The Rise of Shadow Banking: Evidence from Capital Regulation[1]

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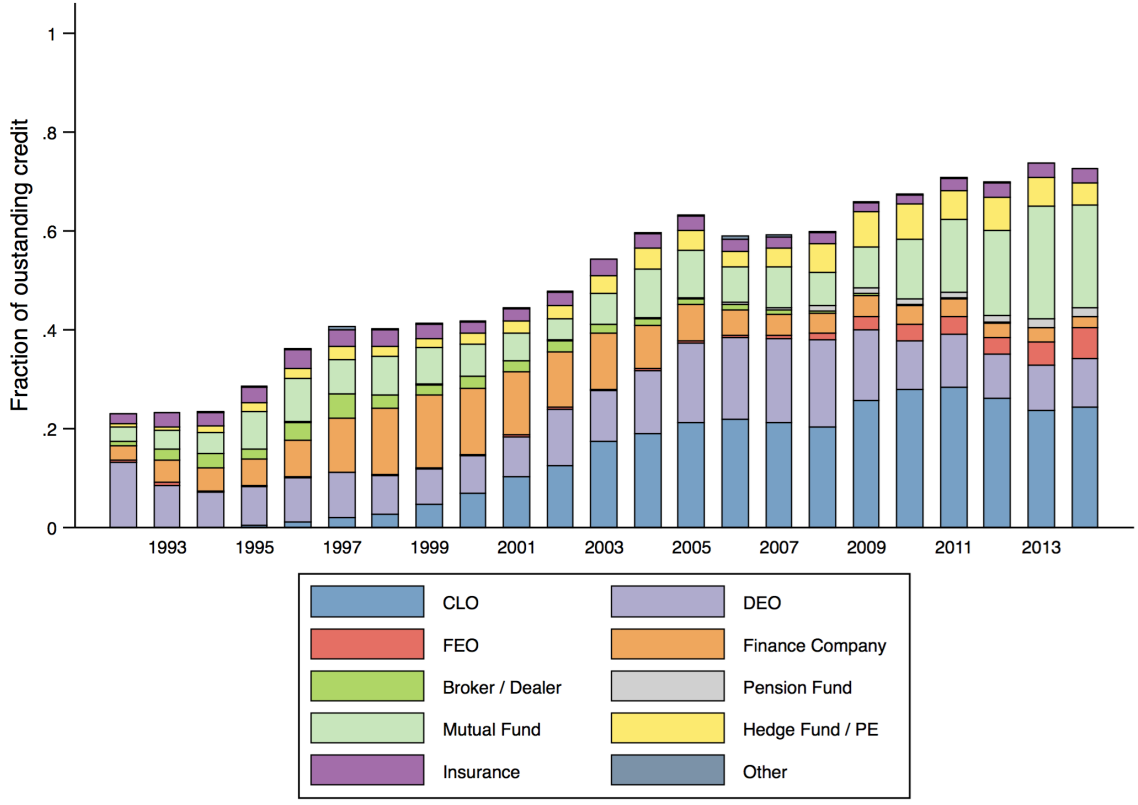
[1] The views expressed here are those of the author and do not necessarily reflect the views of the Board of Governors or staff of the Federal Reserve System.

Credit provision by shadow banks

U.S. syndicated corporate loan market



Source: Shared National Credit Program

- "Shadow banks" = nonbank credit intermediation

Why?

Explanations: comparative advantages and/or bank regulation

Tradeoffs?

- ✓ Credit supply, efficient risk allocation, new technologies
- ✗ Credit market disruptions:
  - Limited access to government backstops
  - Information asymmetry
  - ... problematic during 2007–2010 period

This paper

Objectives:

1. Bank capital constraints and nonbank entry
   → Literature so far only effect on banks
2. Nonbank entry and credit market disruptions in crisis

Setting: $3tn U.S. syndicated corporate loan market

Why?

- Highly relevant: regulators scrutinize riskier deals
- Great data: observe nonbank entry
- Identification: shut down "comparative advantage" channel

