Micro-Evidence From a System-Wide Financial Meltdown: The German Crisis of 1931

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The views expressed here do not necessarily represent those of the Federal Reserve Bank of New York or the Federal Reserve System

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Rationales of Short-term Debt in Banking

- Rationale 1: **Provide liquid/safe asset**

  Diamond and Dybvig (1983), Gorton and Pennachi (1990)

- Rationale 2: **Disciplining device**

  Calomiris and Kahn (1991), Diamond and Rajan (2001)

- Both types of rationales differ considerably in their basic premise:
  - Depositors as liquidity demanders
  - Depositors as informed providers of discipline
- Important policy implication (e.g., effects of deposit insurance)

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- Important policy implication (e.g., effects of deposit insurance)

This Paper

- Can both types of theories prevail empirically?
- Do different depositors take different roles?
  - Some being informed and able to discipline bank behavior?
  - Others being less well informed but valuing bank liquidity provision?

→ This paper: Study the German Crisis of 1931

The German Crisis of 1931

- Failure of Austrian *Creditanstalt* in May 1931
- German government suspends reparations payment in June 1931
- Both coincide with *large-scale* deposit withdrawals at German banks
- The run culminated in large number of bank failures

  E.g., failure of Danatbank and Dresdner Bank on July 13, 1931



Figure: Retail depositors withdrawing from *Berliner Sparkasse* on July 13, 1931.

Why the German Crisis of 1931?

Ideal laboratory for three reasons:

1. **Light regulation** and **limited central bank intervention**
2. Detailed, monthly **micro-level** data
3. **Cross-sectional variation in both deposit flows and bank distress**

- Identify heterogeneity in depositor behavior:
  - Step 1: Explain cross-sectional variation in deposit flows and bank distress
  - Step 2: Study predictive power of unexplained deposit flows for bank distress

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Findings

Deposit Withdrawals:

1. Competing banks are the most informed depositors
   - Observable *characteristics* (equity, liquidity) *don't* explain withdrawals
   - Withdrawals themselves predict bank distress
2. Wholesale depositors are less well informed
   - Observable characteristics (equity, liquidity) *do* explain withdrawals
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Maturity:

4. Maturity shortening of informed depositors in early phase of run
   - Conversion of demand deposits into time deposits
   - Maturity shortening in fragile banks

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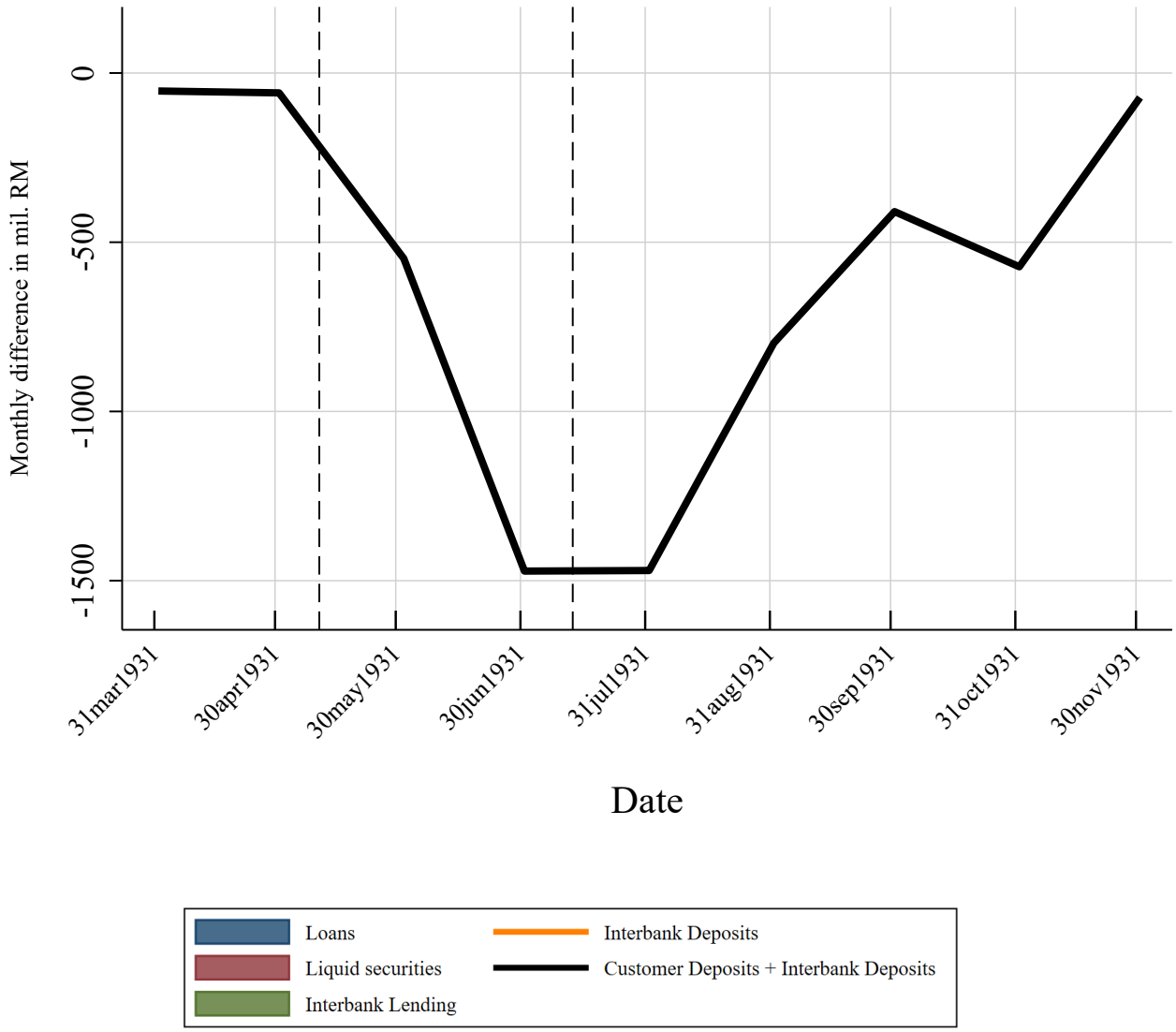
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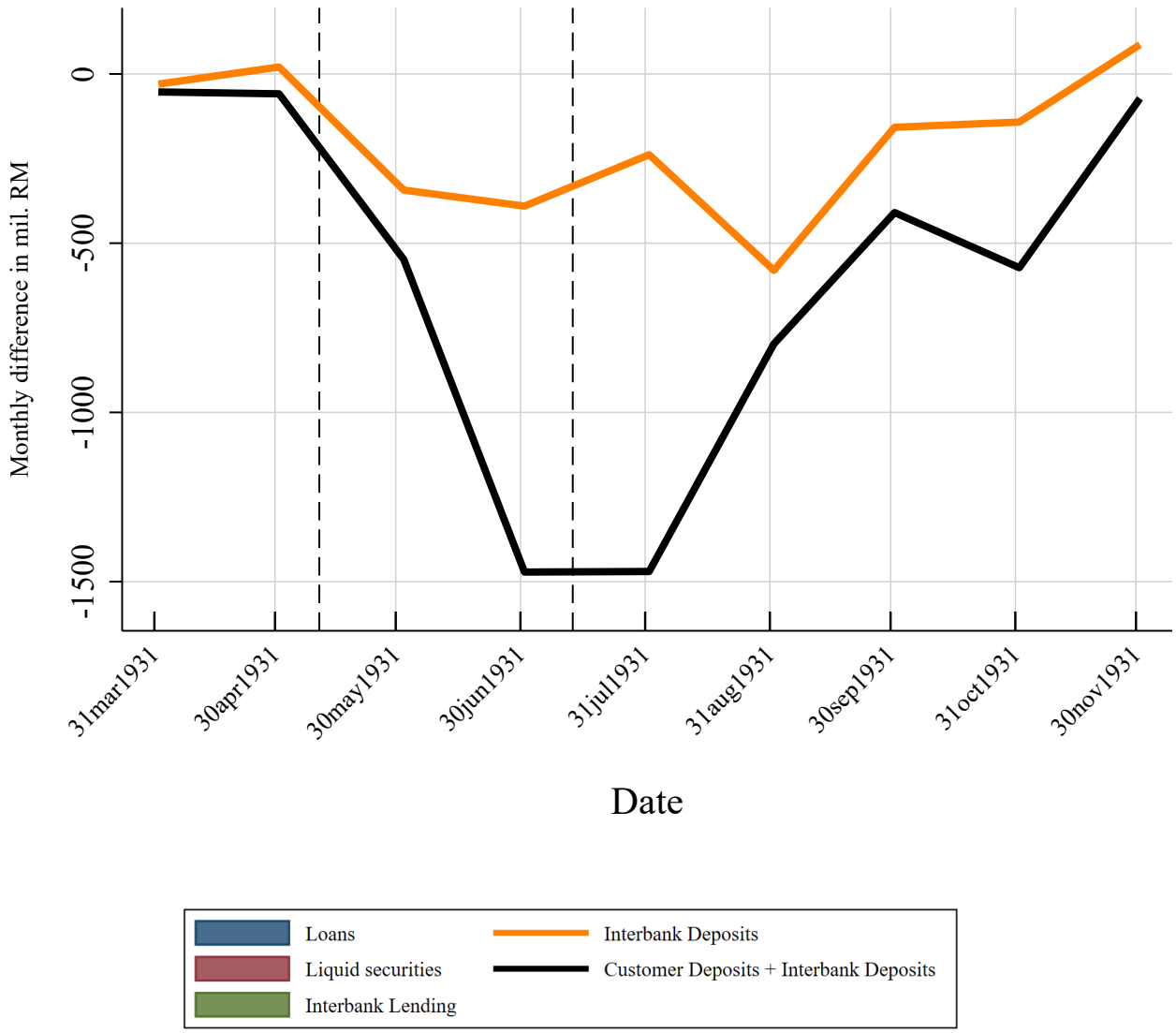
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2 Informational Content of Deposit Flows

