# Failing Banks

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# Motivation

- Bank failures are an endemic feature of banking
  - 20% of all national banks in existence between 1863 and 1934 failed
  - 15% of all commercial banks in existence between 1935 and 2023 failed
- Bank failures often lead to real economic disruptions

  Bernanke (1983)
- Systemic banking crises are associated with severe macroeconomic downturns

  Reinhart and Rogoff (2009)

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*Which types of failures are most empirically relevant?*

*Do bank runs present a common cause of bank failures?*

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→ New dataset with **balance sheets for most banks** in the U.S. since the Civil War

- ≈ 37,000 distinct banks
- ≈ 5,000 bank failures
- Sample before/after Federal Reserve System and deposit insurance

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→ Depositors appear slow to react, even before deposit insurance

# Data and Context

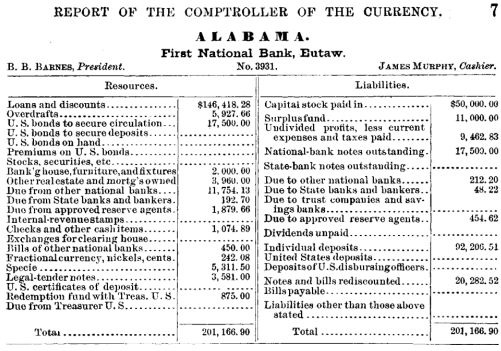
# Data

**Bank fundamentals**:

- OCC Call Reports of national banks, 1865-1941
  - Source: OCC's Annual Report to Congress
  - 1865-1904: Carlson, Correia, and Luck (2022)
  - 1905-1941: digitized for this project
    - OCR methods by Correia and Luck (2023)
- FFIEC Call Report, 1959-2023
  - Extend data back from 1976 to 1959

**Bank failures**:

- Definition of failure: receivership
- OCC list of failing banks, 1863-1941
- FDIC list of failing banks, 1935-2023



REPORT OF THE COMPTROLLER OF THE CURRENCY. 7

ALABAMA.

First National Bank, Eutaw.

B. B. BARNES, *President*. No. 3931. JAMES MURPHY, *Cashier*.

| Resources. | | Liabilities. | |
|---|---|---|---|
| Loans and discounts | $146,448.28 | Capital stock paid in | $50,000.00 |
| Overdrafts | 5,927.66 | Surplus fund | 11,000.00 |
| U. S. bonds to secure circulation | 17,500.00 | Undivided profits, less current expenses and taxes paid | 9,462.83 |
| U. S. bonds to secure deposits | | National-bank notes outstanding | 17,500.00 |
| U. S. bonds on hand | | State-bank notes outstanding | |
| Premiums on U. S. bonds | | Due to other national banks | 212.20 |
| Stocks, securities, etc. | | Due to State banks and bankers | 48.22 |
| Bank'g house, furniture, and fixtures | 2,000.00 | Due to trust companies and savings banks | |
| Other real estate and mortg's owned | 3,960.00 | Due to approved reserve agents | 454.62 |
| Due from other national banks | 11,754.13 | Dividends unpaid | |
| Due from State banks and bankers | 192.70 | Individual deposits | 92,206.51 |
| Due from approved reserve agents | 1,879.66 | United States deposits | |
| Internal-revenue stamps | | Deposits of U. S. disbursing officers | |
| Checks and other cash items | 1,074.89 | Notes and bills rediscounted | 20,282.52 |
| Exchanges for clearing house | | Bills payable | |
| Bills of other national banks | 450.00 | Liabilities other than those above stated | |
| Fractional currency, nickels, cents | 242.08 | | |
| Specie | 5,311.50 | | |
| Legal-tender notes | 3,581.00 | | |
| U. S. certificates of deposit | | | |
| Redemption fund with Treas. U. S. | 875.00 | | |
| Due from Treasurer U. S. | | | |
| Total | 201,166.90 | Total | 201,166.90 |

# Predicting Bank Failures

Consider the conditional probability of failure

$$\mathbb{P}(\text{Failure}_{b,t+1\to t+3}|\text{Insolvency}_{b,t}, \text{Funding Vulnerability}_{b,t}),$$

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  - Capitalization
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  - Non-performing assets

