INVOLVED

Britain and Continent Fear That  
We Do Not Have Faith in  
Young Plan Institution.

### SCHEME IS LAID TO HOOVER

President is Said to Wish to Avoid  
Clash in Congress Over Linking of  
Reparations and War Debts.

By EDWIN L. JANKES.

Special Cable to The New York Times.  
LONDON, Oct. 28.—There appears to exist in London a certain amount of misunderstanding as to the significance of the conversation between Washington and Berlin which now are about to ripen into diplomatic

## STOCK PRICES SLUMP \$14,000,000,000 IN NATION-WIDE STAMPEDE TO UNLOAD; BANKERS TO SUPPORT MARKET TODAY

Sixteen Leading Issues Down \$2,893,520,108;  
Tel. & Tel. and Steel Among Heaviest Losers

A shrinkage of \$2,893,520,108 in the open market value of the shares of sixteen representative companies resulted from yesterday's sweeping decline on the New York Stock Exchange. American Telephone and Telegraph was the heaviest loser, \$448,202,162 having been tugged off of its total value. United States Steel common, traditional bellwether of the stock market, made its greatest nose-dive in recent years by falling from a high of 202½ to a low of 185. In a feeble last-minute rally it snapped back to 196, at which it closed, showing a net loss of 17½ points. This represented for the 8,121,955 shares of common stock outstanding a total loss in value of \$142,259,446.

In the following table are shown the day's net depreciation in the outstanding shares of the sixteen companies referred to:

Issues	Shares Listed	Points	Depreciation
American Radiator	10,000,000	3½	\$35,000,000
American Tel. & Tel.	13,700,000	34	464,202,162
Commonwealth & Southern	20,744,400	2¼	51,238,262
Columbia Gas & Electric	8,472,207	32	273,500,756
Consolidated Gas	11,421,138	20	228,422,760
DuPont E. I.	10,332,491	18½	189,049,623
Rustless Metals	2,250,701	61½	137,868,813
General Electric	7,511,688	6½	48,842,680
General Motors	41,500,000	7¼	307,625,000
International Nickel	18,777,408	7¼	368,497,048
New York Central	4,837,000	27½	133,211,075
Standard Oil of New Jersey	24,863,843	6	149,148,144

### PREMIER ISSUES HARD

Unexpected Torrent  
Liquidation Again  
Rocks Markets.

DAY'S SALES 9,212,4

Nearly 3,000,000 Shares  
Traded in Final Hour—TI  
Tickers Lag 167 Minutes.

### NEW RALLY SOON BROK

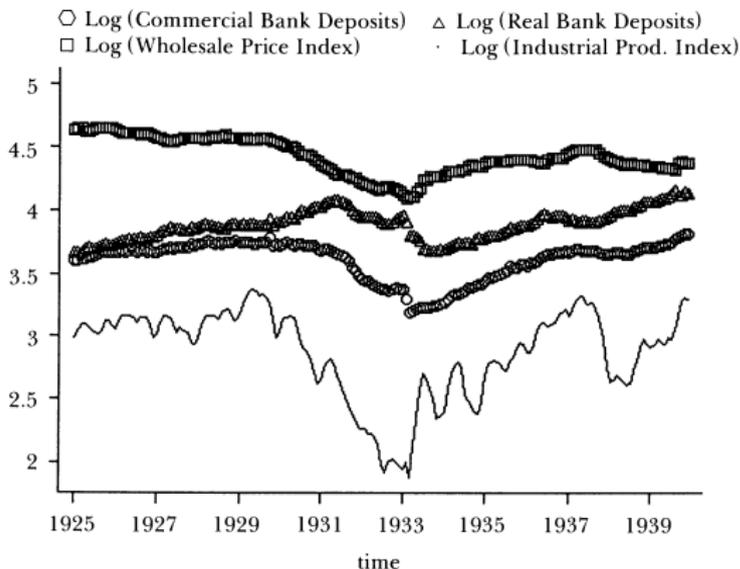
Selling by Europeans and "W  
Psychology" Big Factors  
in Second Big Break.

papers reported in sterile statistics the painful details of Wall Street's collapse.

