

Distortive Effects of Deposit Insurance: Administrative Evidence from Deposit and Loan Accounts

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Disclaimer: The views expressed are those of the authors and do not necessarily represent the views of the Danmarks Nationalbank, the Bank of Italy, or the Eurosystem.

Motivation

- Bank runs have been at the center stage of financial crises throughout history (Reinhart & Rogoff 09)
 - ▶ But also recently: Bank runs in high-income countries in the 2008 GFC (Shin 09), and also in 2023 with SVB and Signature Bank (2nd and 3rd largest failures in the FDIC history)
- Recent events reignited debates over deposit insurance (DI) schemes' design (FDIC, 23). Moreover, Davila & Goldstein (23) derives the optimal level of DI, which balances DI benefits vs costs
- A fundamental question is which banks benefit most from deposit guarantees and what are the implications?
 - ▶ Diamond & Dybvig (83): Bank runs (within solvent but illiquid banks) are driven by sunspots, unrelated to bank fundamentals → completely efficient to save banks
 - ▶ Runs can also be driven by banks' weaker fundamentals, within panic runs as in Goldstein & Pauzner (05), or with pure fundamental-based runs as in Allen & Gale (04)
 - Hence DI —by supporting weaker banks— may be distortive (see also Gorton, 88; Calomiris & Kahn, 91; Diamond & Rajan, 01; Rochet & Vives, 04)

This paper

- **Question:** How do changes to deposit insurance limits affect the allocation of deposits across banks and, in turn, the allocation of credit to non-financial firms?
 - ▶ Both across and within: (i) banks and (ii) individuals
- **Danish administrative data:** Universe of retail deposits (**deposit register**) and corporate loans (**credit register**) matched to bank & firm balance sheets + depositors' wealth and income records
- **Reforms:** Analyze **changes to deposit insurance limits** triggered by the GFC and EU reforms
 - ▶ October 2008: Limited insurance of 300K DKK (EUR 40K) lifted → unlimited deposit insurance coverage
 - ▶ October 2010: EU-wide insurance limit of 750K DKK (EUR 100K) adopted → limited deposit insurance coverage
- **Identifying “exposed” bank:** Banks' loan-to-deposit ratio in Dec-2007 proxies dependence on adverse effects of GFC (IMF, 11; Jensen & Johannesen, 17)

Preview of results

- **Exposed banks have weaker loan portfolios prior to GFC**

- ▶ Lend to less productive (lower TFP) firms and real-estate firms, resulting in higher loan losses during GFC and later years

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- ▶ Onset of GFC: Funding liquidity squeeze at exposed banks (limited insurance); reversal with unlimited insurance coverage
 - Individual-bank level data: She withdraws more deposits from exposed banks, notably above the insurance limit (HH FEs)
 - When DI becomes unlimited, she moves large deposits from stronger to weaker banks (stronger for wealthier HHs)
 - Stronger effects for exposed (weaker) banks with more uninsured deposits, and opposite results for limited vs unlimited DI
 - Bank-account level data: Exposed banks lose deposits from *just above* vs *just below* deposit insurance limit

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- ▶ Exposed banks raise deposit rates to attract deposits, both in 2008 (limited DI) and post-2010 reform (limited DI)

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- **Firms ex-ante more reliant on exposed banks experience better credit availability in 2009 (unlimited DI) as compared to 08 (limited DI) – stronger results for weaker firms**

- ▶ Loan level data with firm-time FE: exposed banks' credit supply to weak firms remain elevated after 2008/10 DI reforms

Data, Deposit Insurance and Empirical Strategy

Administrative datasets

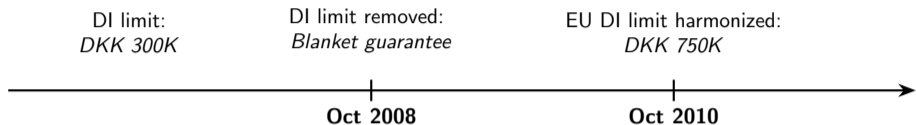
• Universe of retail deposit (**deposit register**)

- ▶ Data spans deposit accounts of 6.5 million individuals at 92 banks in Denmark between 2004 and 2015
- ▶ Annual data on **year-end volume** and interest payment over the previous year
- ▶ Impute deposit rates for depositor h at bank b in year t as $i_{hbt} = \frac{\text{Interest payments}_{hbt}}{0.5 \times (\text{Deposit balance}_{hbt} + \text{Deposit balance}_{hb,t-1})}$
- ▶ Each deposit account is associated with a unique identifier for each individual and bank

• Matched with:

- ▶ Credit register: Term loans, credit lines and credit cards to 101,000 non-financial firms
- ▶ Individual-level wealth data from tax records
- ▶ Supervisory bank data
- ▶ Firm registry

