

# The Secular Decline in Interest Rates and the Rise of Shadow Banks

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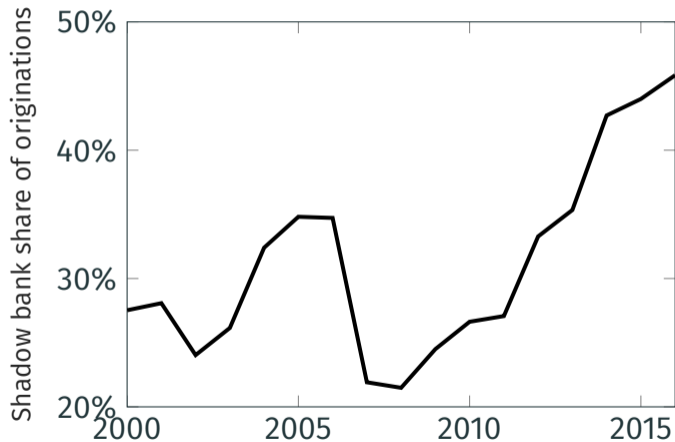
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NYU Stern

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# The rise of shadow banks



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Nonbank lenders are a major concern for policymakers

- lightly regulated → riskier lending
- funding less stable than (insured!) deposits → subject to runs

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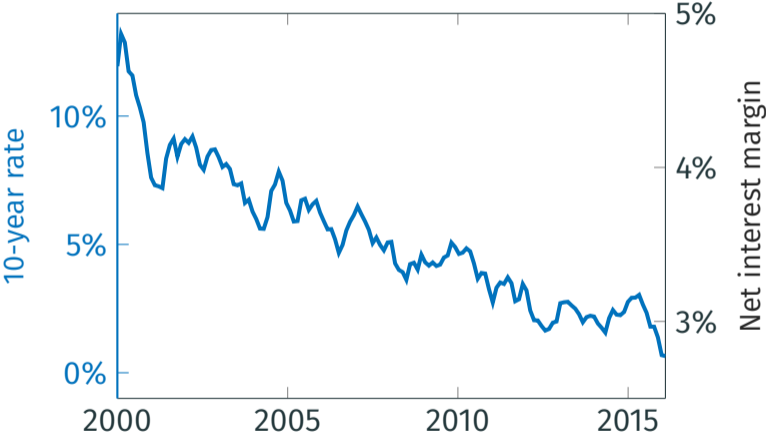
Two known drivers (Buchak et al. 2018):

**Technology:** shadow banks have a technological edge

e.g., faster screening process, better monitoring, “big data”

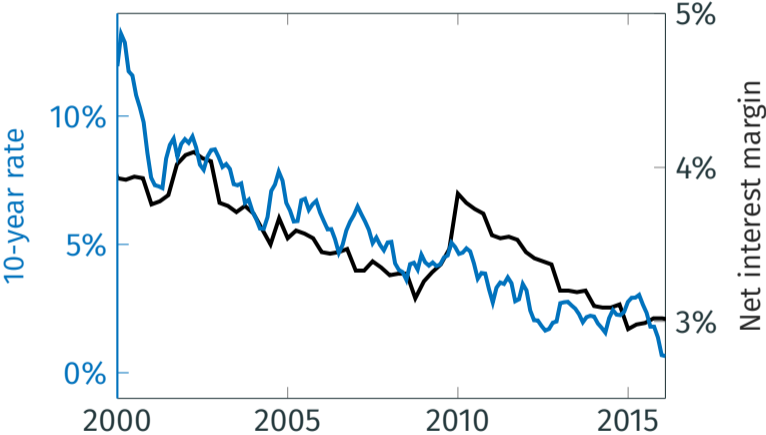
**Regulation:** traditional banks faced increased regulatory burden after the GFC

# Meanwhile...



longer time series

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longer time series

# Connecting the two trends

Causal link between the **decline in rates** and the **rise in non-bank lending**?

1. Decline in  $i$  compresses banks' NIM  
difficult to hedge in the long run
- 2a. **Net worth channel:** persistent NIM compression hurts banks' capital and lending capacity
- 2b. **Cost-cutting channel:** banks adapt to past and anticipated NIM compression by reducing costs
3. Shadow banks: not affected by low  $i$ , increase market share

# Main Results

Construct measure of “exposure to declining interest rates”

1. **Bank-level:** more exposed banks → lower equity and loan growth



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2. **County-level:** more exposed banks → larger increases in SB share
  - robust to regulation and technology

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Construct measure of “exposure to declining interest rates”

1. **Bank-level:** more exposed banks → lower equity and loan growth
2. **County-level:** more exposed banks → larger increases in SB share
  - robust to regulation and technology
3. **Mechanisms:**
  - lower equity
  - reduction in non-interest expenses (branches)→ explains why results hold for both GSE and non-GSE loans