# Was the Depression Predictable?

Figure 1

## Money, Prizes, Production

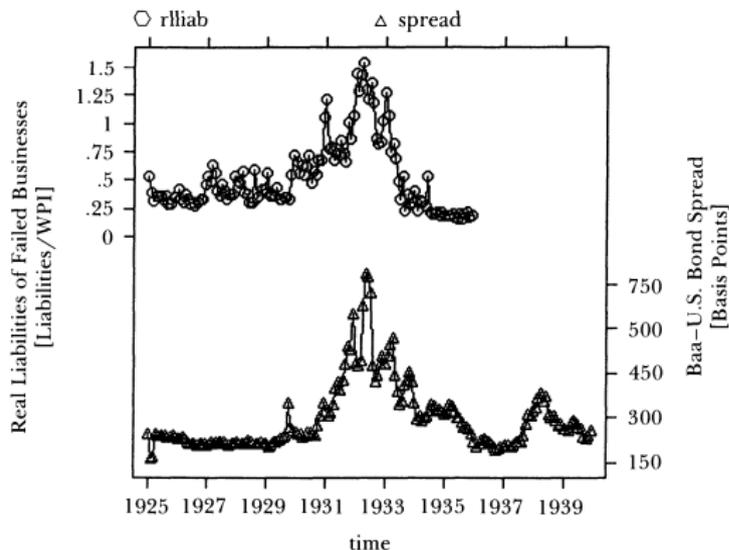


Sources: Bank deposits are from Friedman and Schwartz (1970, pp. 507–13, columns 3 + 6); the wholesale price index and industrial production index are from U.S. Department of Commerce (1949, pp. 344, 310)

# Was the Depression Predictable?

Figure 2

## Real Liabilities and Bond Spreads



Sources: Liabilities of failed businesses and the wholesale price index are from U.S. Department of Commerce (1949, pp. 344, 349); U.S. Treasury bond and Baa bond yields are from Board of Governors of the Federal Reserve System (1943, pp. 469-71)

- ① 'Good' firms anticipated the crisis, and levered up in advance
- ② 'Good' firms were able to reduce their debt once the Depression started

# Robustness: Bonds Issued Before 1929 Only

	$\Delta \log E$	$\Delta \log E$	$\Delta \log E$	$\Delta \log E$
Bonds Due <sub>1930–1934</sub>	-1.600*	-1.514**	-1.811***	-1.738*
	(0.817)	(0.636)	(0.595)	(0.930)
Adjusted R <sup>2</sup>	0.006	0.131	0.172	0.399
State FE	No	Yes	Yes	Yes
Industry FE	No	No	Yes	No
Region $\times$ Industry FE	No	No	No	Yes
Firm Characteristics	No	No	No	Yes
Observations	1,010	1,010	1,009	767

- ① 'Good' firms anticipated the crisis, and levered up in advance
- ② 'Good' firms were able to reduce their debt once the Depression started
- ③ Firms with (maturing) debt different on unobservables

# Placebo: Bonds Maturing in 1928

	$\Delta \log E$	$\Delta \log E$	$\Delta \log E$	$\Delta \log E$
Bonds Due <sub>1928</sub>	-0.928 (4.346)	1.710 (4.600)	2.891 (5.426)	2.321 (3.029)
Adjusted R <sup>2</sup>	0.000	0.127	0.166	0.395
State FE	No	Yes	Yes	Yes
Industry FE	No	No	Yes	No
Region $\times$ Industry FE	No	No	No	Yes
Firm Characteristics	No	No	No	Yes
Observations	1,010	1,010	1,009	767