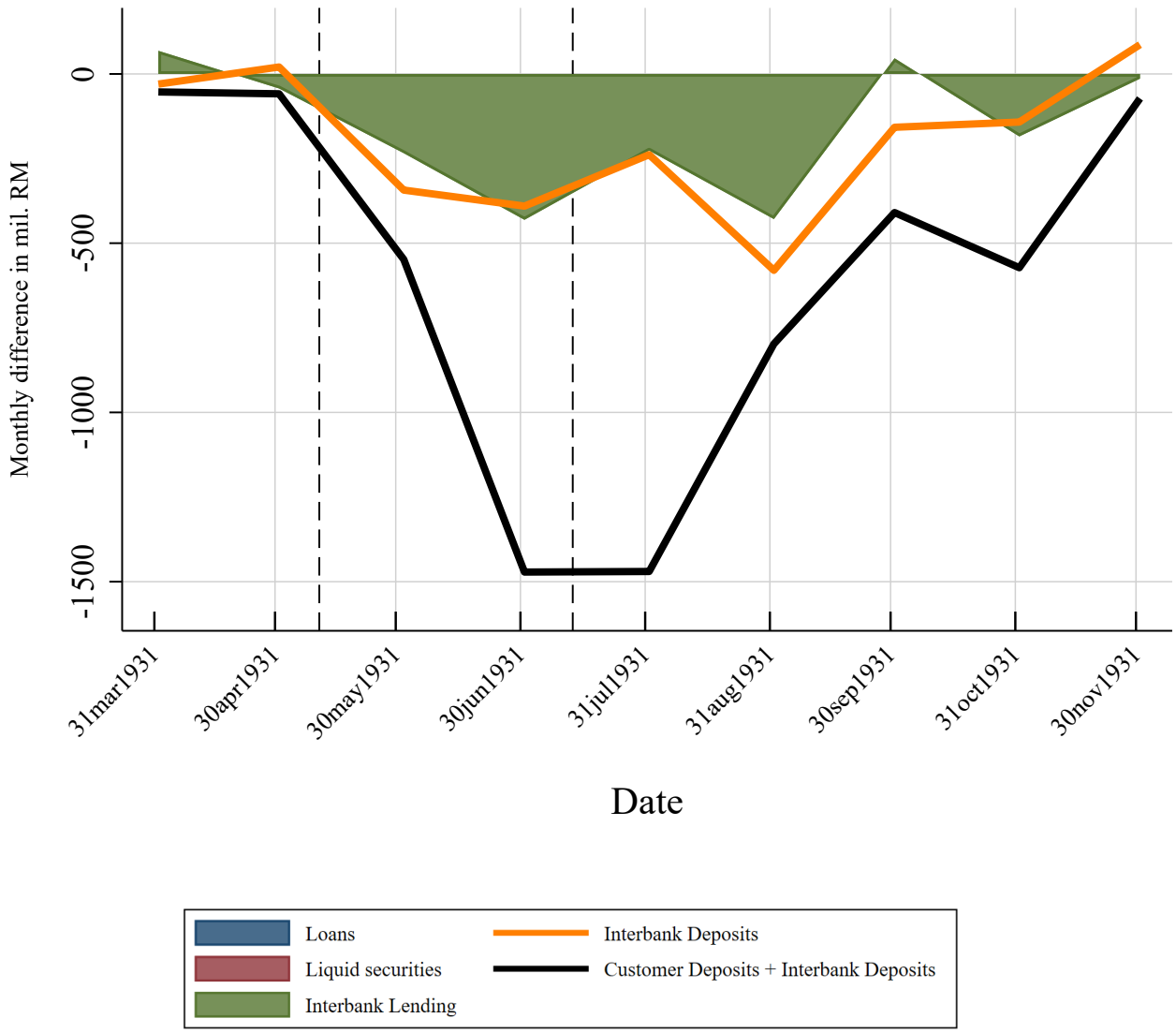
Aggregate Monthly Changes in 1931



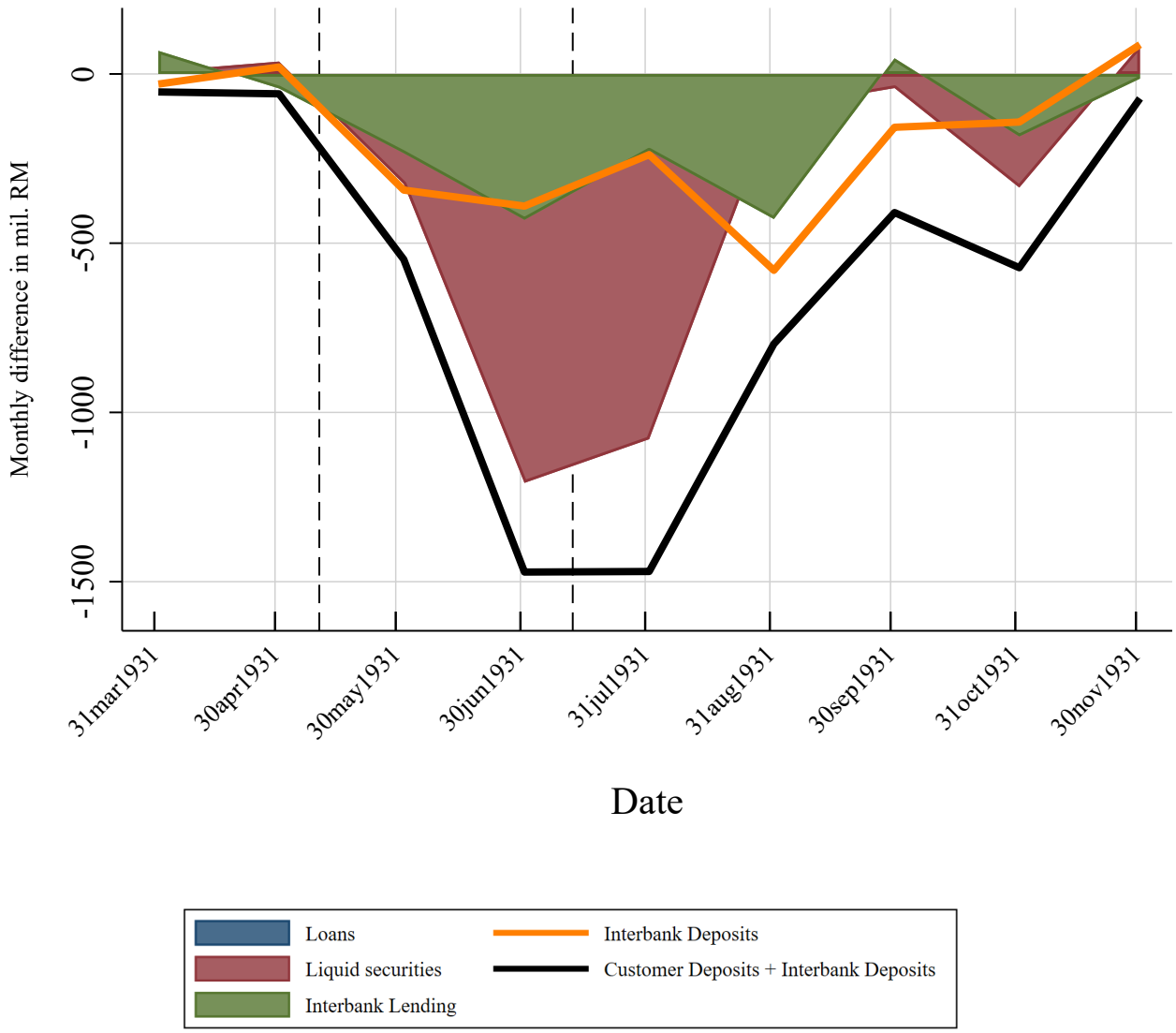
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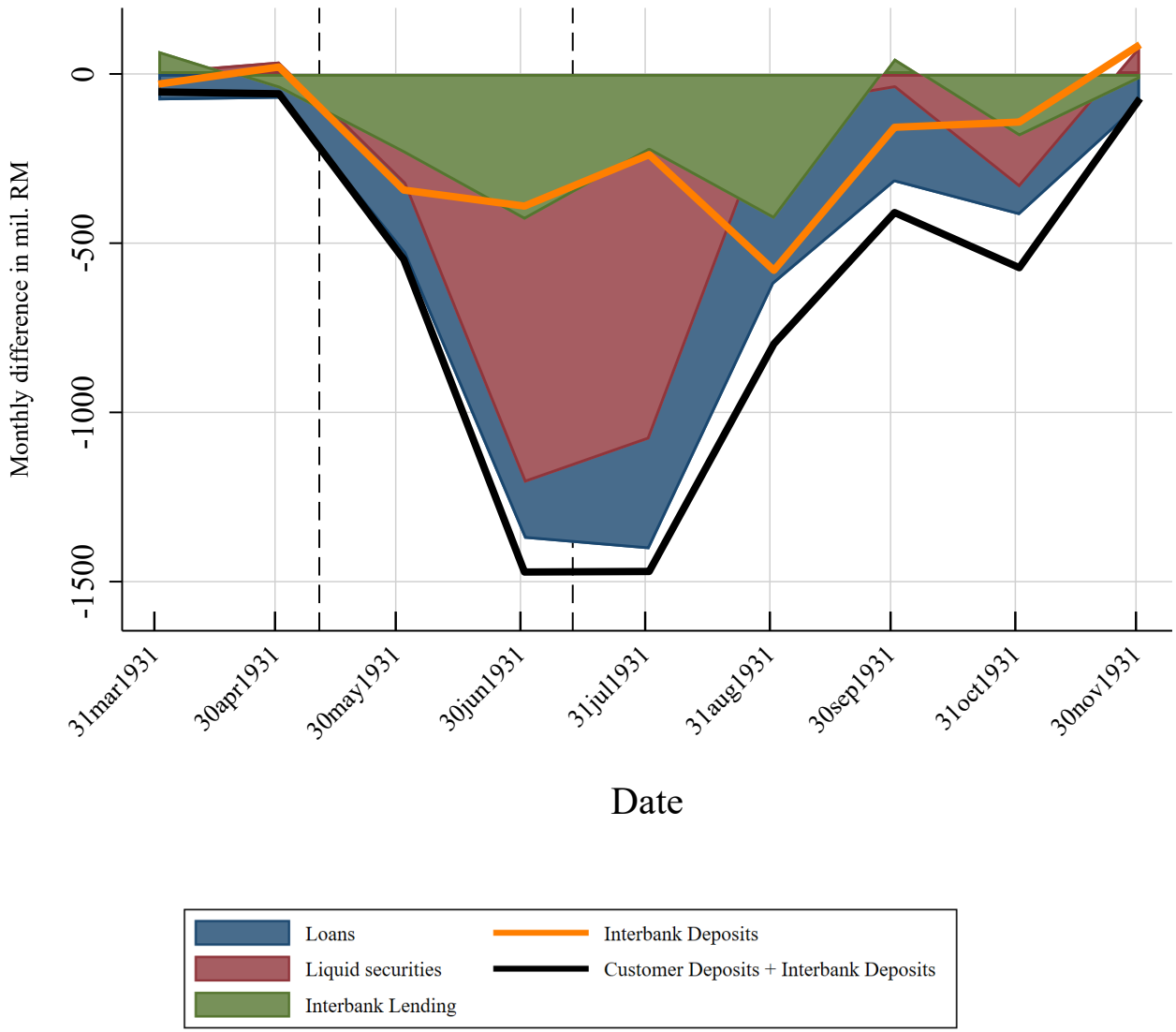