# Related Literature

## 1. Non-bank lending:

- **Mortgages:** Buchak et al. (2018), Demyanyk and Loutskina (2016), Fuster et al. (2019), Drechsler et al. (2022), Jiang et al. (2020), Jiang (2022), Gete and Reher (2020), Mian and Sufi (2021), Lewellen and Williams (2021), Buchak et al. (2022)
- **C&I:** Chernenko et al. (2022), Gopal and Schnabl (2022), Irani et al. (2020)

## 2. Low interest rates : Abadi et al. (2022), Eggertsson et al. (2020), Heider et al. (2019), Ulate (2021), Wang et al. (2020), Wang (2022), Balloch and Koby (2022), Supera (2022)

# Conceptual framework

**Banks** have two-sided business:

must generate ROE from loan spread  $\tau^l$  + deposit spread  $\tau^d$

but are subject to regulation: maximal leverage  $\phi$

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must generate ROE from loan spread  $\tau^l$  + deposit spread  $\tau^d$

but are subject to regulation: maximal leverage  $\phi$

**Shadow banks** focus on lending:

relative technological cost of lending  $\gamma$

unregulated, but costly wholesale funding instead of cheap deposits

# Conceptual framework

## Proposition

For  $i$  below a threshold  $\bar{i}$ ,  $L^{SB}$  and  $L^{SB}/(L^{SB} + L^B)$  increase in response to

- tighter regulation on traditional banks:  $\Delta\phi < 0$
- better shadow bank technology (e.g., fintech):  $\Delta\gamma < 0$
- **lower interest rate:**  $\Delta i < 0$

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- better shadow bank technology (e.g., fintech):  $\Delta\gamma < 0$
- **lower interest rate:**  $\Delta i < 0$

Intuition: lower  $i \rightarrow$  low  $\tau^d \rightarrow$  lower profits  $\rightarrow L^B$  falls  $\rightarrow$  higher  $\tau^l$

[Extension: low future  $\tau^d \rightarrow$  banks disinvest in branches  $\rightarrow L^B$  falls]

# Data

- Mortgage loans: HMDA (1990-2016)
- Bank balance sheets: U.S. Call Reports (1984-2016)
- Branch-level deposits: FDIC (1994-2016)
- Employment, income, and population: BEA (1969-2019)
- Educational attainment: Census (1990, 2000, 2010, 2015-2019)
- Demographics: NBER (1990-2015)
- Population density: Census (2010)
- Broadband Access: ASU estimates based on ACS (2000-2018)
- Fedfunds and Treasury interest rates: FRED (1962-2017)



# Empirical strategy: Heterogeneous bank exposures

Exposure  $e_b$  is a **Bartik/shift-share instrument**:

$$e_{bt} = \int_{t_0}^t \left\{ \sum_{i \in I_A} \omega_{b,t_0-T}^i (r_s^i - r_{t_0}^i) - \sum_{i \in I_L} \omega_{b,t_0-T}^i (r_s^i - r_{t_0}^i) \right\} ds$$

- $\omega_{b,t_0-T}^i$ : lagged balance sheet weight of category  $i$
- $r_t^i$ : national average of category's  $i$  rate at time  $t$
- $I_A$ : loans, securities, other assets
- $I_L$ : transaction deposits, savings deposits, time deposits, other liabilities

# Empirical strategy: Heterogeneous bank exposures

- In the cross-section we use a nested-Bartik:

$$e_{ct} = \sum_{b \in B_{ct_0}} l_{cbt_0} e_{bt}$$

where  $l_{cbt_0}$ : share of total mortgage lending in  $c$  of bank  $b$  as of  $t_0$

# Empirical strategy: Heterogeneous bank exposures

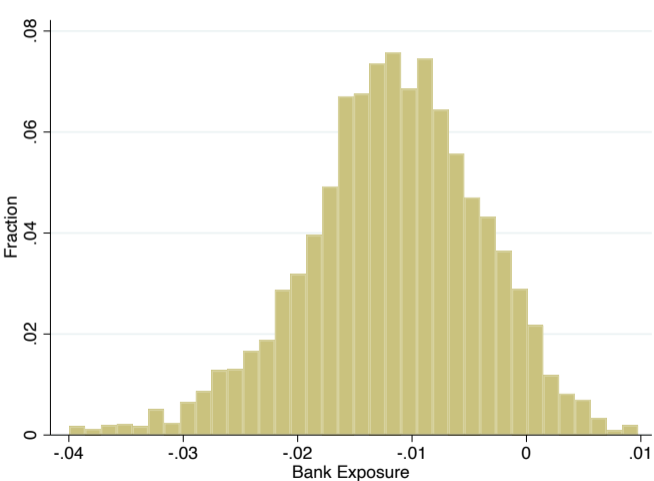
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- **Controls**: balance sheet controls, liability beta, initial shadow bank share, demographics, economic indicators (income, employment, etc). [List of controls](#)

# Distribution of $e_{bt}$ (2003-2016)



# Step 1: Exposure and bank profitability

We estimate:

$$\Delta y_{b,2016} = \alpha + \beta e_{b,2016} + \text{controls}_{b,2003} + u_{b,2016}$$

using Equity Growth and Cumulated Net Income:

$$\text{Cumulated Net Income} = \int_{t_0}^t \left( \frac{\text{Net Income}_{bs}}{\text{Assets}_{bs}} - \frac{\text{Net Income}_{bt_0}}{\text{Assets}_{bt_0}} \right) ds,$$

where  $\text{controls}_{b,2003}$ : log assets, equity to assets ratio, loans to assets ratio, liability beta (DSS).