# Differences between Treated and Control Firms—Failed Banks

National Bank Failures	0		> 0	
	Mean	Median	Mean	Median
Employees, log, 1928	6.644	6.661	6.761	6.745
Profitability, 1928	0.083	0.066	0.089	0.076
Book Assets, log, 1928	15.452	15.354	15.623	15.571
Leverage, 1928	0.112	0.050	0.135	0.088
Bonds Due	0.011	0.000	0.011	0.000
Firms	323		687	

# Bank Failures and Firm Employment

	$\Delta \log E$	$\Delta \log E$	$\Delta \log E$	$\Delta \log E$
Bank Failures	-0.086** (0.041)	-0.105*** (0.038)	-0.113* (0.060)	-0.039 (0.053)
Leverage <sub>1928</sub>	-0.506*** (0.170)	-0.502*** (0.187)	-0.298* (0.163)	-0.200 (0.165)
Log E <sub>1928</sub>	-0.141*** (0.037)	-0.142*** (0.041)	-0.185*** (0.047)	-0.160*** (0.048)
Log Assets <sub>1928</sub>	0.135*** (0.037)	0.128*** (0.041)	1.172*** (0.049)	0.130** (0.050)
Profitability <sub>1928</sub>			1.800*** (0.436)	1.126** (0.448)
Profitability <sub>1933</sub>				2.706*** (0.435)
Adjusted R <sup>2</sup>	0.203	0.254	0.322	0.399
FE	State+Industry	State+I×R	State+I×R	State+I×R
Observations	1,009	1,009	822	787

# Differences between Treated and Control Firms—Bonds Due and Bank Failures

	Bank Failures=0				Bank Failures=1			
	Bonds Due=0		Bonds Due>0		Bonds Due=0		Bonds Due>0	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Employees, log, 1928	6.740	6.774	6.528	6.501	6.817	6.908	6.697	6.533
Profitability, 1928	0.059	0.049	0.081	0.071	0.072	0.061	0.063	0.062
Book Assets, log, 1928	15.556	15.463	15.572	15.307	15.680	15.647	15.672	15.505
Leverage, 1928	0.157	0.121	0.227	0.217	0.180	0.142	0.237	0.224
Bonds Due	-	-	0.080	0.061	-	-	0.078	0.065
Firms	170		42		390		98	

# Main Empirical Strategy

Preferred empirical specification:

$$\begin{aligned}\log(E_{i,1933}) - \log(E_{i,1928}) = & \alpha + \beta_1 \times \text{BankFailures}_{i,1928-1933} + \\ & + \beta_2 \times \text{BondsDue}_{i,1930-1934} + \\ & + \beta_3 \times \text{BankFailures}_{i,1928-1933} \times \text{BondsDue}_{i,1930-1934} \\ & + X_{i,1928}\lambda + k_i\theta + s_i\psi + \varepsilon_i\end{aligned}$$

Robust to:

- Linear treatment on bank failures
- Discrete treatment for bonds due
- Restricting to bonds issued before 1929
- Restricting to firms with positive leverage only
- Using non-parametric controls for leverage
- Placebo for bonds due in 1928

# Firm Financing Needs, Bank Failures, and Firm Employment

	$\Delta \log E$	$\Delta \log E$	$\Delta \log E$	$\Delta \log E$
Bank Failures	-0.055 (0.043)	-0.066 (0.043)	-0.078 (0.069)	-0.021 (0.053)
Bonds Due	0.459 (0.718)	1.034 (0.753)	0.765 (0.851)	0.788 (0.876)
Bank Failures*Bonds Due	-2.814*** (0.855)	-3.130*** (0.827)	-2.702** (1.009)	-3.018*** (1.061)
Adjusted R <sup>2</sup>	0.180	0.263	0.329	0.404
Firm Controls	No	Yes	Yes	Yes
FE	State+Industry	State+I×R	State+I×R	State+I×R
Observations	1,009	1,009	823	768