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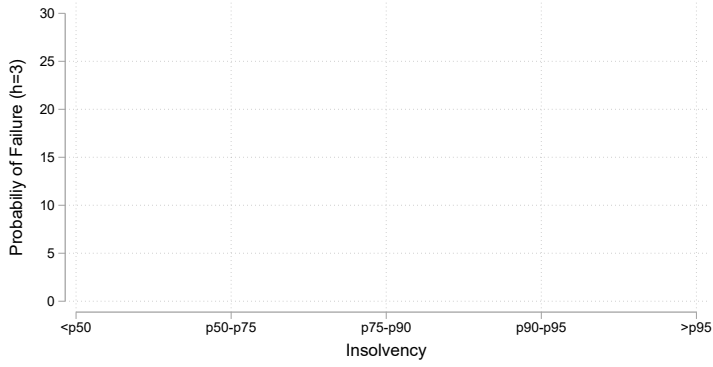
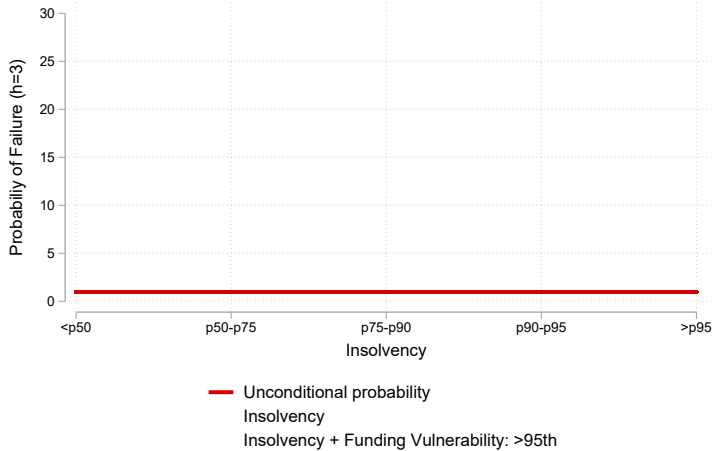
- $\text{Insolvency}_{bt}$: proxy distance to default
  - Capitalization
  - Income
  - Non-performing assets
- $\text{Funding Vulnerability}_{bt}$: reliance on expensive funding
  - Wholesale funding
  - Time deposits
    - More sensitive to federal funds rate (Drechsler, Schnabl, and Savov, 2017)
    - More sensitive to bank risk (Martin, Puri, and Ufier, 2022)

# Conditional Probability of Failure: 1959-2023




Unconditional probability
Insolvency
Insolvency + Funding Vulnerability: >95th

# Conditional Probability of Failure: 1959-2023



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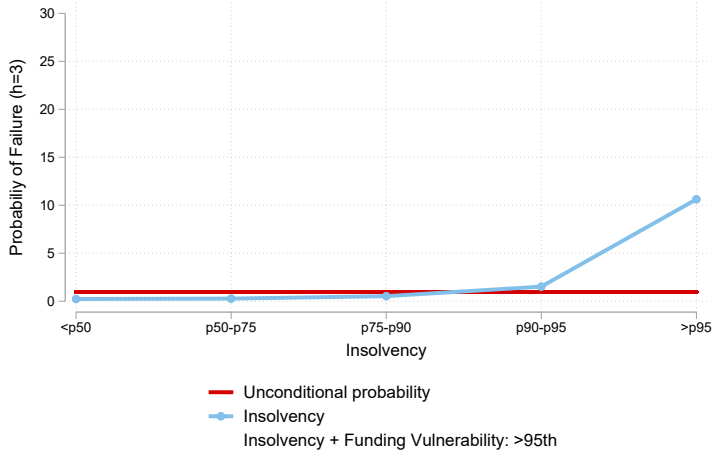

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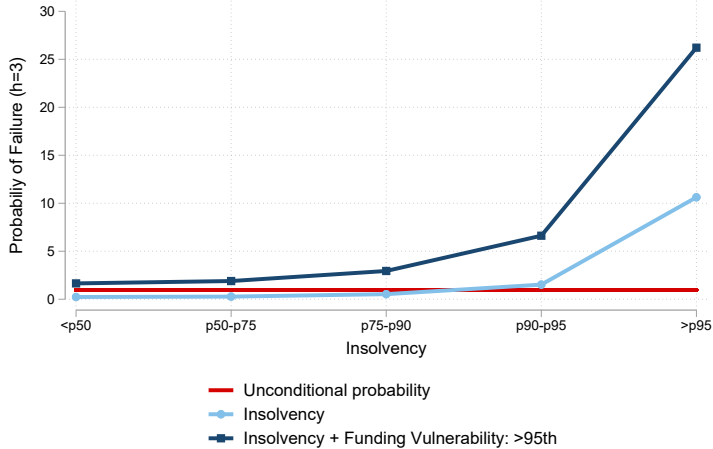