Deposit insurance (DI) reforms in Denmark: Timeline of key events



- Pre-Oct 08: DI limit was **DKK 300K**
- Oct 08: Reacting to Lehman collapse, Danish government **guarantees all deposits** (Reform 1)
 - ▶ Danish banks financed credit boom, notably in real estate, by relying on wholesale (foreign) borrowing. Wholesale market freeze in 2008-Q3 led to liquidity squeeze for Danish banks
- Oct 10: EU harmonized DI to **DKK 750K** (Reform 2)
- DI applies at the **depositor-bank** level

Empirical strategy

- We analyze deposit and credit data by exploiting:
 - ▶ Before and after the two deposit insurance reforms
 - GFC with limited DI and GFC with unlimited DI coverage (Reform 1)
 - European Union reform to limit DI coverage (Reform 2)
 - ▶ Below and above DI limits when DI is limited
 - DKK 300K (Reform 1)
 - DKK 750K (Reform 2)
 - ▶ Differential bank exposure to the GFC based on their loan-to-deposit ratio at the end of 2007 (IMF, 11; and Jensen & Johannesen, 17). $Exposed_b = (Loans / Deposits)_{Dec-07}$
 - Further heterogeneity: Individual-level wealth; % uninsured bank deposits; firm weakness (e.g., TFP)
- Exploiting data at the *bank-time*, *bank-account-time*, *individual-bank-time*, *firm-bank-time* level, and differential granular level of fixed effects
 - ▶ E.g., the same individual reallocating deposits across different banks within the same period

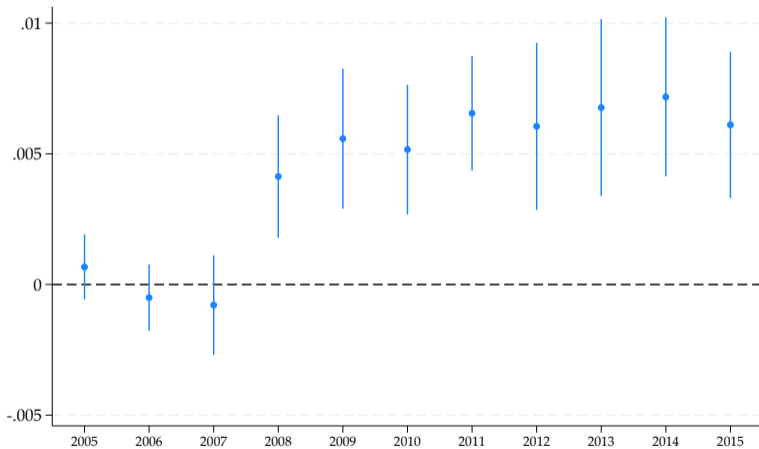
The 2008 Global Financial Crisis (GFC) and
shift from limited to unlimited DI coverage:
Bank-level outcomes

Exposed banks lend to less productive and riskier firms prior to GFC

Outcome:	Period: 2004-2007					
	TFP			Real-estate firm		
	(1)	(2)	(3)	(4)	(5)	(6)
Exposed	-0.64** (0.27)	-0.57*** (0.22)	-0.59*** (0.22)	0.05*** (0.02)	0.07*** (0.02)	0.07*** (0.01)
Observations	330	330	330	330	330	330
R2	0.02	0.03	0.04	0.06	0.11	0.15
Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Bank controls		Yes	Yes		Yes	Yes
Control: Top-6 bank			Yes			Yes

Notes: Bank controls include banks' total assets and tier-1 capital ratio measured in 2007.

Resulting in elevated loan losses



Table

Liquidity stress in 2008: Q3 limited vs. Q4 unlimited DI coverage

Change in bank-level (log) outcomes

	Total deposits		Deposit rate		Total liquidity	
	(1) 2008-q3	(2) 2008-q4	(3) 2008-q3	(4) 2008-q4	(5) 2008-q3	(6) 2008-q4
Exposed	-0.011*** (0.0042)	0.022*** (0.0071)	0.004** (0.0014)	-0.009** (0.0035)	-0.027*** (0.0099)	0.037** (0.0187)
Observations	77	85	69	72	89	87
R2	0.09	0.15	0.51	0.37	0.06	0.12
Control: Log(size)	Yes	Yes	Yes	Yes	Yes	Yes
Control: Capital ratio	Yes	Yes	Yes	Yes	Yes	Yes
Control: Top-6 bank	Yes	Yes	Yes	Yes	Yes	Yes

2008:Q3 with all differential controls

2008:Q4 with all differential controls

Deposit insurance reforms:
insured vs. uninsured deposits
Granular data

Individual-bank level deposit reallocation - Individual FEs

- We keep all individuals with at least 2 banks in Dec-07, add individual FEs to analyze deposit changes *within* individual

$$\Delta \log(\text{deposits})_{hb2008} = \beta_1 \text{Exposed}_b \times \text{Above 300K}_{h,2007} + \beta_2 \text{Exposed}_b + \alpha_b + \alpha_h + \dots + \epsilon_{hb2008}$$