## Step 1: Exposure and bank profitability

$$\Delta y_{b,2016} = \alpha + \beta e_{b,2016} + \text{controls}_{b,2003} + u_{b,2016}$$

	Cumulated Net Income (1)	Equity Growth (2)
Exposure ( $e_{bt}$ )	0.801*** (0.183)	21.789*** (8.368)
Balance sheet controls	Yes	Yes
Liability beta (DSS)	Yes	Yes
N	3,399	3,404
R-sq	0.193	0.399

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

## Step 2: Exposure and bank lending

$$\Delta y_{b,2016} = \alpha + \beta e_{b,2016} + \text{controls}_{b,2003} + u_{b,2016}$$

	Equity Growth (1)	Asset Growth (2)	Loans Growth (3)
Exposure ( $e_{bt}$ )	21.789*** (8.368)	20.772*** (3.719)	56.321*** (6.363)
Balance sheet controls	Yes	Yes	Yes
Liability beta (DSS)	Yes	Yes	Yes
N	3,404	3,407	3,414
R-sq	0.399	0.129	0.188

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

## Step 2: Exposure and bank lending

$$\Delta y_{b,2016} = \alpha + \beta e_{b,2016} + \text{controls}_{b,2003} + u_{b,2016}$$

	Real Estate Loans Growth (1)	Mortgage Backed Securities Growth (2)	Equity-Asset Ratio Growth (3)
Exposure ( $e_{bt}$ )	60.846*** (7.448)	247.788*** (45.602)	0.002 (0.183)
Balance sheet controls	Yes	Yes	Yes
Liability beta (DSS)	Yes	Yes	Yes
N	3,404	2,924	3,279
R-sq	0.078	0.098	0.569

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$



# Incorporating county-level mortgage data

before:  $\Delta y_{b,2016} = \alpha + \beta e_{b,2016} + \text{controls}_{b,2003} + u_{b,2016}$

now:  $\Delta y_{cb,2016} = \alpha_c + \beta e_{b,2016} + \text{controls}_{b,2003} + u_{cb,2016}$

- County FE  $\alpha_c$  controls for local shocks (e.g., credit demand)
- $\beta$  identified from differentially exposed banks serving the same county

## Step 2': Bank-county level results

$$\Delta y_{cb,2016} = \alpha_c + \beta e_{b,2016} + \text{controls}_{b,2003} + u_{cb,2016}$$

	All Loans Growth (1)	Portfolio Loans Growth (2)
Exposure ( $e_{bt}$ )	3.257*** (0.595)	8.034*** (2.321)
County FE	Yes	Yes
Balance Sheet Controls	Yes	Yes
Liability Beta	Yes	Yes
N	45,017	36,902
R-sq	0.191	0.063

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

## Step 3: County-level results

What happened to shadow bank lending in exposed regions?

$$\Delta y_{ct} = \alpha + \beta e_{ct} + \text{controls}_{ct_0} + u_{ct}$$

where:

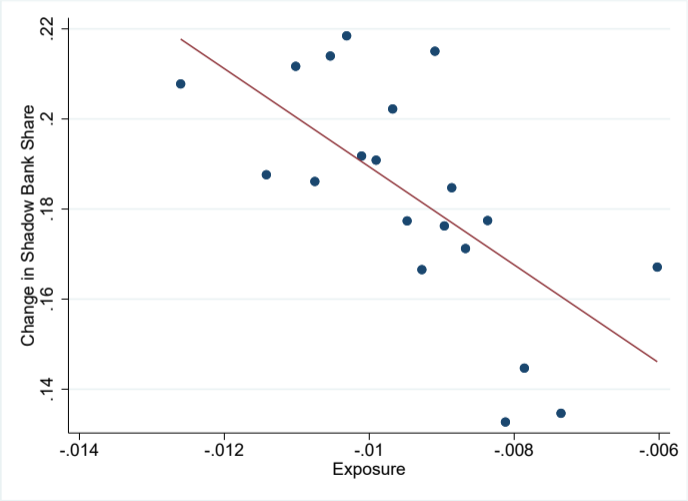
- $\Delta y_{ct}$  = change in shadow bank share:

$$y_{ct} = \frac{\text{SB Originations}_{ct}}{\text{All Originations}_{ct}}$$

- County-level exposure  $e_{ct}$ :

$$e_{ct} = \sum_{b \in B_{ct_0}} l_{c b t_0} e_{bt}$$

# Exposure and shadow bank share, 2003-2016



# Exposure and shadow bank share, 2003-2016

$$\Delta y_{c,2016} = \alpha + \beta e_{c,2016} + \text{controls}_{c,2003} + u_{c,2016}$$