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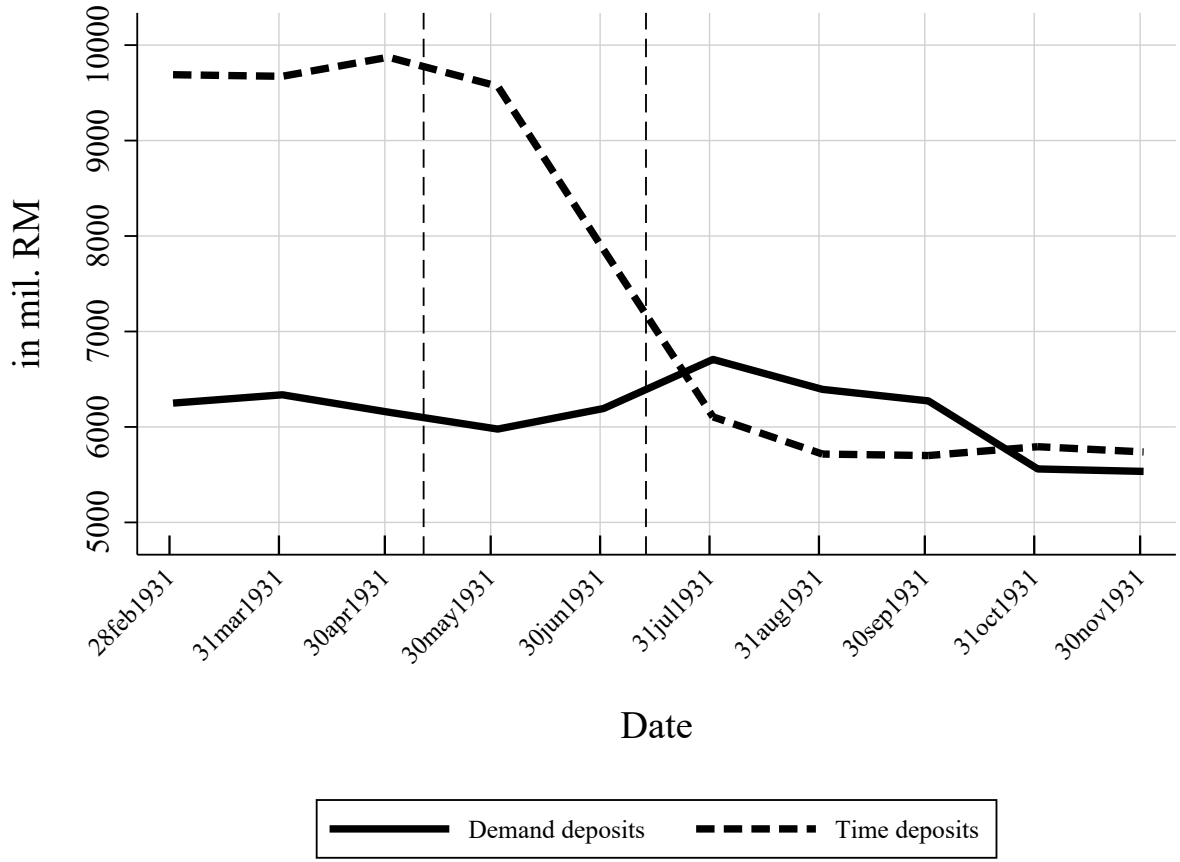
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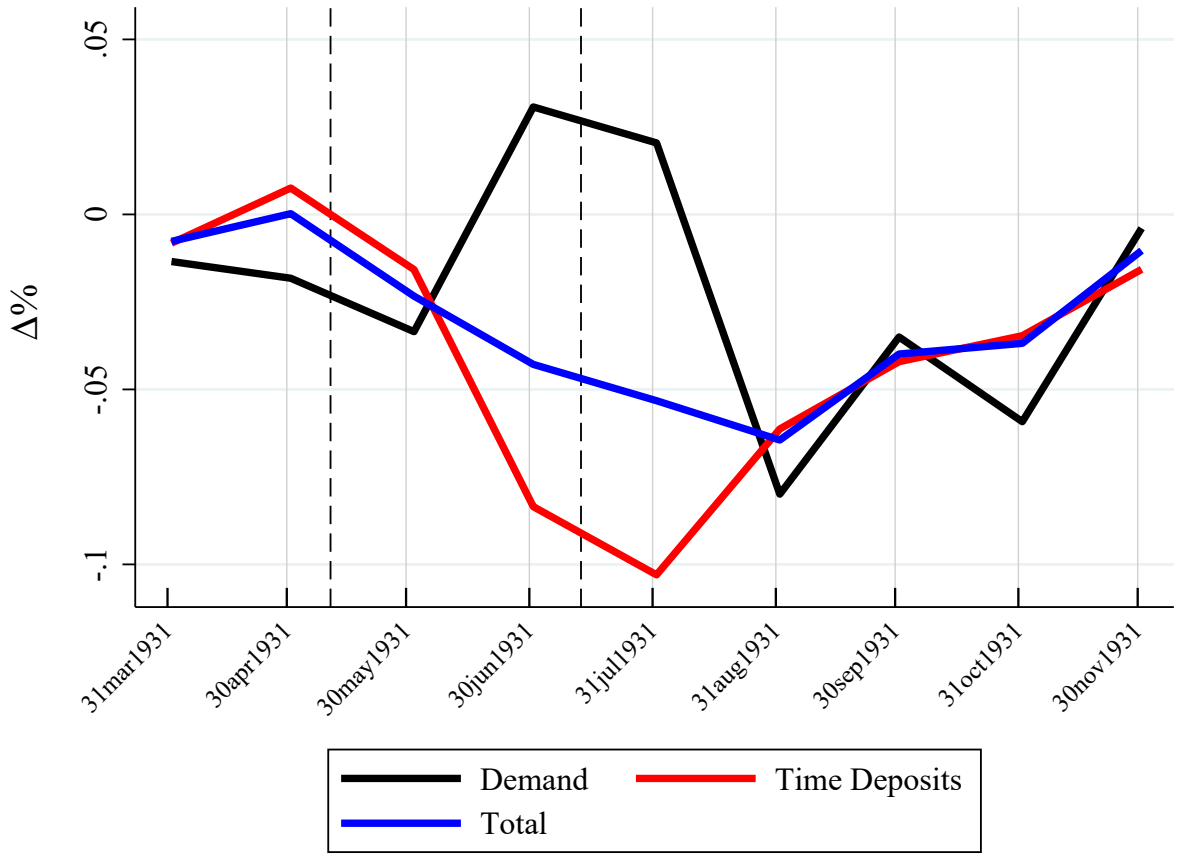
Time vs. Demand Deposits