Outcome: Δ (log) Deposits	Individuals with 2+ banks in 2007					All individuals				
	Year: 2008				Year: 2009	Year: 2008				Year: 2009
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Exposed										
Above 300K										
Exposed X Above 300K										
Observations	1,776,698	1,776,698	1,776,698	1,776,698	1,622,053	5,521,087	5,521,087	5,521,087	5,521,087	5,588,505
R2	0.46	0.47	0.47	0.47	0.46	0.00	0.01	0.01	0.01	0.01
Individual FE	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No
Bank FE				Yes	Yes				Yes	Yes
Bank controls		Yes	Yes				Yes	Yes		

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	Year: 2008					Year: 2008				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Exposed	-0.005*** (0.001)	-0.018*** (0.002)	-0.015*** (0.002)							
Above 300K		-0.514*** (0.004)	-0.498*** (0.004)	-0.502*** (0.004)	-0.279*** (0.004)					
Exposed X Above 300K			-0.051*** (0.006)	-0.051*** (0.006)	0.019*** (0.005)					
Observations	1,776,698	1,776,698	1,776,698	1,776,698	1,622,053	5,521,087	5,521,087	5,521,087	5,521,087	5,588,505
R2	0.46	0.47	0.47	0.47	0.46	0.00	0.01	0.01	0.01	0.01
Individual FE	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No
Bank FE				Yes	Yes				Yes	Yes
Bank controls		Yes	Yes				Yes	Yes		

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Exposed	-0.005*** (0.001)	-0.018*** (0.002)	-0.015*** (0.002)			-0.006*** (0.001)	-0.009*** (0.001)	-0.007*** (0.001)		
Above 300K		-0.514*** (0.004)	-0.498*** (0.004)	-0.502*** (0.004)	-0.279*** (0.004)		-0.439*** (0.001)	-0.430*** (0.002)	-0.431*** (0.002)	-0.337*** (0.001)
Exposed X Above 300K			-0.051*** (0.006)	-0.051*** (0.006)	0.019*** (0.005)			-0.025*** (0.002)	-0.023*** (0.002)	0.019*** (0.002)
Observations	1,776,698	1,776,698	1,776,698	1,776,698	1,622,053	5,521,087	5,521,087	5,521,087	5,521,087	5,588,505
R2	0.46	0.47	0.47	0.47	0.46	0.00	0.01	0.01	0.01	0.01
Individual FE	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No
Bank FE				Yes	Yes				Yes	Yes
Bank controls		Yes	Yes				Yes	Yes		

Individual-bank level deposit reallocation - Individual FEs

- We keep all individuals with at least 2 banks in Dec-07, add individual FEs to analyze deposit changes *within* individual

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	Year: 2008					Year: 2008				
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Exposed	-0.005*** (0.001)	-0.018*** (0.002)	-0.015*** (0.002)			-0.006*** (0.001)	-0.009*** (0.001)	-0.007*** (0.001)		
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R2	0.46	0.47	0.47	0.47	0.46	0.00	0.01	0.01	0.01	0.01
Individual FE	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No
Bank FE				Yes	Yes				Yes	Yes
Bank controls		Yes	Yes				Yes	Yes		

Individual-bank level deposit reallocation - Bank's uninsured deposit share

Outcome: Δ (log) Deposits	Individuals with 2+ banks in 2007		All individuals	
	Year: 2008	Year: 2009	Year: 2008	Year: 2009
	(1)	(2)	(3)	(4)
Above 300K	-0.467*** (0.005)	-0.277*** (0.004)	-0.408*** (0.002)	-0.333*** (0.002)
Exposed X Above 300K	0.005 (0.008)	0.023*** (0.006)	0.017*** (0.003)	0.024*** (0.003)
Above 300K X Bank's uninsured share	-0.091*** (0.008)	-0.035*** (0.007)	-0.057*** (0.004)	-0.027*** (0.003)
Exposed X Bank's uninsured share X Above 300K	-0.076*** (0.010)	0.032*** (0.007)	-0.058*** (0.005)	0.015*** (0.004)
Observations	1,766,963	1,612,609	5,513,601	5,580,454
R2	0.47	0.46	0.01	0.01
Bank FE	Yes	Yes	Yes	Yes
Individual FE	Yes	Yes		

Notes: The bank's uninsured share is defined as the share of uninsured deposits in total retail deposits as of December 2007.