	Shadow Bank Share 2003 to 2016		
	(1)	(2)	(3)
Exposure ( $e_{ct}$ )	-10.890*** (2.553)	-9.557*** (2.192)	-11.846*** (1.653)
Initial SB share	Yes	Yes	Yes
Demographics		Yes	Yes
Economic indicators			Yes
N	3,099	3,098	3,098
R-sq	0.034	0.151	0.235

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

List of controls

# Alternative forces I: Regulation

Following Buchak et al. (2018), control for:

1. Share of originations regulated by the OTS in the county:

$$OTS_{ct_0} = \frac{OTS\ loans_{ct_0}}{Total\ Loans_{ct_0}}$$

2. Change in county's banks tier 1 risk-based capital ratio (T1RBC%):

$$T1RBC_{ct} = \sum_{b \in B_{ct_0}} l_{cbt_0} \Delta CR_{bt}, \Delta CR_{bt} = T1RBC\%_{bt} - T1RBC\%_{bt_0}$$

3. MSR as a percent of tier 1 capital:

$$MSR_{ct_0} = \sum_{b \in B_{ct_0}} l_{cbt_0} MSR\%_{bt_0}$$

## Alternative forces I: Regulation

	Shadow Bank Share 2003 to 2016				
	(1)	(2)	(3)	(4)	(5)
Exposure ( $e_{ct}$ )	-11.846*** (1.653)	-13.022*** (1.781)	-12.996*** (1.759)	-10.854*** (1.719)	-12.936*** (1.891)
OTS		Yes			Yes
T1RBC			Yes		Yes
MSR				Yes	Yes
Demo, Ec Ind, ISBS	Yes	Yes	Yes	Yes	Yes
N	3,098	3,098	3,098	3,098	3,098
R-sq	0.235	0.236	0.242	0.240	0.249

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

# Alternative forces II: Technology

Following Fuster et al. (2019) , control for two proxies:

- Population density
- Broadband access

Results also hold when **excluding “fintech” lenders.**



## Alternative forces II: Technology

	Shadow Bank Share 2003 to 2016			
	(1)	(2)	(3)	(4)
Exposure ( $e_{ct}$ )	-11.846*** (1.653)	-11.425*** (1.607)	-24.578*** (5.515)	-24.910*** (5.189)
Pop. Density		Yes		Yes
Broadband Access			Yes	Yes
Demo, Ec Ind, ISBS	Yes	Yes	Yes	Yes
N	3,098	3,076	216	215
R-sq	0.235	0.284	0.549	0.599

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

## Alternative forces II: Technology

	Non-Fintech SB Share 2003 to 2016		
	(1)	(2)	(3)
Exposure ( $e_{ct}$ )	-9.079*** (2.154)	-8.597*** (1.796)	-10.838*** (1.429)
Initial SB share	Yes	Yes	Yes
Demographics		Yes	Yes
Economic indicators			Yes
N	3,099	3,098	3,098
R-sq	0.024	0.143	0.259

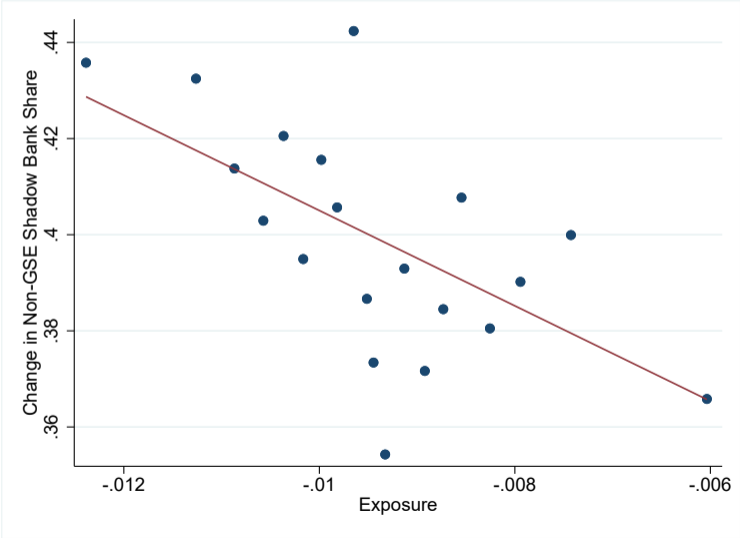
\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

# Loan types: GSE and Non-GSE

Bank profitability and equity should be more relevant for non-GSE lending but...