- Aggregate (uninsured) demand deposits are stable
- Wholesale funding dry-up
- Highlights the potential role of depositor information/sophistication

  O Grada and White (2003), Iyer and Puri (2012), Iyer et al (2016)

Time vs. Demand Deposits



- But in part also reflecting maturity shortening
  - Brunnermeier and Oehmke (2013)

Figure: **Density of Deposits Flows.**

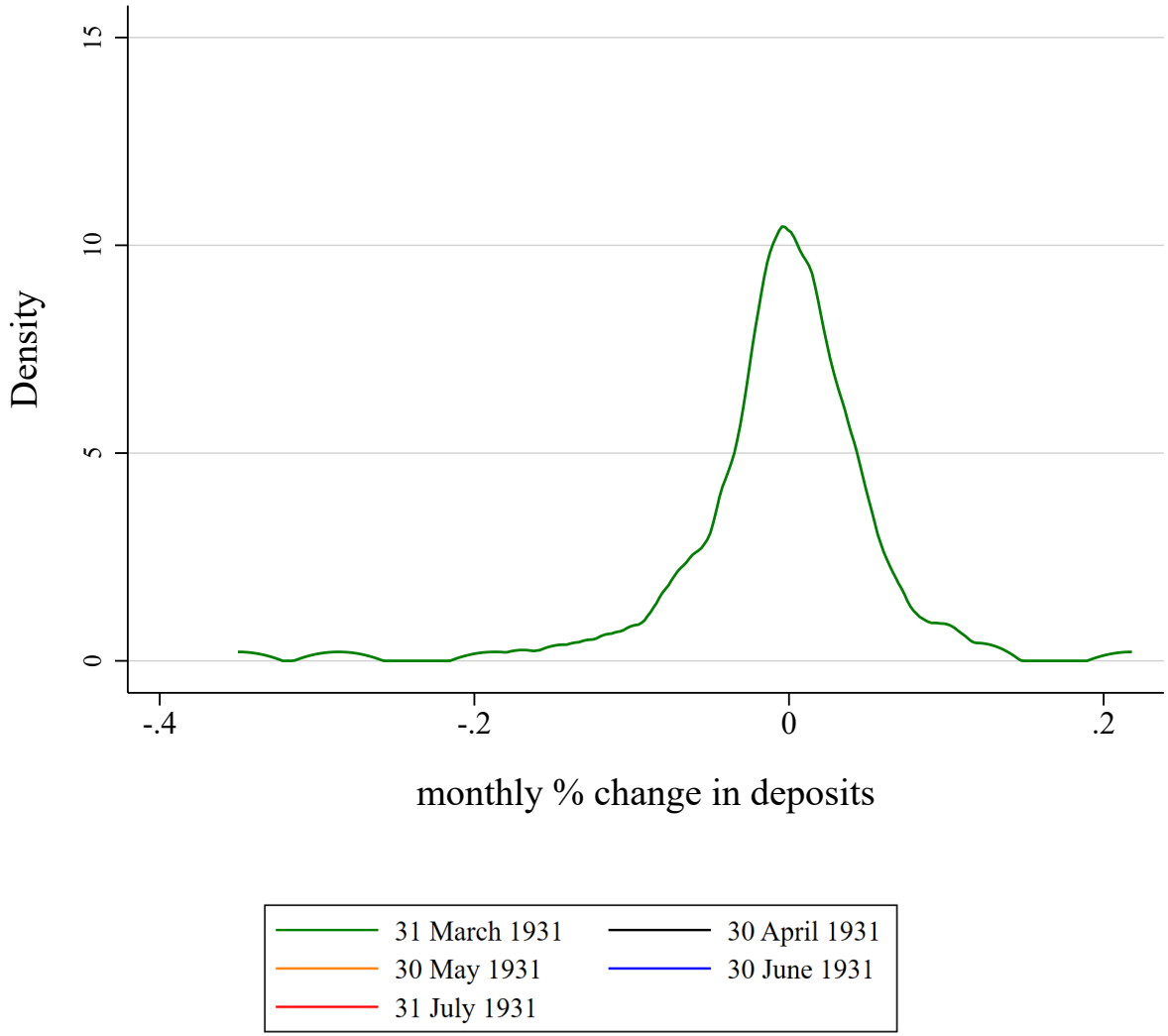


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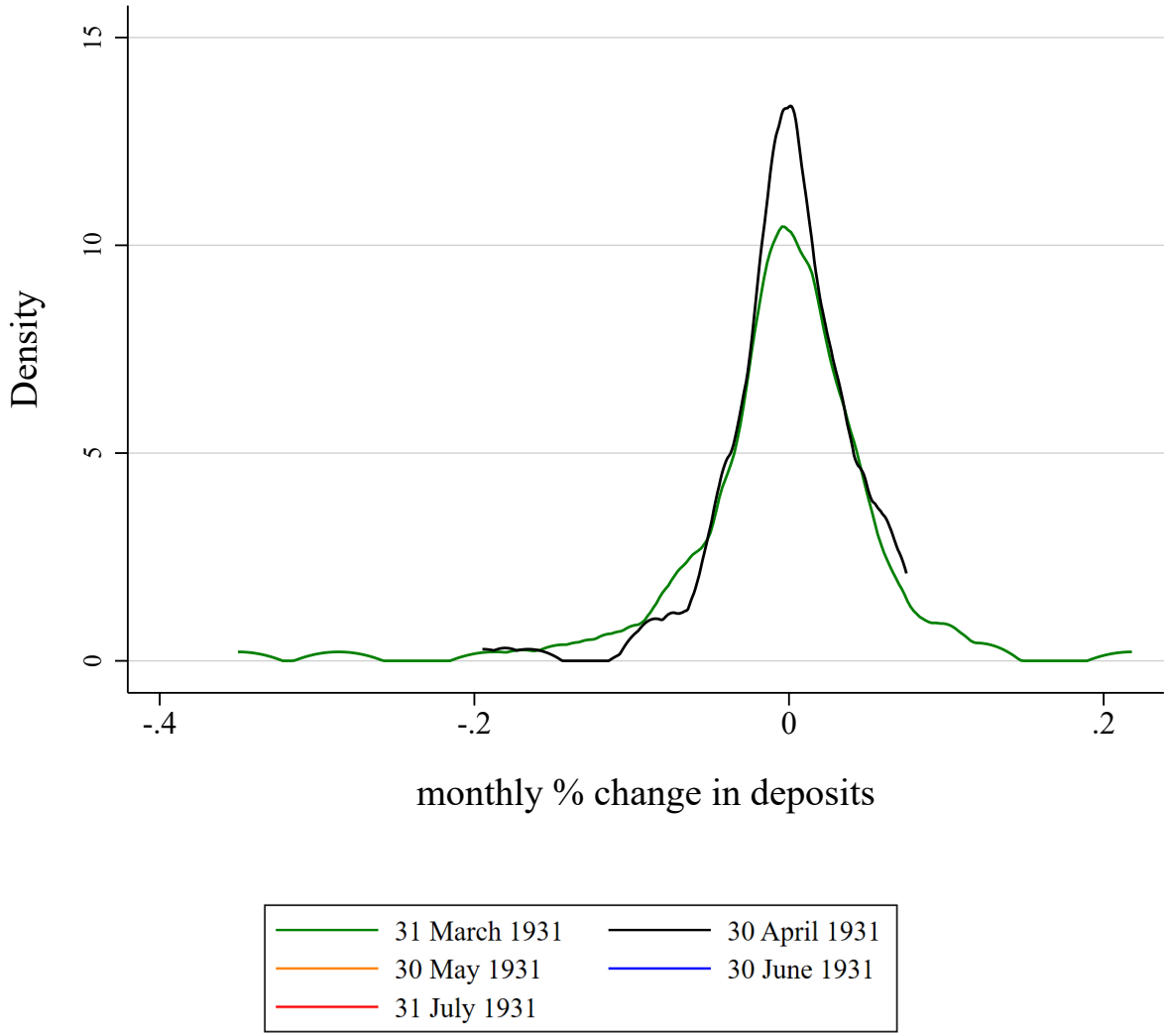