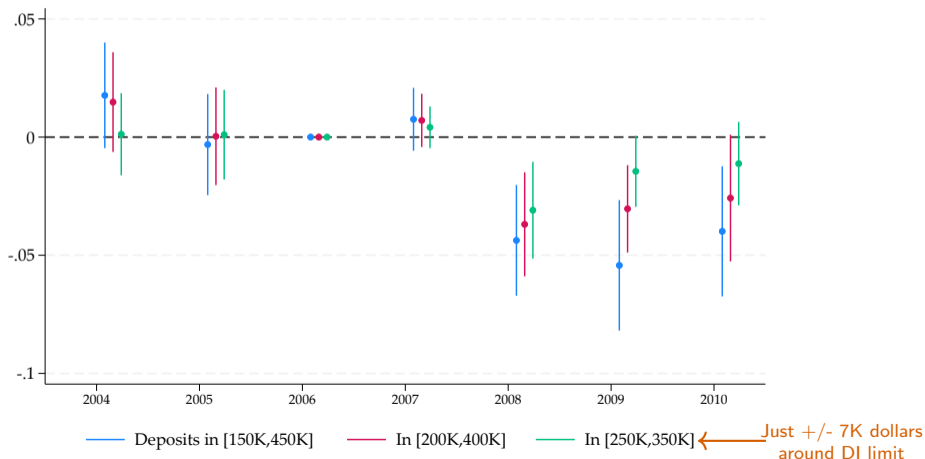
Individual-bank level deposit reallocation - Depositor's wealth

Outcome: Δ (log) Deposits	Individuals with 2+ banks in 2007		All individuals	
	Year: 2008	Year: 2009	Year: 2008	Year: 2009
	(1)	(2)	(3)	(4)
Above 300K	-0.498*** (0.005)	-0.271*** (0.004)	-0.408*** (0.002)	-0.332*** (0.002)
Exposed X Above 300K	-0.049*** (0.006)	0.020*** (0.005)	-0.023*** (0.002)	0.015*** (0.002)
Wealth			0.012*** (0.004)	0.008*** (0.002)
Exposed X Wealth	0.002** (0.001)	-0.003*** (0.001)	0.002 (0.001)	-0.003*** (0.001)
Above 300K X Wealth	-0.003* (0.002)	-0.010*** (0.003)	-0.014*** (0.005)	-0.011*** (0.002)
Exposed X Wealth X Above 300K	-0.002*** (0.001)	0.004** (0.001)	-0.002 (0.002)	0.004*** (0.001)
Observations	1,404,822	1,271,805	4,281,056	4,254,076
R2	0.47	0.46	0.01	0.01
Bank FE	Yes	Yes	Yes	Yes
Individual FE	Yes	Yes		

Note: Wealth refers to individual-level total wealth as of December 2007.

Oct 2008 reform – Lift 300K insurance limit – Bank-account level analysis

$$\text{Log}(\text{deposits})_{btk} = \alpha_{k,t} + \alpha_{b,t} + \beta_t \alpha_t \times \text{Exposed}_b \times \text{Above } 300\text{K}_{bk} + \dots + \epsilon_{btk}$$



2010 reform – Zoom in on 750K threshold – Bank-account level analysis

$$\text{Log}(\text{deposits})_{btk} = \alpha_{k,t} + \alpha_{b,t} + \beta_t \alpha_t \times \text{Exposed}_b \times \text{Above } 750\text{K}_{bk} + \dots + \epsilon_{btk}$$

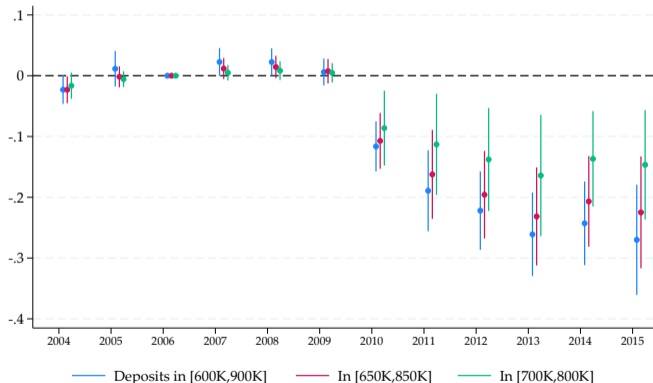


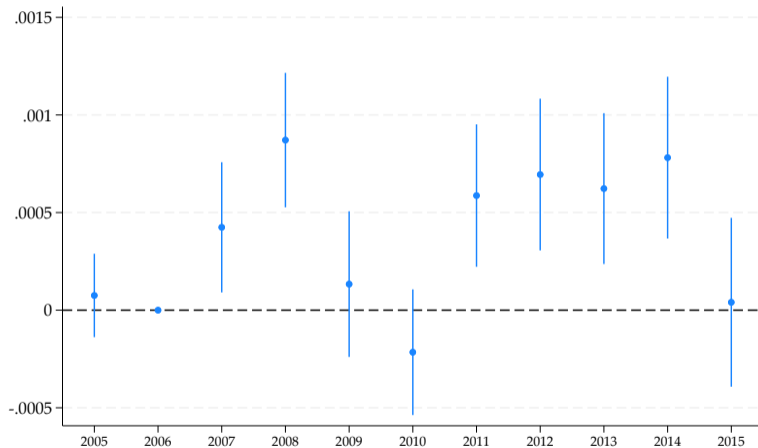
Table: Before vs after

Table: New depositors only

Table: Existing depositors only

Evidence on deposit rates

$$\text{Rate}_{btk} = \alpha_t + \alpha_{b,k} + \beta_1 \alpha_t \times \text{Exposed}_b + \beta_2 \text{Exposed}_b + \gamma_1 X_{b,t} + \gamma_2 \alpha_t \times X_{b,t} + \epsilon_{btk}$$



Alternative tests:

Table: Before vs after

Balanced sample of banks

Drop smallest and largest 10% of banks

Drop top6 banks

Exposed banks benefited more by deposit insurance & had worse loans pre-GFC

What happens to their lending after DI reforms?