- Banks still need some balance sheet space for GSE lending
- Non-banks enter more easily in GSE lending
- **Both types rely on employees and branches**

# GSE lending



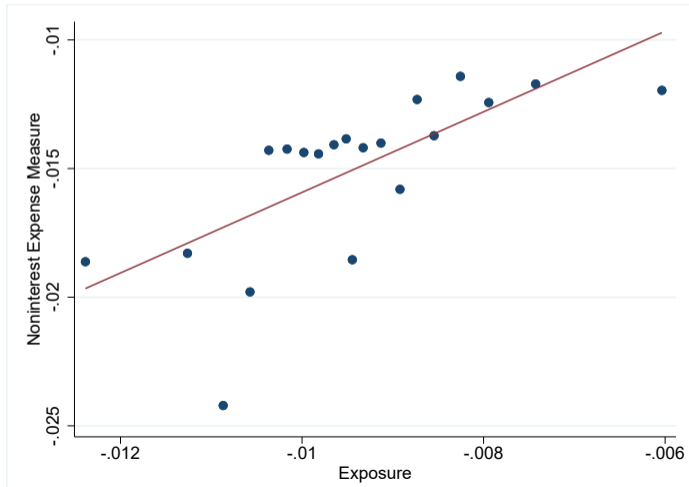
## GSE and Non-GSE lending

	Overall	Non-GSE	GSE
	(1)	(2)	(3)
Exposure ( $e_{ct}$ )	-11.846***	-5.818***	-9.915***
	(1.653)	(1.841)	(1.911)
Initial SB share	Yes	Yes	Yes
Demographics	Yes	Yes	Yes
Economic Indicators	Yes	Yes	Yes
N	3,099	3,098	3,098
R-sq	0.235	0.179	0.284

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

# Mechanism I: Cost-cutting channel

Expenses on branches react to past (and future) profitability and affect all loans



# Mechanism I: Cost-cutting channel

	Non-Interest Expense Measure		Change in GSE Shadow Bank Share
	(1)	(2)	(3)
Exposure ( $e_{ct}$ )	0.867*** (0.157)	1.566*** (0.365)	
Non-Interest Expense Measure			-6.332*** (1.758)
Bank Controls	Yes		
Demo, Ec Ind, ISBS		Yes	Yes
Level	Bank	County	County
Kleiberger-Paap F	-	-	18.4
N	3,419	3,098	3,098
R-sq	0.181	0.114	-

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

## Mechanism II: Net worth channel

	Loans Growth (1)	Real Estate Loans Growth (2)	Commercial/Industrial Loans Growth (3)
Exposure ( $e_{bt}$ )	31.682*** (4.693)	18.464*** (6.829)	52.961*** (15.539)
Low Equity $\times$ Exposure	32.873*** (8.003)	53.418*** (9.555)	34.738*** (17.711)
Balance Sheet Controls	Yes	Yes	Yes
Expense Beta	Yes	Yes	Yes
N	3,414	3,404	3,408
R-sq	0.203	0.087	0.265

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$



# Incumbents and entrants

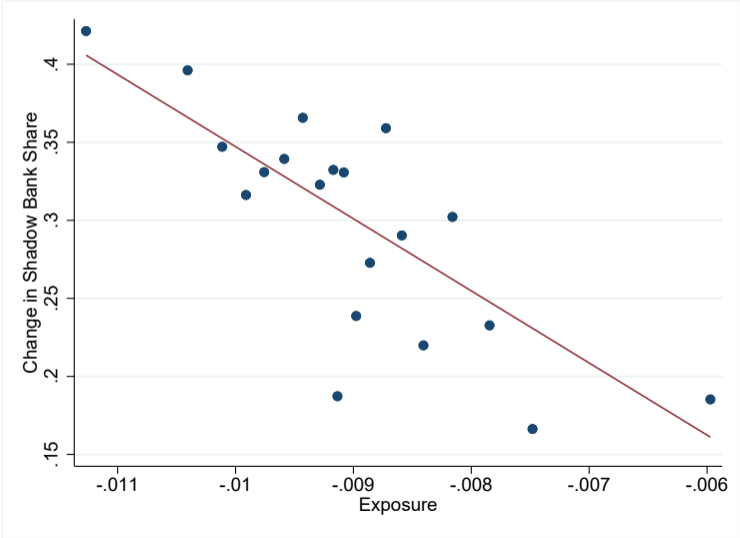
## **Incumbents** (already present in the county in 2003)