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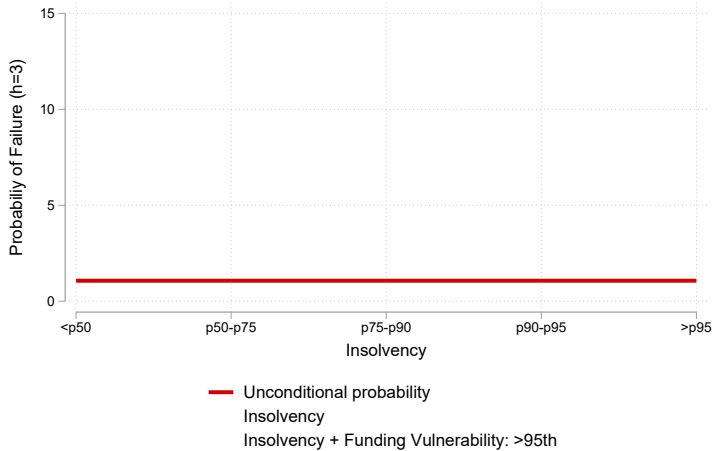

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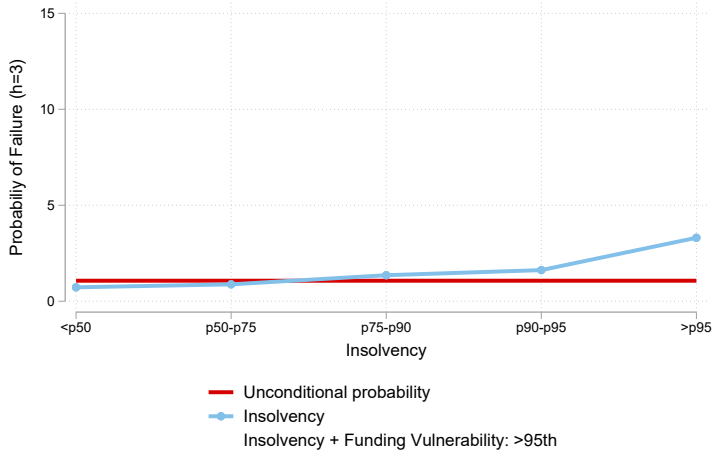

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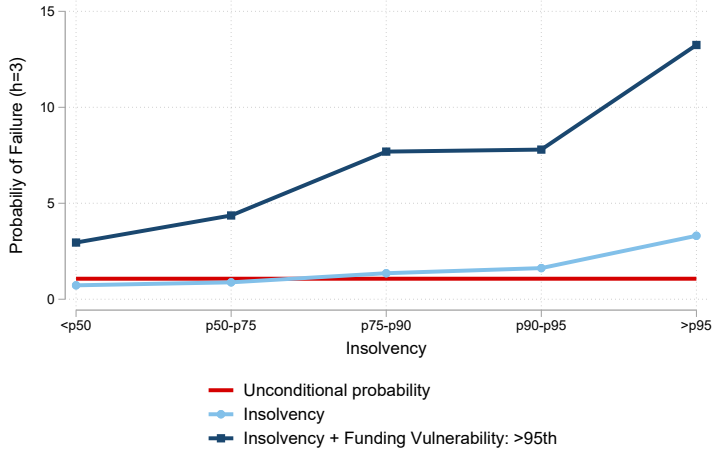

# Prediction Framework

- Predictive model:

$$\begin{aligned}\text{Failure}_{b,t+1\to t+s} = \alpha + \beta_1 \times \text{Insolvency}_{b,t} + \beta_2 \times \text{Funding Vuln.}_{b,t} \\ + \beta_3 \times \text{Insolvency}_{b,t} \times \text{Funding Vuln.}_{b,t} + \epsilon_{b,t+1\to t+s}\end{aligned}$$

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- Predictability metric: Area Under the Receiver Operating Characteristics Curve (AUC)
  - AUC$=0.50 \rightarrow$ Naive predictor (coin toss)
  - AUC$>0.50 \rightarrow$ Informative predictor
  - Benchmark: predicting financial crises AUC $\approx 0.74$
    - Greenwood, Hanson, Shleifer, Sorensen, 2022