Loan-level evidence

Dependent Variable: $\Delta \log \text{ credit}$	(1) 2008	(2) 2009	(3) 2008	(4) 2009	(5) 2008	(6) 2009
Exposed	-0.07*** (0.01)	-0.05*** (0.01)				
Exposed X Defaulting firm			-0.03 (0.02)	0.05* (0.03)	-0.00 (0.01)	0.04*** (0.01)
Observations	4,633	4,214	4,626	4,198	21,698	21,663
R2	0.52	0.48	0.54	0.49	0.04	0.04
Bank controls	Y	Y	Y	Y	Y	Y
Bank FE			Y	Y	Y	Y
Firm FE	Y	Y	Y	Y		
Industry-location-size FE					Y	Y

Note: "Defaulting firm" is an indicator variable equal to one if the firm defaults between 2009 and 2013.

Firm-level evidence

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable: $\Delta \log \text{ credit}$	2008	2009	2008	2009	2008	2009
Firm exposure	-0.06*** (0.01)	0.00 (0.01)	-0.05*** (0.01)	0.00 (0.01)	-0.05*** (0.01)	0.00 (0.01)
Defaulting firm			0.07*** (0.01)	0.07*** (0.02)	0.08*** (0.02)	0.07*** (0.02)
Firm exposure X Defaulting firm			-0.04 (0.03)	0.04** (0.02)	-0.04 (0.03)	0.05* (0.02)
Observations	22,140	22,066	22,140	22,066	21,982	21,950
Control: Firm size	Yes	Yes	Yes	Yes		
Municipality FE	Yes	Yes	Yes	Yes		
Industry FE	Yes	Yes	Yes	Yes		
Industry-Location-Size FE					Yes	Yes

Note: "Defaulting firm" is an indicator variable equal to one if the firm defaults between 2009 and 2013.

- *Firm exposure* denotes firms (lagged) loan-weighted exposure to banks with varying 2007 loan-to-deposit ratios:

$$\text{Firm exposure}_{f,t-1} = \sum_{b=1}^B \frac{\text{credit}_{b,f,t-1}}{\text{credit}_{f,t-1}} \times (\text{Loan/Deposit})_{b,2007}$$

Summary

- We contribute to the literature by exploiting 2 deposit insurance (DI) reforms, the GFC shock, and matched admin deposit & credit registers, and individual-, firm- and bank- balance sheet data:
- DI reforms trigger deposit reallocation from stronger to weaker banks
 - ▶ Onset of GFC: Funding liquidity squeeze at exposed banks (limited insurance); reversal with unlimited insurance coverage
 - Individual-bank level data: She withdraws more deposits from exposed banks, notably above the insurance limit (HH FEs)
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 - ▶ Exposed banks raise deposit rates to attract deposits, both in 2008 (limited DI) and post-2010 reform (limited DI)
- Firms ex-ante more reliant on exposed banks experience better credit availability in 2009 (unlimited DI) as compared to 08 (limited DI) – stronger results for weaker firms
 - ▶ Loan level data with firm-time FE: exposed banks' credit supply to weak firms remain elevated after 2008 DI reform

Appendix

Descriptive statistics

	Mean	SD	Min	p10	p50	p90	Max
Panel A. Banks							
Total assets (1bn kr)	56.72	338.37	0.19	0.62	4.48	33.83	3169.77
Loan-to-deposit ratio	1.20	0.43	0.41	0.65	1.17	1.78	2.19
T1 capital ratio	13.46	8.87	3.60	7.60	11.60	19.10	72.80
Loan losses 2008-2010/TA	0.05	0.04	0.01	0.01	0.04	0.11	0.20
Panel B. Firms							
Total assets (1M kr)	54.19	1121.82	0.75	1.27	5.07	46.47	1.7e+05
TFP	8.71	11.76	-0.09	0.76	3.79	25.60	45.00
Leverage ratio	0.67	0.19	0.12	0.41	0.69	0.90	0.98
Return on assets	0.08	0.16	-0.66	-0.07	0.08	0.27	0.34

Note: All statistics are measured in December-2007. Panel A and Panel B report the characteristics of banks and firms, respectively. TA refers to "Total Assets" and VA refers to "Value Added".