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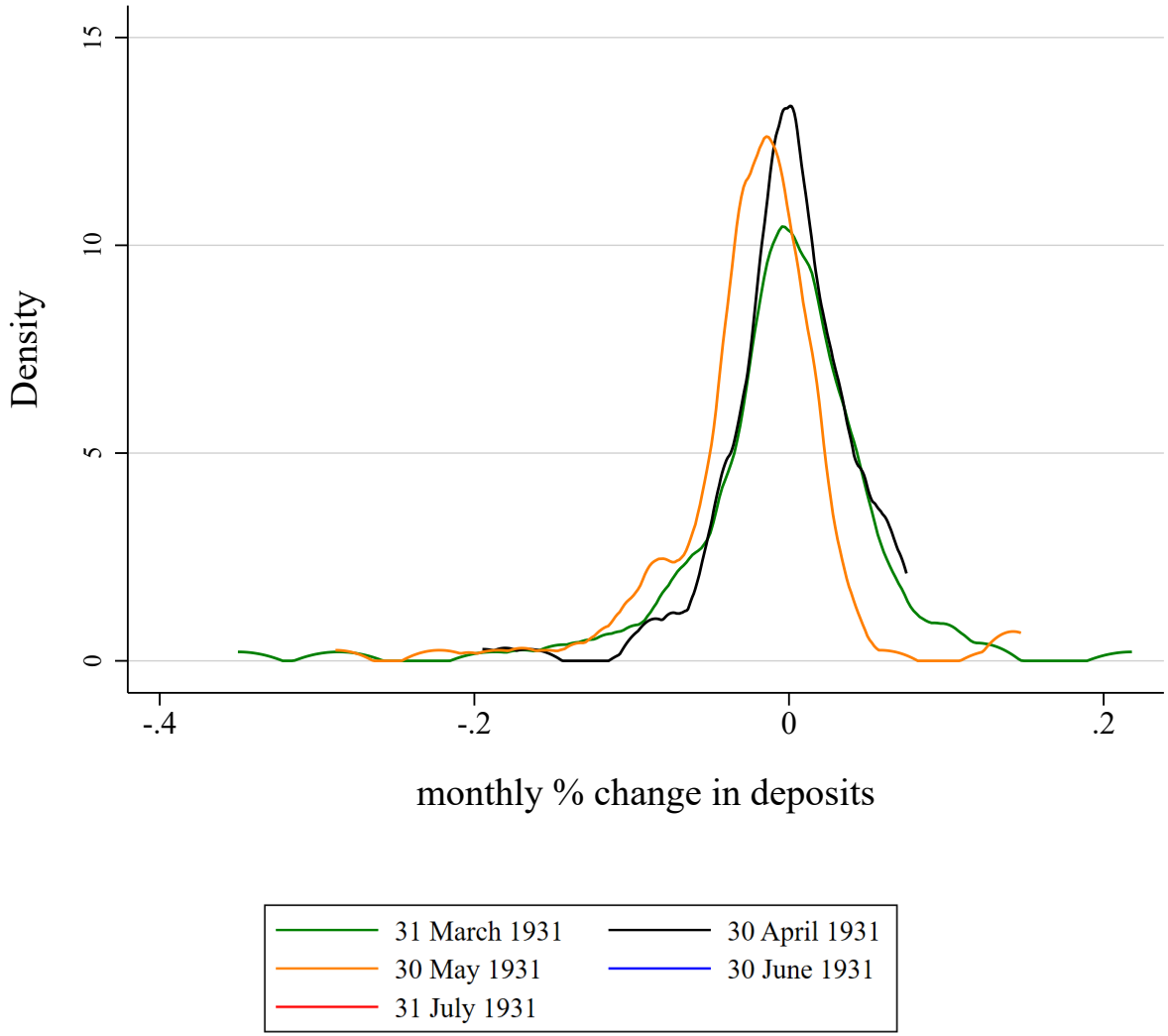


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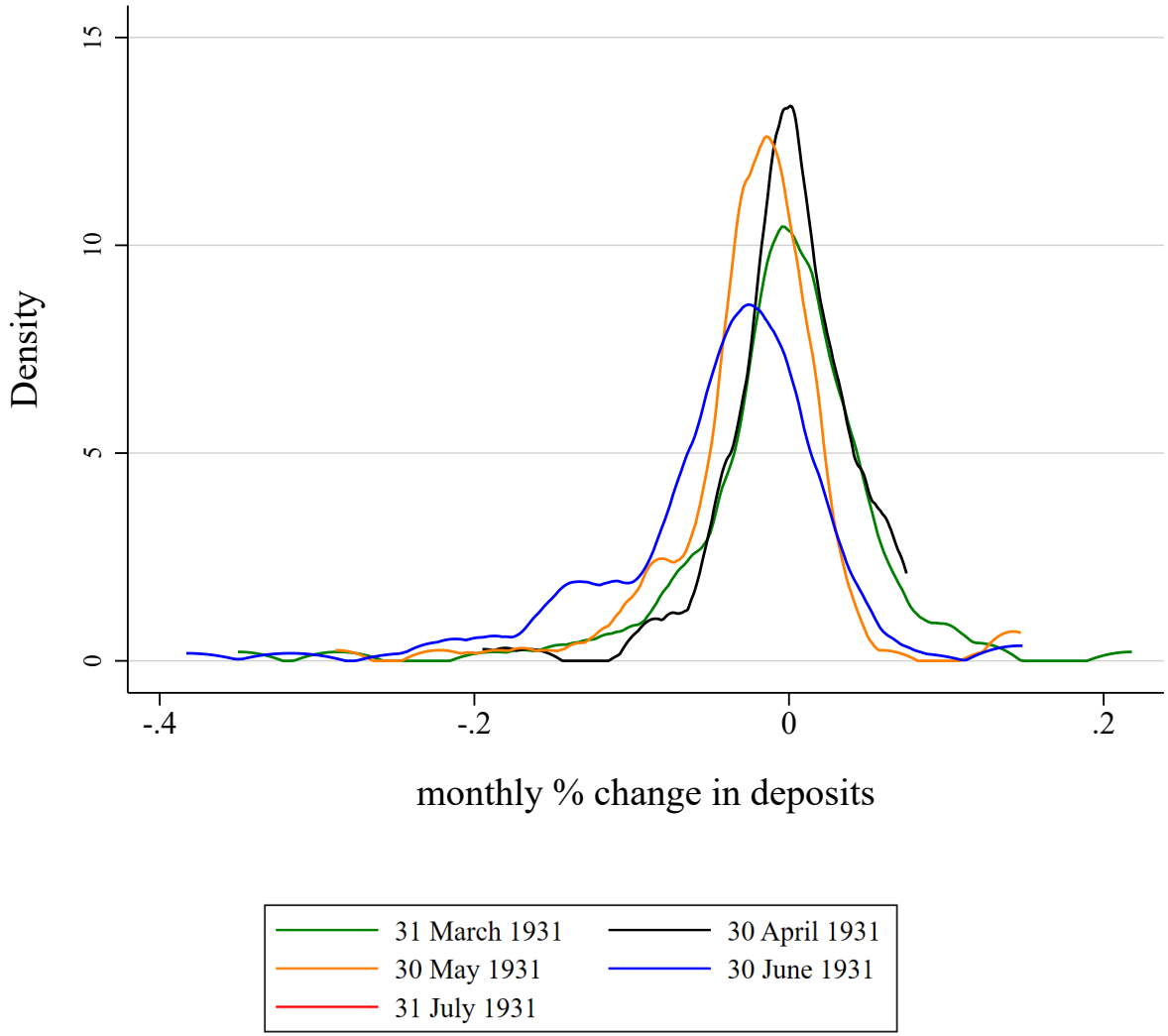
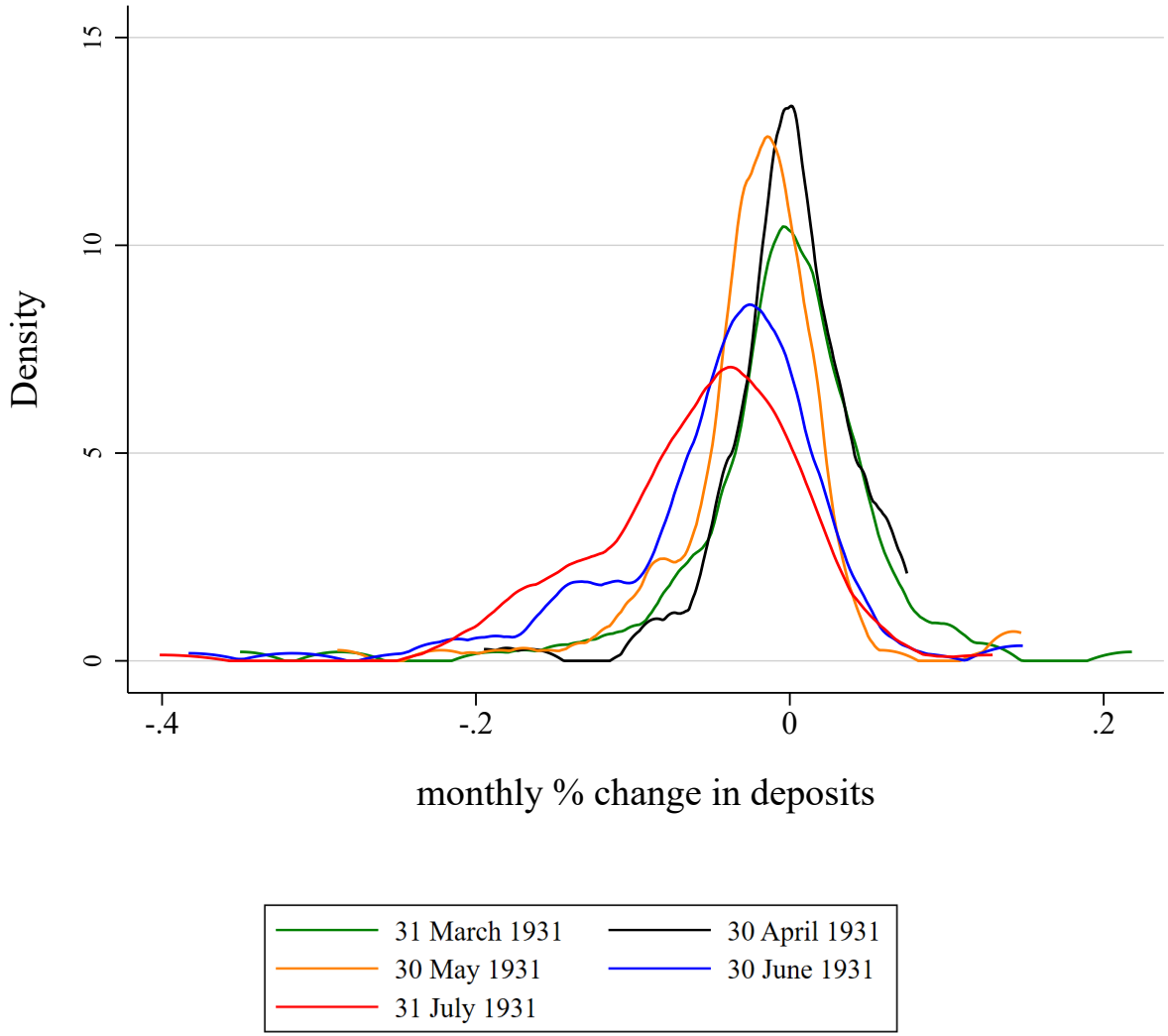