# Bank Failures Are Highly Predictable

## AUC Statistics: One-Year Horizon

| Sample | AUC In-sample | AUC Out-of-sample |
|---|---|---|

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| Sample | AUC In-sample | AUC Out-of-sample |
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| Early Fed (1914-1928) | 0.901 | 0.892 |

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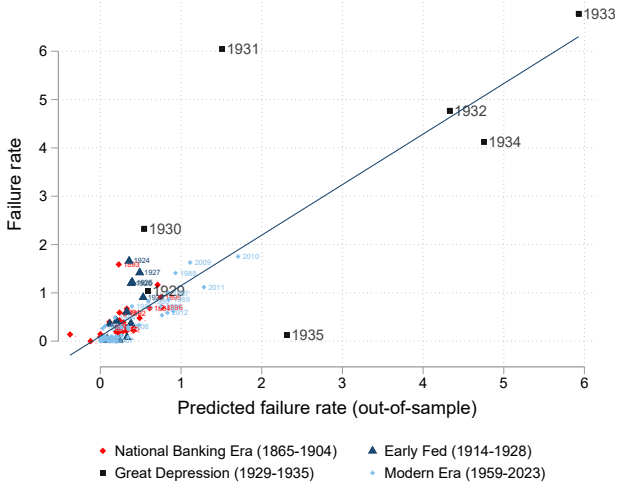
| Early Fed (1914-1928) | 0.901 | 0.892 |
| Great Depr. (1929-1934) | 0.830 | 0.720 |
| Modern Era (1959-2023) | 0.951 | 0.938 |

# Does the Link between Fundamentals and Failures Hold During Crises?

$$FailureRate_{t+1} = \alpha + \beta \text{Avg. Predicted Failure}_{t+1|t} + \epsilon_{t+1}$$