Resulting in elevated loan losses – Table

Outcome: Loan losses/TA	Period: 2004-2015			Period: 2008-2015		
	(1)	(2)	(3)	(4)	(5)	(6)
Exposed	0.003*** (0.0004)	0.004*** (0.0004)	0.003*** (0.0004)	0.004*** (0.0006)	0.006*** (0.0006)	0.005*** (0.0006)
Observations	888	888	888	544	544	544
R2	0.42	0.45	0.46	0.23	0.30	0.33
Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Bank controls		Yes	Yes		Yes	Yes
Control: Top-6 bank			Yes			Yes

Return to slide

Liquidity stress during 2008 crisis – 2008-q3

- Quarterly bank-level data from the Danish supervisor to document the impact of the onset of the GFC on exposed banks
- Regress changes in bank (log) outcomes between 2008-q2 and q3 on bank exposure measure
- Deposit insurance was still capped at 300K DKK
- Mounting liquidity pressure at exposed banks

Change in bank-level (log) outcomes

	(1)	(2)	(3)	(4)
Panel A. Total deposits				
Exposed	-0.012*** (0.0029)	-0.012*** (0.0037)	-0.011*** (0.0036)	-0.011*** (0.0042)
Observations	77	77	77	77
R2	0.06	0.06	0.07	0.09
Panel B. Deposit rate				
Exposed	0.003** (0.0015)	0.004** (0.0015)	0.004** (0.0016)	0.004** (0.0014)
Observations	69	69	69	69
R2	0.45	0.47	0.48	0.51
Panel C. Total liquidity				
Exposed	-0.031*** (0.0092)	-0.025** (0.0104)	-0.027*** (0.0094)	-0.027*** (0.0099)
Observations	89	89	89	89
R2	0.04	0.05	0.05	0.06
Control: Log(size)		Yes	Yes	Yes
Control: Capital ratio			Yes	Yes
Control: Top-6 bank				Yes

Liquidity stress during 2008 crisis – 2008-q4 – Unlimited DI coverage

- Liquidity pressure from the GFC at exposed banks significantly eased as deposit insurance limit was lifted in October 2008

Change in bank-level (log) outcomes

	(1)	(2)	(3)	(4)
Panel A. Total deposits				
Exposed	0.023*** (0.0070)	0.024*** (0.0073)	0.022*** (0.0069)	0.022*** (0.0071)
Observations	85	85	85	85
R2	0.12	0.13	0.15	0.15
Panel B. Deposit rate				
Exposed	-0.008** (0.0035)	-0.009** (0.0034)	-0.009** (0.0036)	-0.009** (0.0035)
Observations	72	72	72	72
R2	0.33	0.36	0.37	0.37
Panel C. Total liquidity				
Exposed	0.041** (0.0203)	0.044** (0.0219)	0.037* (0.0195)	0.037** (0.0187)
Observations	87	87	87	87
R2	0.05	0.05	0.11	0.12
Control: Log(size)		Yes	Yes	Yes
Control: Capital ratio			Yes	Yes
Control: Top-6 bank				Yes

2010 reform – Reduction of insurance limit to 750K – Bank-account level

$$\text{Log}(\text{deposits})_{btk} = \alpha_{b,k} + \alpha_{b,t} + \beta_1 \text{After}_t \times \text{Exposed}_b \times \text{Below 750K}_{bk} + \dots + \epsilon_{btk}$$

	(1)	(2)	(3)	(4)	(5)
After reform	0.25*** (0.04)	0.11** (0.04)	0.16*** (0.04)		
Exposed bank	-0.07 (0.11)				
After reform x Exposed bank	0.10 (0.07)	-0.02 (0.08)	0.03 (0.08)		
Below 750K	0.91*** (0.07)	0.91*** (0.06)			
After reform x Below 750K	0.54*** (0.05)	0.54*** (0.05)	0.48*** (0.05)	0.49*** (0.02)	
Below 750K x Exposed bank	-0.15 (0.12)	-0.15* (0.09)			
After x Below x Exposed bank	0.32*** (0.08)	0.32*** (0.09)	0.25*** (0.09)	0.26*** (0.03)	0.26*** (0.03)
Observations	17,485	17,485	17,485	17,485	17,485
R2	0.50	0.65	0.90	0.99	0.99
Bank FEs		Yes	Yes		
Bank-range FEs			Yes	Yes	Yes
Bank-time FE				Yes	Yes
Range-time FE					Yes

2010 reform – Zooming in on 750K threshold – New depositors only

$$\text{Log}(\text{deposits})_{btk} = \alpha_{b,k} + \alpha_{b,t} + \beta_1 \text{Below 750K}_{bk} \times \text{After}_t \times \text{Exposed}_b + \dots + \epsilon_{btk}$$