Figure: **Density of Deposits Flows.**



1 The German Crisis of 1931

2 Informational Content of Deposit Flows

Empirical Strategy

Data on flows of different types of deposits (interbank vs. regular, time vs. demand)

1. Explain dynamic cross-sectional variation in deposit flows
   - → Can publicly observable bank characteristics explain deposit flows?
   - Results:
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2. Regress bank distress on deposit flows month-by-month
   - 19 out of around 125 banks become distressed during the crisis
   - Exploit that as econometricians, we are able to observe ex-post outcomes
   - → Do deposit flows themselves predict unexplained variation in bank distress?

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Dissecting Informational Content of Deposit Flows

Regress bank distress on deposit flows month-by-month

- Correlation test

  See Chiappori and Salanie (2000)

- Does variation in deposit flows itself predict bank distress?
  - Is there variation across different types of deposits?
  - Is there variation across time?

  → Predictive power in deposit flows would be an indication of (some) depositors being informed

  → Variation across types of deposits and time would indicate heterogeneity information

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Solvency vs. Liquidity

- Cannot identify whether
  - withdrawals are primarily *caused* by the prospect of default
    [solvency run/fundamental]
  - or to which extent withdrawals are the primary *cause* of default
    [liquidity run/panic-based]

- Identify depositor information:

  Do depositors understand which banks will become distressed?
  - Either because they have information about a specific bank's solvency
  - Or, information about banks other depositors are likely to perceive as fragile

- **Key assumption:** No single depositors action induces distress

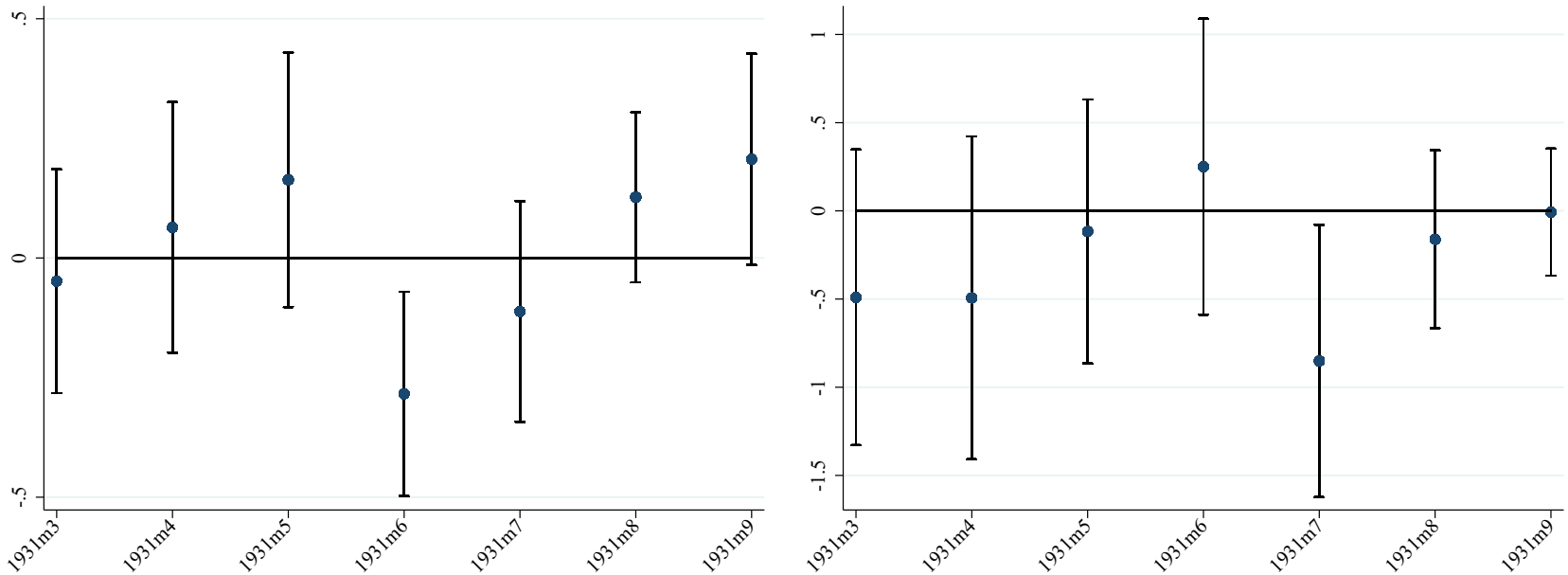
Variation in Distress and Deposit Flows

- Regress unexplained variations month-by-month

$$\Pr[\text{Distress}_b] = \alpha + \beta \times \Delta\%D_b + \rho \times X_b + \epsilon_b,$$

  - D_b:
    - Interbank vs. customer deposits
    - Demand vs. time deposits
  - X_b: equity, liquidity, etc.
- Does variation in deposit flows predict distress?