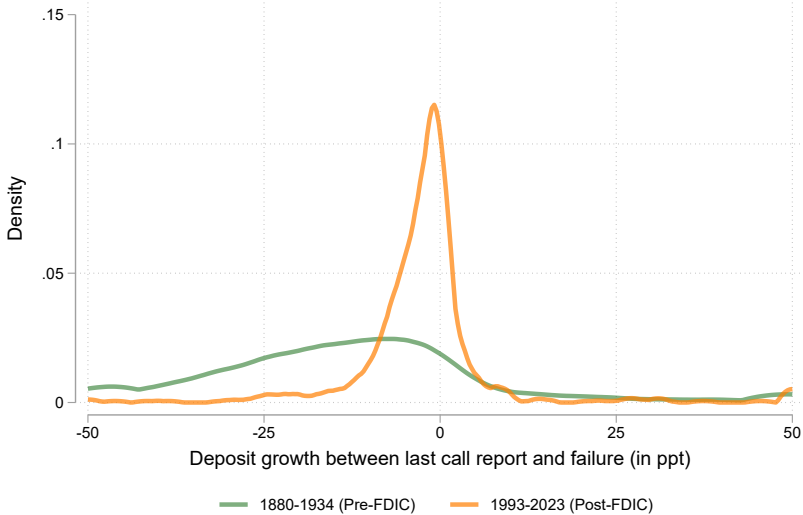
$$R^2 = 72\%$$



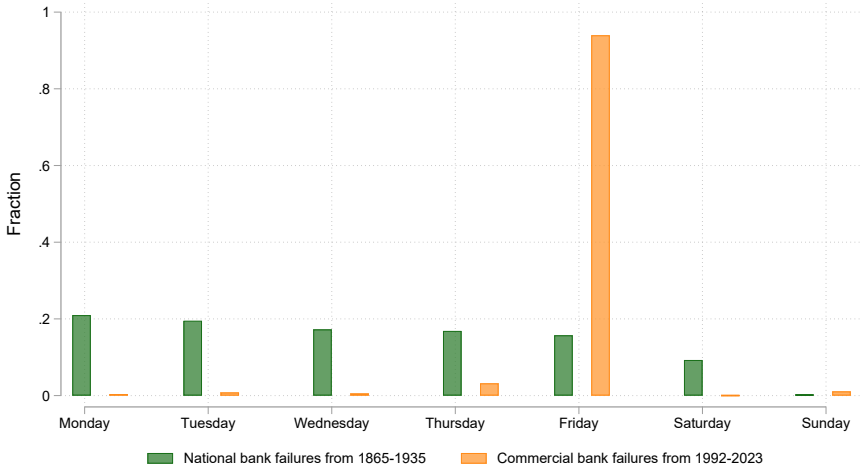
# Failures and Bank Runs

# Deposit Outflows in Failing Banks Were Large Before Deposit Insurance

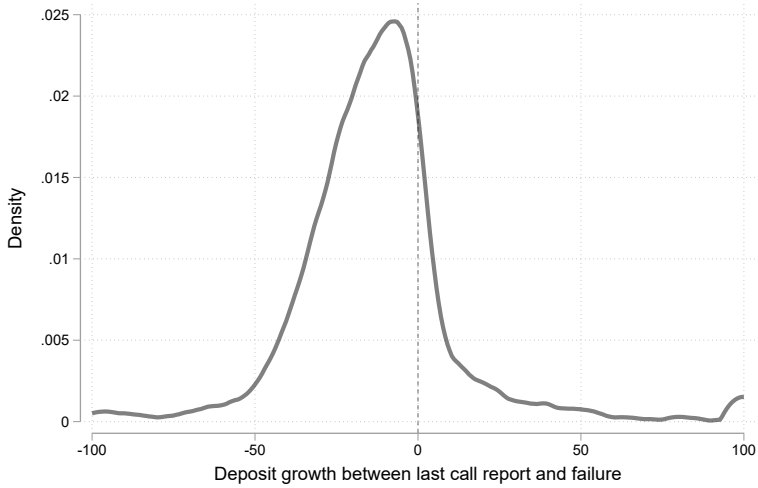
... But Small After



# Weekday of Failure Before and After the FDIC



# Deposit Outflows Before 1935




- Define failures with runs as those with deposit outflow $>7.5\%$

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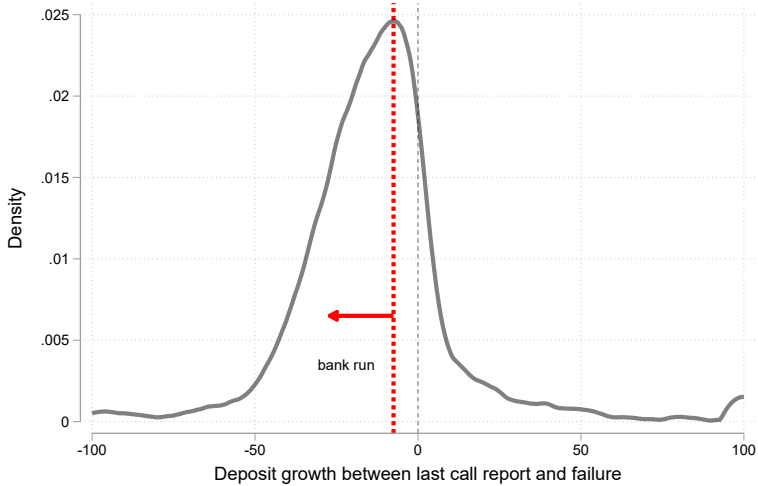


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# Failures With Runs Are As Predictable As Other Failures

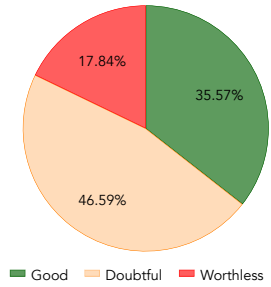
| | AUC (in sample) | |
|---|---|---|
| Sample | With Run | No Run |
| NB Era (1880-1904) | 0.889 | 0.798 |
| Early Fed (1914-1928) | 0.898 | 0.861 |
| Great Depr. (1929-1934) | 0.827 | 0.847 |

- Failures with runs are not disconnected from bank fundamentals, even in historical context where failures due to non-fundamental runs are possible

# Losses in Receivership

# Banks were subject to large losses in failure

- OCC receiver classified assets available at suspension:
  - Good
  - Doubtful
  - Worthless



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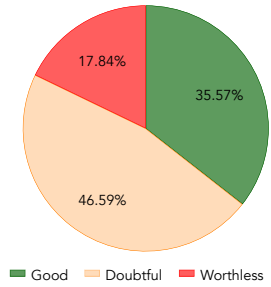



Ultimate recovery rate: $\approx$ **51 cents per $**
Depositor loss rate: $\approx$ **35 cents per $**