	(1)	(2)	(3)	(4)	(5)
After reform	-0.17*** (0.05)	-0.25*** (0.04)	-0.20*** (0.04)	(dropped)	(dropped)
Below 750K	0.69*** (0.07)	0.72*** (0.06)	(dropped)	(dropped)	(dropped)
After reform x Below 750K	0.86*** (0.05)	0.86*** (0.05)	0.81*** (0.05)	0.83*** (0.03)	(dropped)
Exposed bank	0.17** (0.08)	(dropped)	(dropped)	(dropped)	(dropped)
After reform x Exposed bank	0.00 (0.07)	-0.08 (0.07)	-0.05 (0.06)	(dropped)	(dropped)
Below 750K x Exposed bank	-0.20** (0.09)	-0.20** (0.08)	(dropped)	(dropped)	(dropped)
After x Below x Exposed bank	0.41*** (0.08)	0.40*** (0.08)	0.36*** (0.08)	0.31*** (0.04)	0.31*** (0.04)
Observations	17,262	17,262	17,262	17,260	17,260
R2	0.50	0.59	0.82	0.97	0.98
Bank FEs		Yes	Yes	Yes	Yes
Bank-range FEs			Yes	Yes	Yes
Bank-time FE				Yes	Yes
Range-time FE					Yes

2010 reform – Zooming in on 750K threshold – Existing depositors only

$$\text{Log}(\text{deposits})_{btk} = \alpha_{b,k} + \alpha_{b,t} + \beta_1 \text{Below 750K}_{bk} \times \text{After}_t \times \text{Exposed}_b + \dots + \epsilon_{btk}$$

	(1)	(2)	(3)	(4)	(5)
After reform	0.28*** (0.04)	0.16*** (0.04)	0.20*** (0.04)	(dropped)	(dropped)
Below 750K	0.93*** (0.08)	0.93*** (0.06)	(dropped)	(dropped)	(dropped)
After reform x Below 750K	0.49*** (0.05)	0.49*** (0.05)	0.42*** (0.05)	0.45*** (0.02)	(dropped)
Exposed bank	-0.13 (0.11)	(dropped)	(dropped)	(dropped)	(dropped)
After reform x Exposed bank	0.14** (0.07)	-0.00 (0.07)	0.05 (0.07)	(dropped)	(dropped)
Below 750K x Exposed bank	-0.14 (0.12)	-0.13 (0.09)	(dropped)	(dropped)	(dropped)
After x Below x Exposed bank	0.26*** (0.08)	0.27*** (0.09)	0.20** (0.08)	0.24*** (0.03)	0.25*** (0.02)
Observations	17,257	17,257	17,257	17,256	17,256
R2	0.49	0.65	0.90	0.99	0.99
Bank FEs		Yes	Yes	Yes	Yes
Bank-range FEs			Yes	Yes	Yes
Bank-time FE				Yes	Yes
Range-time FE					Yes

Return to slide

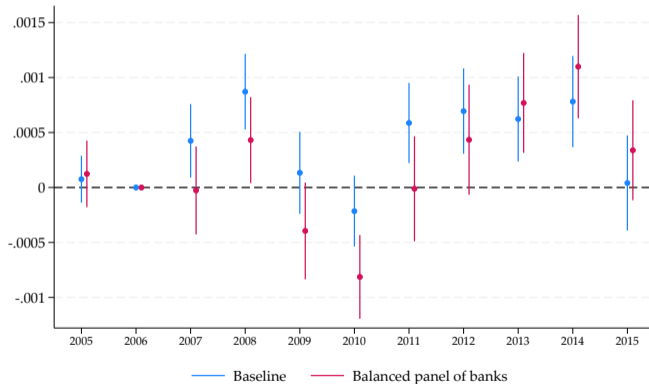
Deposit rates – After vs before 2010 reform

$$\text{Rate}_{btk} = \alpha_b + \alpha_{bk} + \beta_1 \text{After reform}_t \times \text{Exposed}_b + \beta_2 \text{Exposed}_b + \gamma_1 X_{b,t} + \gamma_2 \text{After ref.}_t \times X_{b,t} + \epsilon_{btk}$$

	(1)	(2)	(3)
After reform	0.65*** (0.02)	0.52*** (0.02)	0.52*** (0.02)
Exposed bank	-0.19*** (0.05)		
After reform × Exposed bank	0.34*** (0.04)	0.22*** (0.04)	0.21*** (0.04)
Observations	17,485	17,485	17,485
R2	0.44	0.58	0.90
Bank controls interacted	Yes	Yes	Yes
Bank FEs		Yes	Yes
Bank-range FEs			Yes

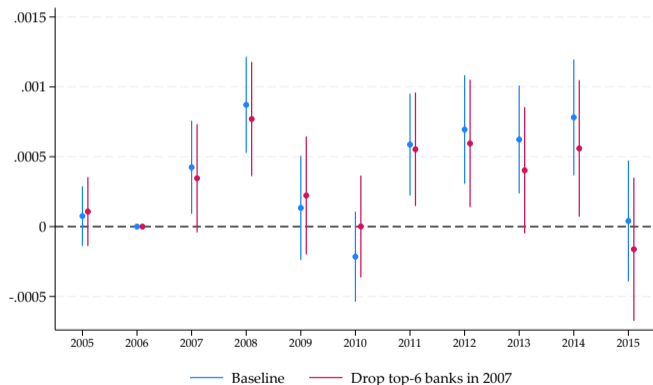
Double – Rates – Balanced sample

$$\text{Rate}_{btk} = \alpha_t + \alpha_b + \alpha_{bk} + \beta_1 \alpha_t \times \text{Exposed}_b + \beta_2 \text{Exposed}_b + \gamma_1 X_{b,t} + \gamma_2 \alpha_t \times X_{b,t} + \epsilon_{btk}$$