Figure: **Deposit Flows and Distress.**



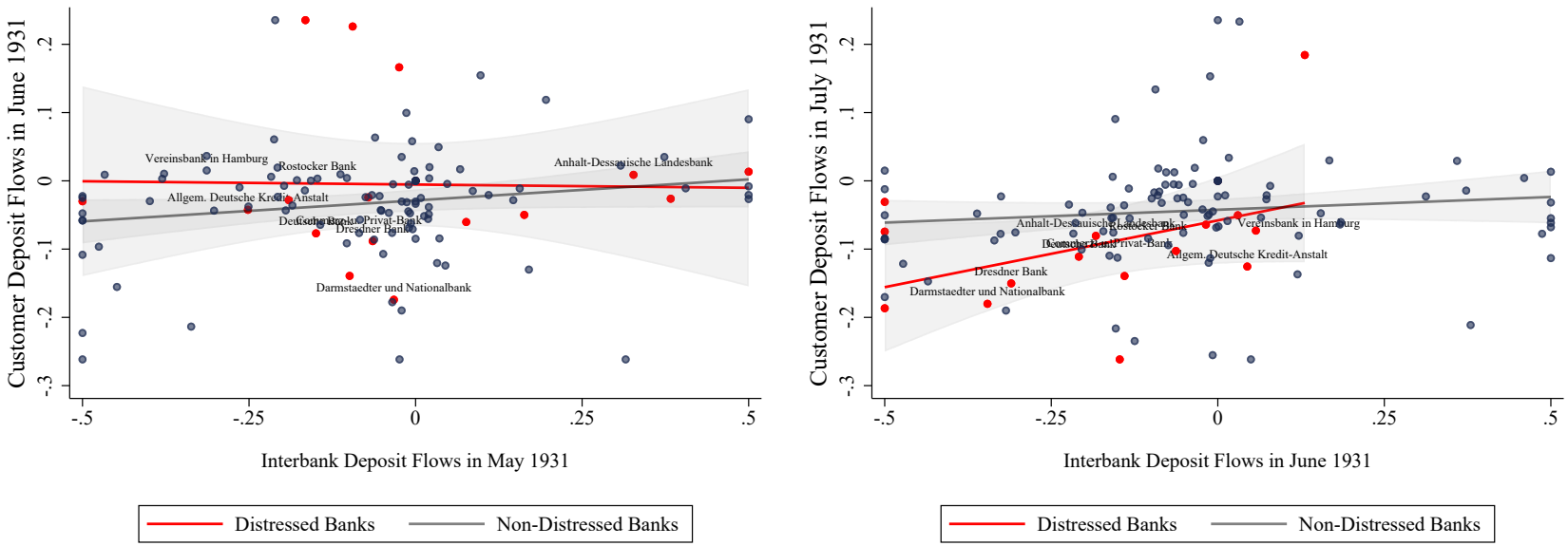
(a) Interbank Deposits

(b) Regular Deposits

- Interbank deposit flows are predicting default in June
- Customer deposit flows are only informative *later*, in July

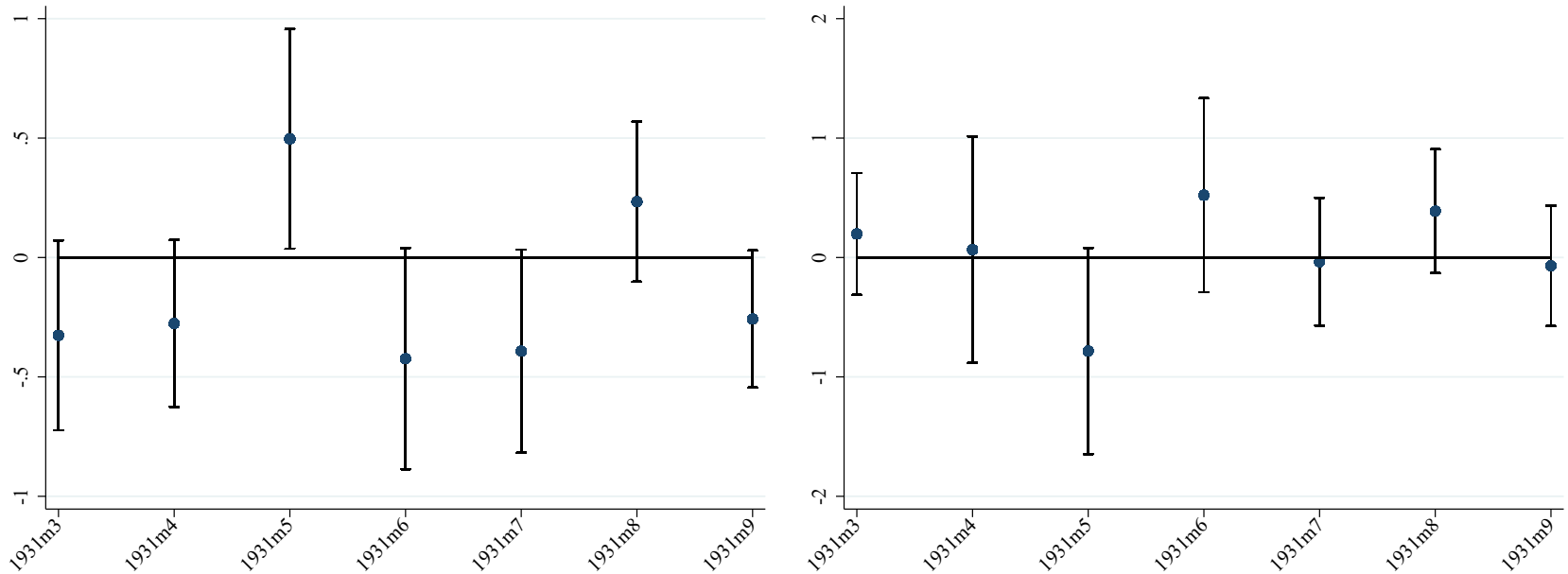
→ Banks are relatively more informed

Figure: **Customer Deposit Flows and Lagged Interbank Deposit Flows.**



- Customer deposit withdrawals become correlated with lagged interbank flow during height of the crisis
- Suggestive of contagion via
  - → Learning
  - → or increased refinancing cost (see Liu 2016)

Figure: **Deposit Flows and Distress.**



(a) Demand Deposits

(b) Time Deposits

- Demand deposits inflow predicts default in May 1931
- Mirrored by predictive power of time deposit flows
  - Arguably reflecting maturity shortening at banks that are at risk

What Do We Learn?

- Roles of short-term debt in banking:
  - Provide liquid/safe asset

    Diamond and Dybvig (1983), Gorton and Pennachi (1990)
  - Disciplining device

    Calomiris and Kahn (1991), Diamond and Rajan (2001)
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- Evidence from German Crisis of 1931 offers (some) reconciliation
  - Various phases of run:
    - Informed investors (interbank market) provide discipline
    - Wholesale depositors are less well informed
    - $\Rightarrow$ Discipline not from retail depositors
    - $\Rightarrow$ True in absence of deposit insurance, capital and liquidity requirements
  - Policy implications
    - Heterogeneity across depositors important
    - Deposit insurance does not undermine discipline
    - Lack of interbank markets potentially do

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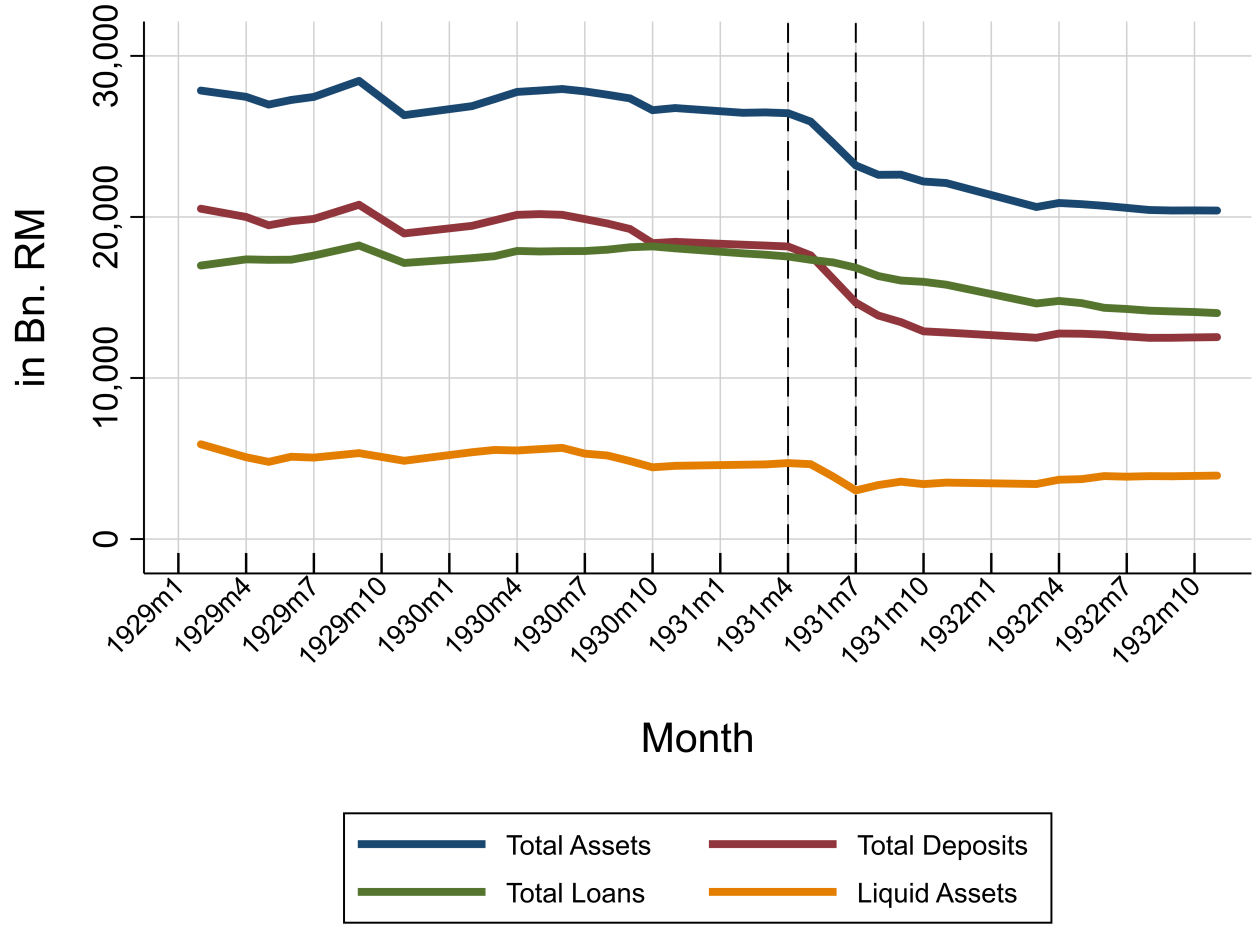
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Dynamics of Aggregate Banking Data