- Banks' volume falls
- Shadow banks' volume increases

## **Entrants**

- Strong entry of new shadow banks

# Change in shadow bank share, incumbents



# Incumbents

	Bank Loan Growth (1)	Shadow Bank Loan Growth (2)	Bank + SB Loan Growth (3)	Change in SB Share (4)
Exposure ( $e_{ct}$ )	10.494*** (0.976)	-8.154*** (2.749)	6.098*** (0.923)	-46.202*** (4.857)
Initial SB share	Yes	Yes	Yes	Yes
Demographics	Yes	Yes	Yes	Yes
Economic indicators	Yes	Yes	Yes	Yes
N	2,849	2,172	2,854	2,227
R-sq	0.186	0.083	0.081	0.297

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

# Entrants

	Entrant Share 2003-2016			Shadow Bank Share of Entrants 2003-2016		
	(1)	(2)	(3)	(4)	(5)	(6)
Exposure ( $e_{ct}$ )	-12.847*** (2.195)	-15.875*** (2.224)	-23.435*** (2.130)	-19.189*** (5.059)	-7.002* (4.064)	-6.977*** (2.236)
Initial B Share	Yes	Yes	Yes	Yes	Yes	Yes
Demographics		Yes	Yes		Yes	Yes
Economic Indicators			Yes			Yes
N	2,870	2,870	2,870	2,870	2,870	2,870
R-sq	0.068	0.150	0.310	0.128	0.337	0.445

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

# Robustness and additional material

- Weights [View](#)
- Pre-trends [View](#)
- Bank Market Power [View](#)
- Small and large banks [View](#)
- Excluding the housing boom and financial crisis
  - Bank and county level main specs [View](#)
  - Controlling for regulation [View](#)
  - Controlling for technology [View](#)
- Counts vs dollar amounts
  - Baseline and regulation [View](#)
  - Technology and non-fintech [View](#)

# Higher frequency results - Bank level

	Equity Growth				Loans Growth			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure ( $e_{ct}$ )	-1.555 (1.113)	1.352 (0.938)	1.105 (0.874)	3.270*** (1.041)	1.111 (1.507)	3.549*** (1.740)	3.238*** (1.550)	5.681*** (1.366)
Lagged Exposure ( $e_{ct}$ )	-2.388 (1.752)	2.254** (0.930)	1.957*** (0.753)	4.742*** (1.032)	-1.270 (1.633)	3.569*** (1.613)	3.285*** (1.188)	4.829*** (1.500)
Year, Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Expense Beta, Equity Ratio	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Window	1 yr	2 yrs	3 yrs	4 yrs	1 yr	2 yrs	3 yrs	4 yrs
N	42,930	19,341	8,954	4,410	42,808	12,837	6,206	6,952

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

## Higher frequency results - County level

	Change in Shadow Bank Share		
	(1)	(2)	(3)
Exposure ( $e_{ct}$ )	1.543 (1.123)	-1.161*** (0.415)	-2.629*** (0.434)
Year, County FE	Yes	Yes	Yes
Demo, Ec Ind, ISBS	Yes	Yes	Yes
Window	1 yr	2 yr	3 yr
N	3,099	3,098	3,098

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

## What about C&I Loans?

Same patterns hold for C&I loans and CLO holdings of banks:

	Real Estate Loans Growth	Commercial/Industrial Loans Growth	CLOs Growth
Exposure ( $e_{bt}$ )	60.846*** (7.448)	77.202*** (16.519)	66.409*** (9.419)
Balance sheet controls	Yes	Yes	Yes
Liability beta (DSS)	Yes	Yes	Yes
N	3,404	3,408	60
R-sq	0.078	0.229	0.160

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$



# What about C&I Loans?

Work in progress (joint with Sebastian Hillenbrand) in the syndicated loan market:

- Use Dealscan to measure the exposure of a borrower based on:
  1. the banks participating in the syndicate
  2. the lead arranger
- Shadow bank share rises in syndicates with higher exposures
- Easier to address the funding vs originate issue because CLO holdings easier to track:
  1. ~ 65% held by insurance companies, pension funds, mutual funds
  2. 20-28% held by banks

# Conclusion

## **Secular decline in $i$ affects competition between different intermediaries**

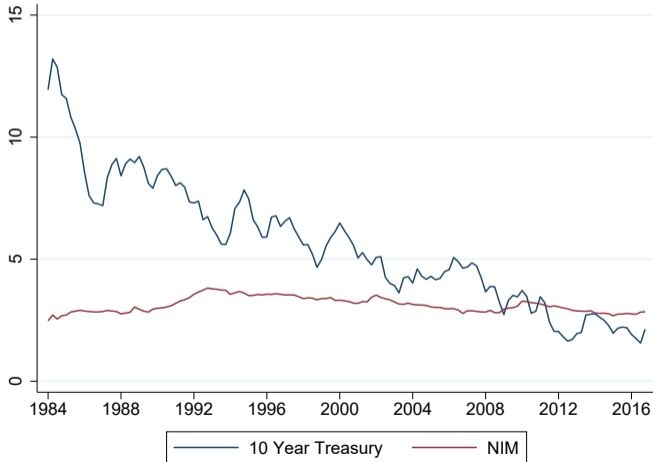
- Compression in deposit spreads
- Tighter traditional bank credit supply relying on this income
- Rise of shadow banks with different cost structure