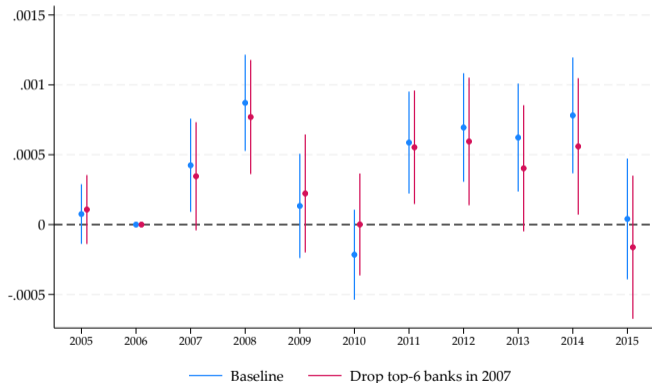
Double – Rates – Drop the smallest and largest 10% of banks

$$\text{Rate}_{btk} = \alpha_t + \alpha_b + \alpha_{bk} + \beta_1 \alpha_t \times \text{Exposed}_b + \beta_2 \text{Exposed}_b + \gamma_1 X_{b,t} + \gamma_2 \alpha_t \times X_{b,t} + \epsilon_{btk}$$



Double – Rates – Drop top6 banks

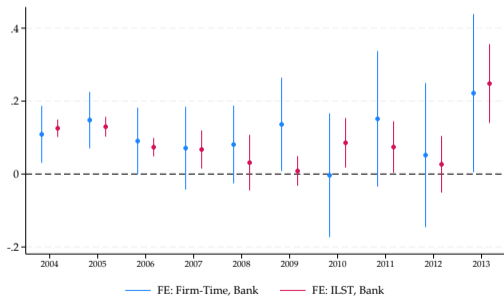
$$\text{Rate}_{btk} = \alpha_t + \alpha_b + \alpha_{bk} + \beta_1 \alpha_t \times \text{Exposed}_b + \beta_2 \text{Exposed}_b + \gamma_1 X_{b,t} + \gamma_2 \alpha_t \times X_{b,t} + \epsilon_{btk}$$



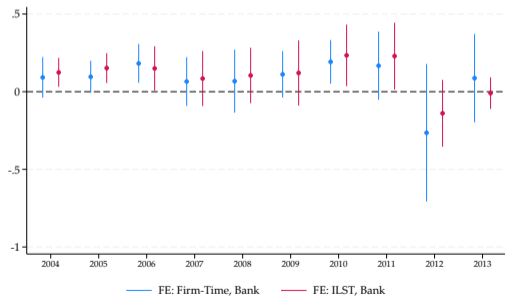
Exposed banks' credit supply to weaker/riskier firms does not improve in GFC & after DI reforms

$$\text{Log(credit)}_{bft} = \alpha_{ft} + \alpha_b + \beta_t \alpha_t \times \text{Exposed}_b \times X_{ft-1} + \dots + \epsilon_{bft}$$

Low TFP firm



Construction & real estate firm



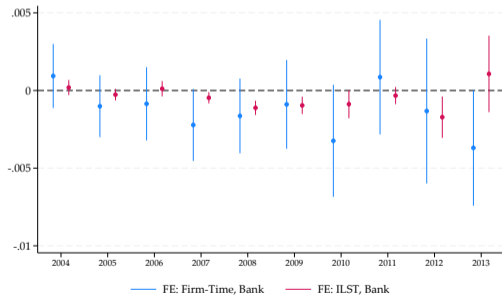
No higher risk-taking by exposed banks during unlimited (vs limited) DI in the GFC

[Back](#)

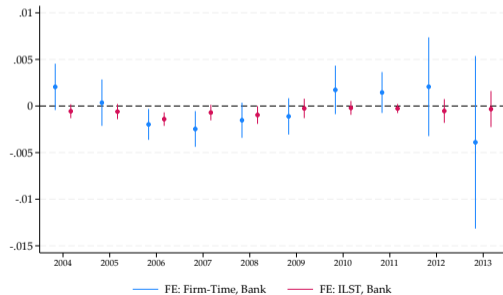
Exposed banks don't raise loan rates to low TFP or real estate firms (If anything, they somewhat decrease loan rates)

$$\text{Loan rate}_{bft} = \alpha_{ft} + \alpha_b + \beta_t \alpha_t \times \text{Exposed}_b \times X_{ft-1} + \dots + \epsilon_{bft}$$

Low TFP firm



Construction & real estate firm



Back to loan-level evidence