# What do recovery rates imply?

- Suppose the bank has book assets $A$, deposits $D$
- Denote losses before entering failure of $\lambda$, and losses incurred in receivership of $\rho$
- Further let $v$ be potential future franchise value as a fraction of current book assets
- Recovery rate we observe in receivership is $R = (1 - \lambda)(1 - \rho)$
- Bank is insolvent irrespective of run if:

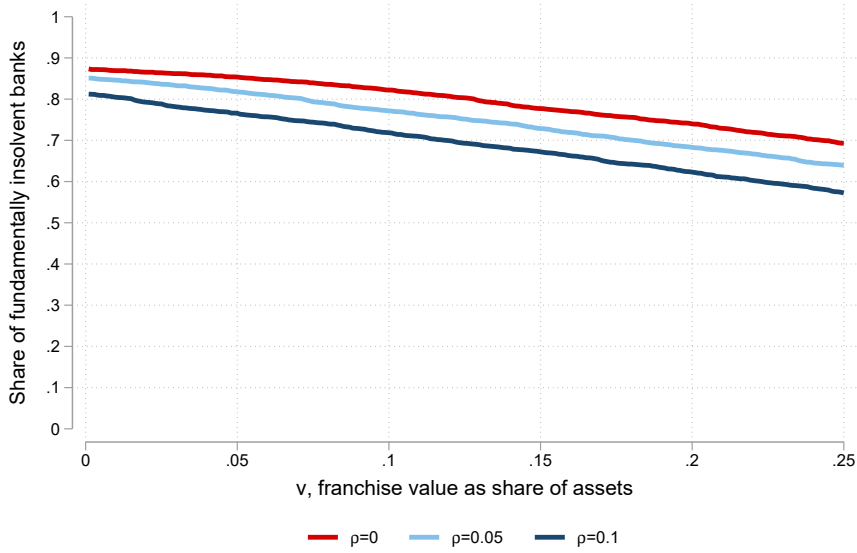
$$(1 - \lambda)A(1 + v) = \frac{R}{1 - \rho}A(1 + v) < D$$

- Let $\ell = D/A$ denote the banks leverage, then the bank was insolvent:

$$\frac{1 + v}{1 - \rho} < \frac{\ell}{R}$$

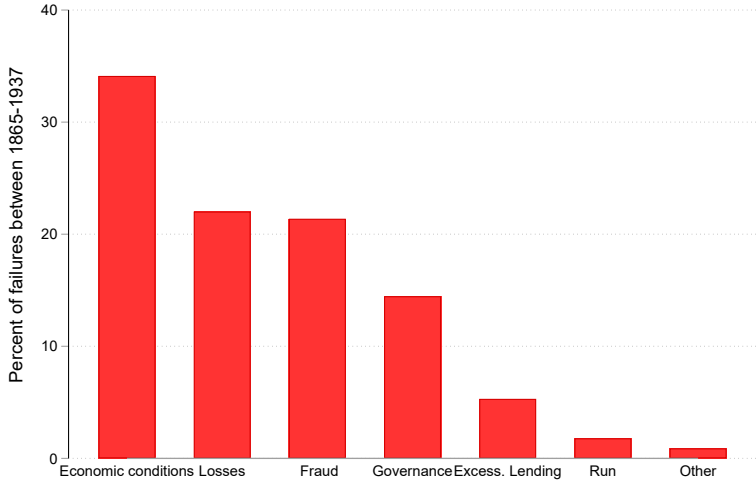
- $R$ and $\ell$ are observable; make assumptions on $v$ and $\rho$

# Many pre-FDIC bank failures featured runs on deeply insolvent banks



# Cause of Failure Assigned by OCC Examiner

Sample: Failures from 1865 to 1931



# Conclusion

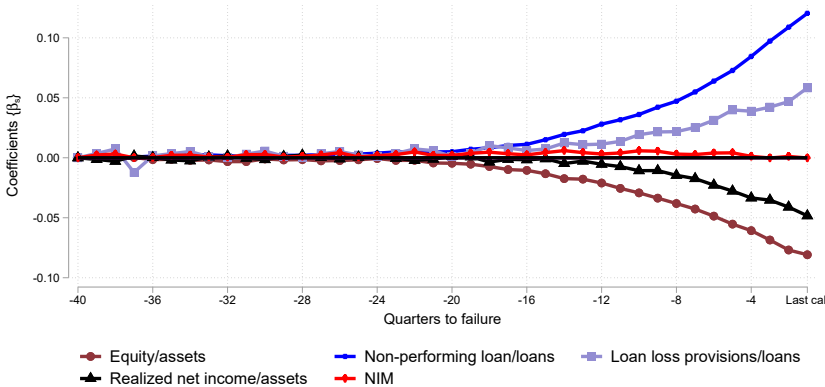
- **Objective:** What causes bank failures and banking crises?
- **Approach:** Study the close to complete history of (failing) banks in the U.S.
- **Main Findings:**
  - Bank failures are almost always related to deteriorating bank fundamentals
  - Bank runs tend to be a consequence of imminent failure as opposed to the cause
- **Policy:** Focus on solvency versus liquidity