List of Distressed Banks

Bank	Event Date	Event
Landesbank d. Rheinprovinz	June 1931	Bail out
Gewerbebank AG	June 1931	Distressed merger
Dresdner Bank	July 1931	Bail out
Allgem. Deutsche Kredit-Anstalt	July 1931	Bail out
Darmstaedter und Nationalbank	July 1931	Distressed merger
Hallescher Bankverein v. Lullisch, Kaempf u. Co., K. a. A.	August 1931	Bail out
Leipziger Immobilienges. Bk. Grundbesitz A.-G.	September 1931	Default
Leipziger Kredit-Bank	September 1931	Bail out
Bank fuer Handel und Gewerbe	September 1931	Default
Rheinische Bauernbank A.-G.	October 1931	Bail out
Hollandische Kreditbank AG	October 1931	Default
Vorschuss- u. Spar-Vereins-Bk. In Luebeck	November 1931	Default
Commerz-Bank in Luebeck	December 1931	Bail out
Anhalt-Dessauische Landesbank	December 1931	Distressed merger
Deutsche Bank	February 1932	Bail out
Wernigeroeder Bank	February 1932	Default
Staedte u. Staatsbank d. Oberlausitz K. a. A.	June 1932	Default
Bernburger Bank	July 1932	Default
Westfalenbank A.-G.	August 1932	Bail out

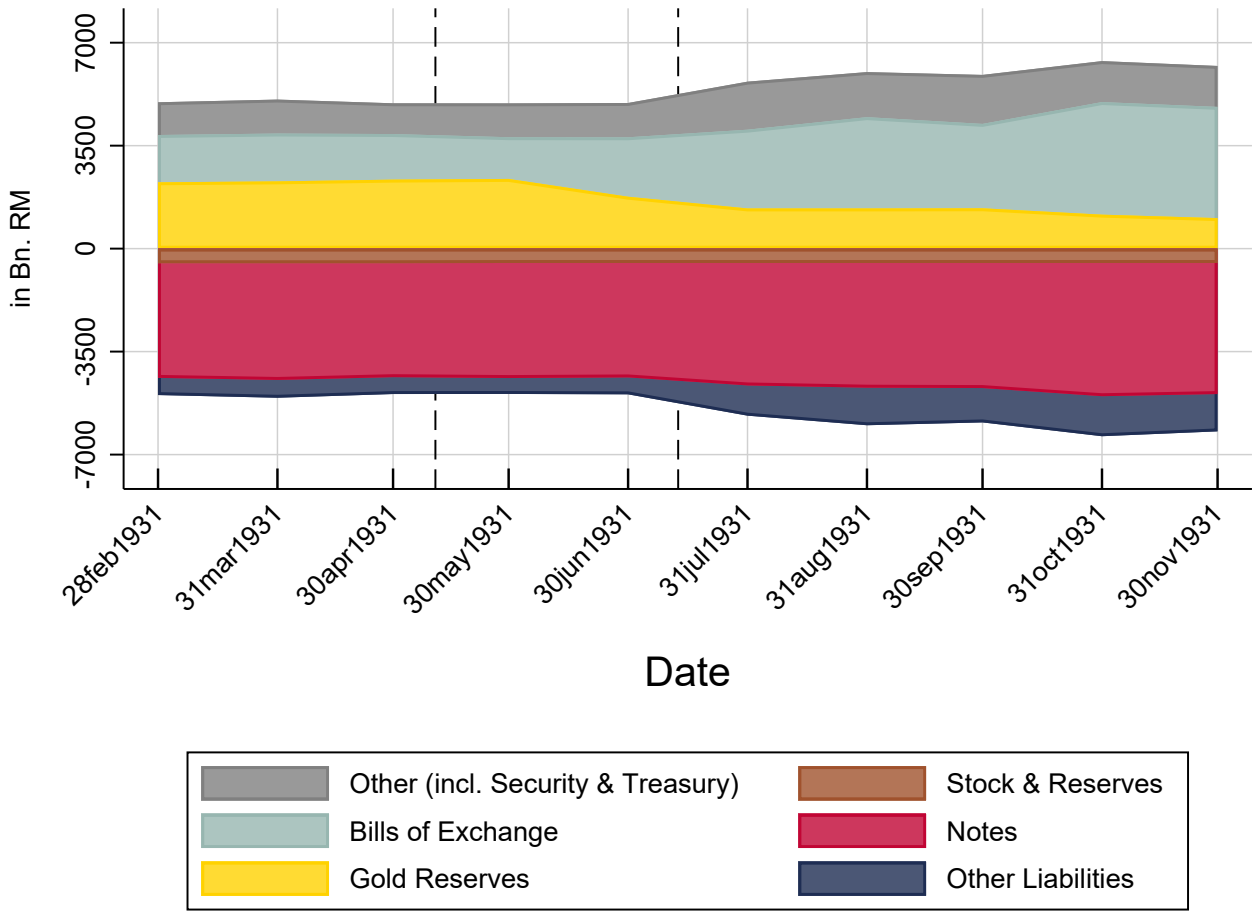
Literature I: Theory

- First generation of bank run models:
  - Diamond and Dybvig (1983), Bryant (1980)
  - Chari and Jagannathan (1988), Jacklin and Bhattacharya (1988)
- Second generation of bank run models:
  - Rochet and Vives (2004), Goldstein and Pauzner (2005)
  - Kashyap, Tsomocos, and Vardoulakis (2018), Gertler and Kiyotaki (2015)
- Dynamic and structural models of bank runs
  - He and Xiong (2012), He and Manela (2012)
  - Egan, Hortacsu, Matvos (2017)

Literature II: Empirical evidence

- Single institution bank runs:
  - Iyer and Puri (2012); Iyer et al. (2016); Martin, Puri, Ufier (2018)
  - Artavanis et al. (2019)
- U.S. evidence from U.S. history
  - O Grada and White (2003), Gorton (1988); Saunders and Wilson (1996); Calomiris and Mason (2003)
- Evidence from 2007-2008:
  - Shin (2009), Kacpercyk and Schnabl (2010), Covitz, Liang, and Suarez (2013), Acharya, Schnabl, and Suarez (2013), Schmidt, Timmermann, and Wermers (2016)
  - Ivashina and Scharfstein (2010); Ippolito, Peydro, Polo, Sette (2016); Acharya and Mora (2014)
- The Great Depression in Germany:
  - Born (1967), James (1984, 1986), Temin (1989, 2007), Schnabel (2004, 2009)

The Reichsbank's Balance Sheet: Liabilities



Step 2: Deposit Flows:

Can balance sheet characteristics explain deposit flows?

$$\begin{aligned}\Delta\%D_{b,t} =& \tau_t + \beta_1 \times \text{Equity}_b \times \text{May 1931}_t + \beta_2 \times \text{Liquidity}_b \times \text{May 1931}_t \\ &+ \rho \times X_b \times \text{May 1931}_t + \gamma_b + \epsilon_{b,t}\end{aligned}$$

- $\Delta\%D_{b,t}$ is the monthly growth in deposits for bank b
  - Interbank vs. regular deposits
  - Demand vs. time deposits
- May 1931$_t$; dummy from May 1931 onwards
- τ_t time fixed effects
- $X_{b,t}$ is a set of bank-level controls

What Explains Deposit Flows?

Dependent variable	Δ%Deposits	Δ%Inter	Δ%Cust	Δ%Time	Δ%Demand
	(1)	(2)	(3)	(4)	(5)
Equity × May 1931	0.033***	-0.018	0.020***	0.034***	0.009
	(0.006)	(0.026)	(0.007)	(0.007)	(0.007)
Liquidity × May 1931	0.110***	0.134	0.042	0.108**	0.069
	(0.035)	(0.110)	(0.035)	(0.051)	(0.061)
Mean	-.026	-.037	-.018	-.032	-.019
R^2	.26	.1	.16	.24	.13
N	1389	1389	1389	1389	1389
No of Banks	126	126	126	126	126
Controls	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
BankType FE	No	No	No	No	No
Bank FE	Yes	Yes	Yes	Yes	Yes
BankType-Time FE	No	No	No	No	No

- Interbank flows insensitive to observable characteristics
- Regular deposits more stable at well capitalized and liquid banks