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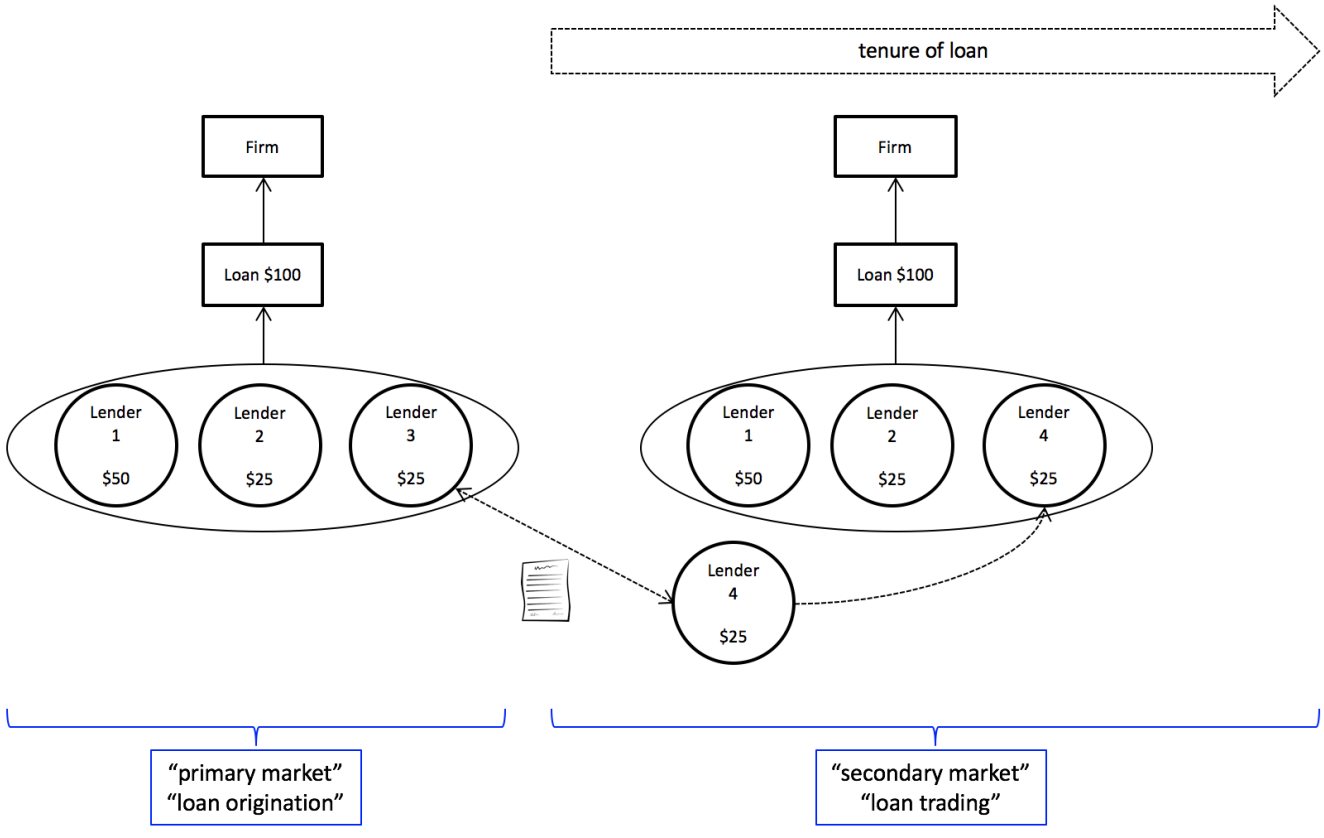
Loan syndication and trading



Data

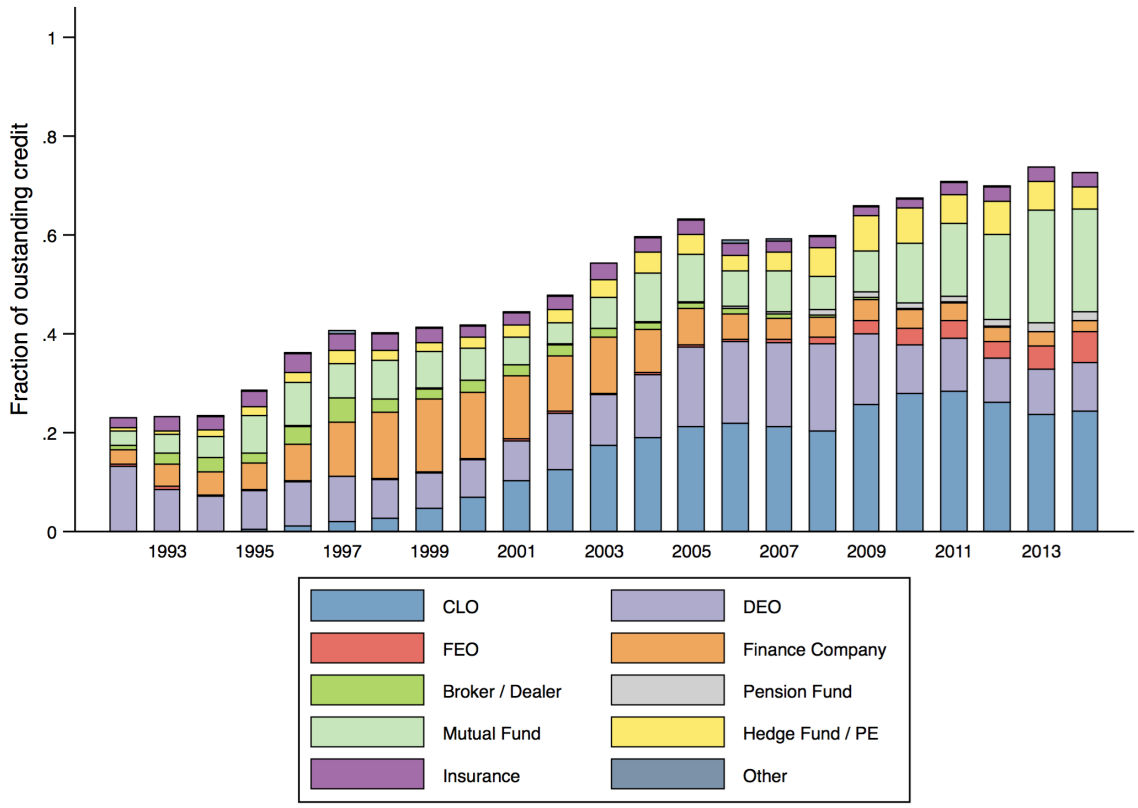
- **Shared National Credit Program (SNC):**
  - Established in 1977 to "provide efficient and consistent credit risk assessment of large syndicated loans"
  - Annual examination by Fed/FDIC/OCC (quarterly, 2009–)
  - Lead banks transmit lender lists