*Bank failures are (almost) always and everywhere a phenomenon of deteriorating fundamentals.*

# Two Facts About Failing Banks

# Fact 1: Failing banks see deteriorating solvency before failure

Sample: 1959-2023



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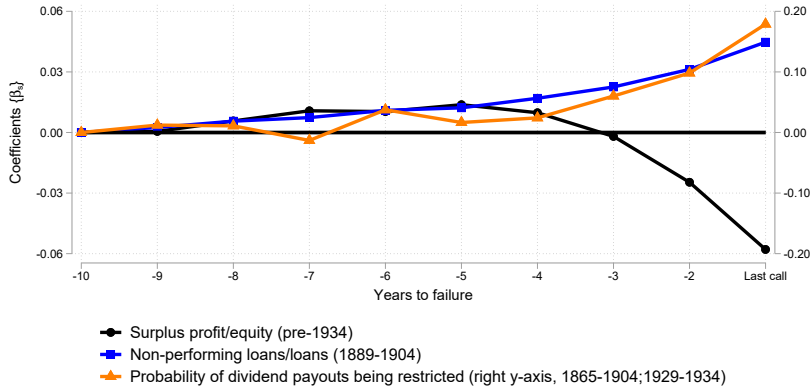
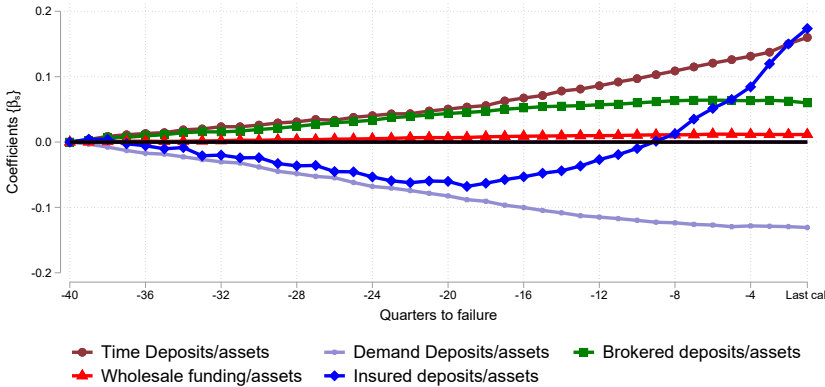


# Fact 2: Failing banks rely on expensive/non-core funding

Sample: 1959-2023



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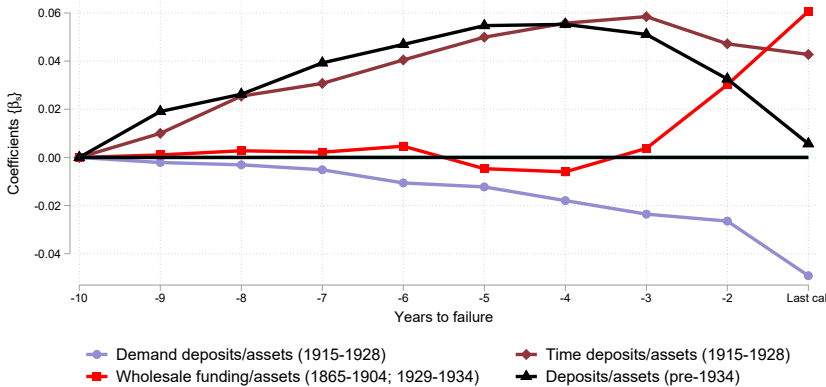

# Sleepy Depositors

- In 23% of failures, predicted probability failure over three years is more than 20% in the year before failure

→ Behavioral frictions such as inattentive depositors or neglect of downside risk (Gennaioli, Shleifer, Vishny, 2012)