## **Work in progress:**

- Short-run vs long-run effects
- Corporate loans: syndicated loans, small business loans

# Banks' NIM [Back](#)

Banks match income/expense sensitivity to  $i$ , making NIM fairly stable (DSS):



# Controls List [Back](#)

## Demographics (shares):

- Over 65
- Under 35
- Male
- Black
- Native American
- Asian
- Hispanic

## Economic indicators:

- Total Lending
- Employment
- Personal Income
- Population

## Education (shares):

- Only HS degree
- Some college
- Bach. degree or higher

## Other:

- Average Loan Size
- Population Density
- Broadband Access
- Deposit HHI (Branch/FIPS)
- Loan Top 4 Share (Branch/FIPS)

# Exposure and betas

	Exposure ( $e_{bt}$ )		NIM beta ( $\beta^{Inc} - \beta^{Exp}$ )
	(1)	(2)	(3)
NIM beta ( $\beta^{Inc} - \beta^{Exp}$ )	3.188*** (0.540)	3.278*** (0.567)	
Expense beta ( $\beta^{Exp}$ )		-0.458 (0.913)	0.353 (0.247)
Balance Sheet Controls	Yes	Yes	Yes
N	3,303	3,303	3,594
R-sq	0.517	0.518	0.303

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

# Largest Banks

Rank	Type of Lender	Lender Name	Volume (Bn)	Market Share (%)
1	Bank	Wells Fargo	138.43	6.64
2	Bank	JPMorgan Chase	90.38	4.33
3	Bank	Bank of America	58.63	2.81
4	Bank	Freedom Mortgage Corporation	32.16	1.72
5	Bank	US Bank	29.32	1.41
6	Bank	Flagstar Bank	26.58	1.27
7	Bank	Citibank	25.39	1.21
8	Bank	USAA Federal Savings	14.87	0.71
9	Bank	Suntrust	14.54	0.70
10	Bank	PNC Bank	14.46	0.69

# Largest Non-banks

Rank	Type of Lender	Lender Name	Volume (Bn)	Market Share (%)
1	Fintech	Quicken Loans	90.55	4.34
2	Fintech	Loandepot.com	35.77	1.72
3	Nonbank	Caliber Home Loans	27.78	1.33
4	Nonbank	United Shore	22.90	1.10
5	Fintech	Guaranteed Rate	18.49	0.89
6	Nonbank	Finance of America	17.72	0.85
7	Nonbank	Fairway Independent	15.90	0.76
8	Nonbank	Guild Mortgage	15.20	0.73
9	Nonbank	Stearns Lending	14.84	0.71
10	Nonbank	Nationstar Mortgage	13.36	0.64

## Robustness: Weights

	Shadow Bank Share			
	Population	No Weights	Lending by dollar amounts	Lending by loan counts
	(1)	(2)	(3)	(4)
Exposure ( $e_{ct}$ )	-11.846*** (1.653)	-6.912*** (1.416)	-14.126*** (2.318)	-12.586*** (1.842)
Demo, Ec Ind, ISBS	Yes	Yes	Yes	Yes
N	3,098	3,098	3,098	3,098
R-sq	0.235	0.194	0.288	0.238

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

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# Robustness: Pre-trends

	Shadow Bank Share					
	Baseline		1990-2003 Controls		1995-2003 Controls	
	(1)	(2)	(3)	(4)	(5)	(6)
Exposure ( $e_{ct}$ )	-9.557*** (2.192)	-11.846*** (1.653)	-9.786*** (2.234)	-12.147*** (1.680)	-9.802*** (2.251)	-11.901*** (1.652)
$\Delta$ Shadow Bank Share (1990-2003)			0.001 (0.013)	-0.011 (0.013)		
$\Delta$ Shadow Bank Share (1995-2003)					0.022 (0.021)	-0.014 (0.020)
Initial SB share	Yes	Yes	Yes	Yes	Yes	Yes
Demographics	Yes	Yes	Yes	Yes	Yes	Yes
Economic Indicators		Yes		Yes		Yes
N	3,098	3,098	2,912	2,912	3,084	3,084
R-sq	0.151	0.235	0.154	0.238	0.152	0.236

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

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# Robustness: Bank Market Power

	Shadow Bank Share				
	(1)	(2)	(3)	(4)	(5)
Exposure ( $e_{bt}$ )	-11.846*** (1.653)	-12.158*** (1.653)	-11.893*** (1.635)	-12.293*** (1.629)	-11.660*** (1.949)
Demos, Ec Ind, ISBS	Yes	Yes	Yes	Yes	Yes
Deposit HHI		Yes		Yes	
Top 4 Share			Yes	Yes	
Expense Beta					Yes
N	3,098	3,077	3,098	3,077	3,098
R-sq	0.235	0.238	0.255	0.260	0.235