- Firm in 90th percentile of ‘Bonds due’ located in city with failed banks experienced decline in employment 8.8% to 11.1% relative to median firm (37% to 46% of unconditional mean)

# Robustness: Discrete Function on Bonds Due

	$\Delta \log E$	$\Delta \log E$	$\Delta \log E$	$\Delta \log E$
Bank Failures*I(Bonds Due>0)	-0.245***	-0.201**	-0.229**	-0.224**
	(0.074)	(0.097)	(0.100)	(0.104)
Adjusted R <sup>2</sup>	0.259	0.326	0.404	0.400
Bank Failures*I(Bonds Due $\geq$ 5%)	-0.294**	-0.271*	-0.343**	-0.317**
	(0.093)	(0.139)	(0.143)	(0.135)
Adjusted R <sup>2</sup>	0.259	0.326	0.405	0.400
Bank Failures*I(Bonds Due $\geq$ 10%)	-0.504***	-0.449**	-0.574**	-0.533**
	(0.179)	(0.195)	(0.213)	(0.213)
Adjusted R <sup>2</sup>	0.261	0.327	0.406	0.401
Firm Controls	Yes	Yes	Yes	Yes
FE	State+I	State+I $\times$ R	State+I $\times$ R	State+I $\times$ R
Observations	1,009	1,009	787	768

# Aggregate Impact of Financial Frictions

- Our analysis provides an estimate for the elasticity of employment to maturing debt.
- What does this magnitude imply for the overall drop in employment in our sample?
- Two approaches:
  - 1 Compare to the counterfactual level of employment under the assumption that estimated treatment effect were zero
    - Measures the direct treatment effect
  - 2 Use a structural model to compute counterfactual
    - Firms can be affected even if they did not have any maturing debt

# Approach 1: Direct Treatment Effect

- Calculate aggregate effects assuming no treatment:
  - 1 For each firm, compute the counterfactual change of employment between 1933 and 1928

$$\Delta \hat{E}_{i,1933} = \left[ \exp \left( \hat{\beta}_1 \text{BondsDue}_i + \hat{c} Z_{it} \right) - \exp \left( \hat{c} Z_{it} \right) \right] E_{i,1928}$$

- 2 Aggregate across all firms (with non-missing observations)

$$\hat{G}_E^r = \frac{\sum_f \Delta \hat{E}_{i,1933}^r}{\sum_f E_{i,1928}}$$

- Direct treatment effect ranges from 0.9% to 1.8%
  - Implies that maturing debt account for 10% to 20% of the aggregate drop in employment (9%) in the sample
  - But this calculation assumes only firms with maturing debt were affected by financing frictions.

## Approach 2: Simple Structural Model

- Key features:
  - Firms choose (and pay) labor at  $t$ , production takes place in  $t + 1$
  - External finance is costly (quadratic costs of ext finance)
  - Simplest version: crisis is transitory; external finance is costly today ( $\phi > 0$ ) but not in the future (no precautionary motives)
  - Extension: persistent shock to  $\phi$
- Model predicts:
  - firm employment decreases with marginal cost of financing  $\phi$
  - elasticity of employment to maturing debt  $D$  monotonically increasing in  $\phi$

## Simple Structural Model (cont.)

- Step 1: Calibrate the model to match data, including elasticity of employment on maturing debt
- Step 2: Use estimated parameters, along with the empirical joint distribution of 1928 employment and maturing debt, to compute counterfactuals
- Estimates imply that in the absence of financial frictions ( $\phi = 0$ ) employment would have been 2.0% to 2.9% higher
  - About 22% to 32% of the aggregate drop in employment in sample

- Financial frictions likely played an important role in the job losses experienced during the Great Depression
- Effects were sizable even for largest, most connected firms in the economy
  - Focus on surviving firms may understate magnitude of the effects
  - Contraction in financial intermediation may have had even larger consequences for smaller firms, and households
- Suggests that financial frictions may have operated through the aggregate supply and not just the aggregate demand channel