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

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## Robustness: Small and large banks

	Shadow Bank Share		
	(1)	(2)	(3)
Exposure - Top 10 ( $e_{ct}$ )	-8.122** (3.855)	-7.587** (3.010)	-12.172*** (2.390)
Exposure - Non Top 10 ( $e_{ct}$ )	-12.115*** (2.835)	-10.504*** (2.488)	-11.698*** (1.973)
Initial SB share	Yes	Yes	Yes
Demographics		Yes	Yes
Economic Indicators			Yes
N	3,099	3,098	3,098
R-sq	0.037	0.152	0.235

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

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# Bank and county level main specs, 2010-2016

	Bank-Level						County-Level		
	Equity Growth (1)	Assets Growth (2)	Loans Growth (3)	Securities Growth (4)	Other Assets Growth (5)	Real Estate Loans Growth (6)	Change in Shadow Bank Share		
	(7)	(8)	(9)						
Exposure ( $e_{bt}$ , $e_{ct}$ )	10.743*** (1.503)	11.677*** (1.688)	9.946*** (1.179)	15.779*** (4.280)	10.144** (4.075)	19.332*** (1.858)	-7.946* (4.554)	-10.965*** (3.181)	-13.115*** (2.400)
Balance Sheet Controls	Yes	Yes	Yes	Yes	Yes	Yes			
Expense Beta	Yes	Yes	Yes	Yes	Yes	Yes			
Initial SB Share							Yes	Yes	Yes
Demographics								Yes	Yes
Economic Indicators									Yes
N	2,916	2,917	2,916	2,919	2,917	2,918	3,099	3,098	3,098
R-sq	0.288	0.250	0.113	0.347	0.250	0.350	0.011	0.151	0.223

\* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01

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## Controlling for regulation, 2010-2016

	Shadow Bank Share				
	(1)	(2)	(3)	(4)	(5)
Exposure ( $e_{ct}$ )	-13.115*** (2.400)	-12.942*** (2.436)	-13.029*** (2.400)	-13.341*** (2.476)	-13.208*** (2.482)
OTS		Yes			Yes
T1RBC			Yes		Yes
MSR				Yes	Yes
Demo, Ec Ind, ISBS	Yes	Yes	Yes	Yes	Yes
N	3,098	3,098	3,098	3,098	3,098
R-sq	0.223	0.224	0.225	0.225	0.227

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

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# Controlling for technology, 2010-2016

	Shadow Bank Share			Non-Fintech Shadow Bank Share		
	(1)	(2)	(3)	(4)	(5)	(6)
Exposure ( $e_{ct}$ )	-15.623*** (1.818)	-6.662 (4.985)	-13.856*** (4.216)	-6.652* (3.662)	-8.703*** (2.706)	-10.707*** (2.032)
Pop. Density	Yes		Yes			
Broadband Access		Yes	Yes			
Initial SB share	Yes	Yes	Yes	Yes	Yes	Yes
Demographics	Yes	Yes	Yes		Yes	Yes
Economic Indicators	Yes	Yes	Yes			Yes
N	3,076	326	325	3,099	3,098	3,098
R-sq	0.266	0.416	0.470	0.011	0.117	0.193

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

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# Baseline and regulation, loan counts

	Shadow Bank Share						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Exposure (e <sub>ct</sub> )	-7.138*** (1.940)	-7.344*** (2.009)	-11.509*** (1.399)	-12.948*** (1.554)	-12.373*** (1.481)	-10.622*** (1.477)	-12.640*** (1.680)
Initial SB share	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demographics		Yes	Yes	Yes	Yes	Yes	Yes
Economic Indicators			Yes	Yes	Yes	Yes	Yes
OTS				Yes			Yes
T1RBC					Yes		Yes
MSR						Yes	Yes
N	3,099	3,098	3,098	3,098	3,098	3,098	3,098
R-sq	0.051	0.152	0.284	0.286	0.288	0.287	0.293

\* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01

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# Technology and non-fintech, loan counts

	Shadow Bank Share			Non-Fintech Shadow Bank Share		
	(1)	(2)	(3)	(4)	(5)	(6)
Exposure ( $e_{ct}$ )	-11.274*** (1.402)	-20.156*** (5.051)	-20.555*** (4.992)	-5.180*** (1.845)	-6.318*** (1.716)	-10.227*** (1.292)
Pop. Density	Yes		Yes			
Broadband Access		Yes	Yes			
Initial SB share	Yes	Yes	Yes	Yes	Yes	Yes
Demographics	Yes	Yes	Yes		Yes	Yes
Economic Indicators	Yes	Yes	Yes			Yes
N	3,076	216	215	3,099	3,098	3,098
R-sq	0.306	0.540	0.553	0.018	0.139	0.285

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

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