- **Loan included if:**
  1. Loan package $\geq$ \$20 million
  2. Syndicated by at least 2 supervised institutions[2]

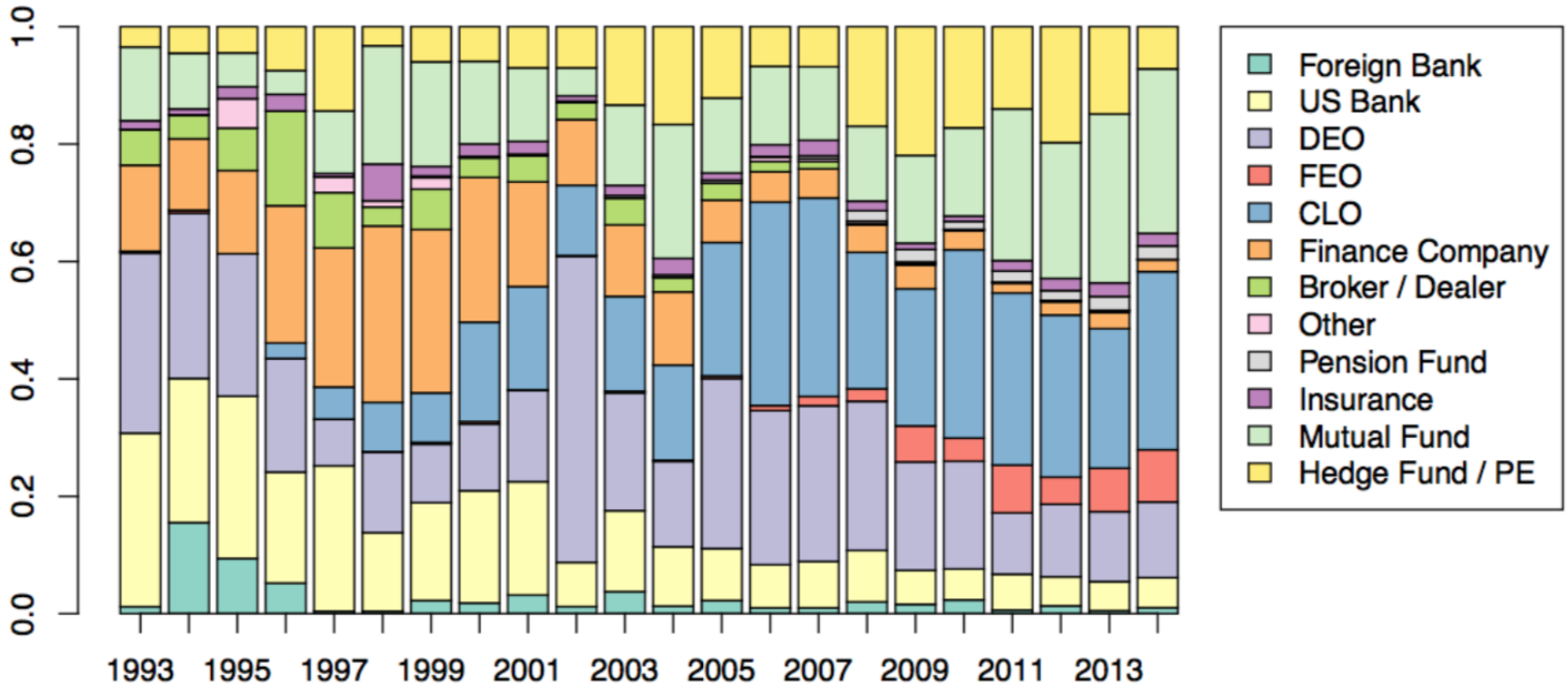
- **Complete register of loan share ownership:**
  - Accounts for trades post-origination
  - Includes all nonbanks
  - Clean link to BHC identifiers (RSSD ID)

[2] At least 3 supervised institutions after 1999

Nonbanks in term loan market



Active buyers of distressed loans (%)



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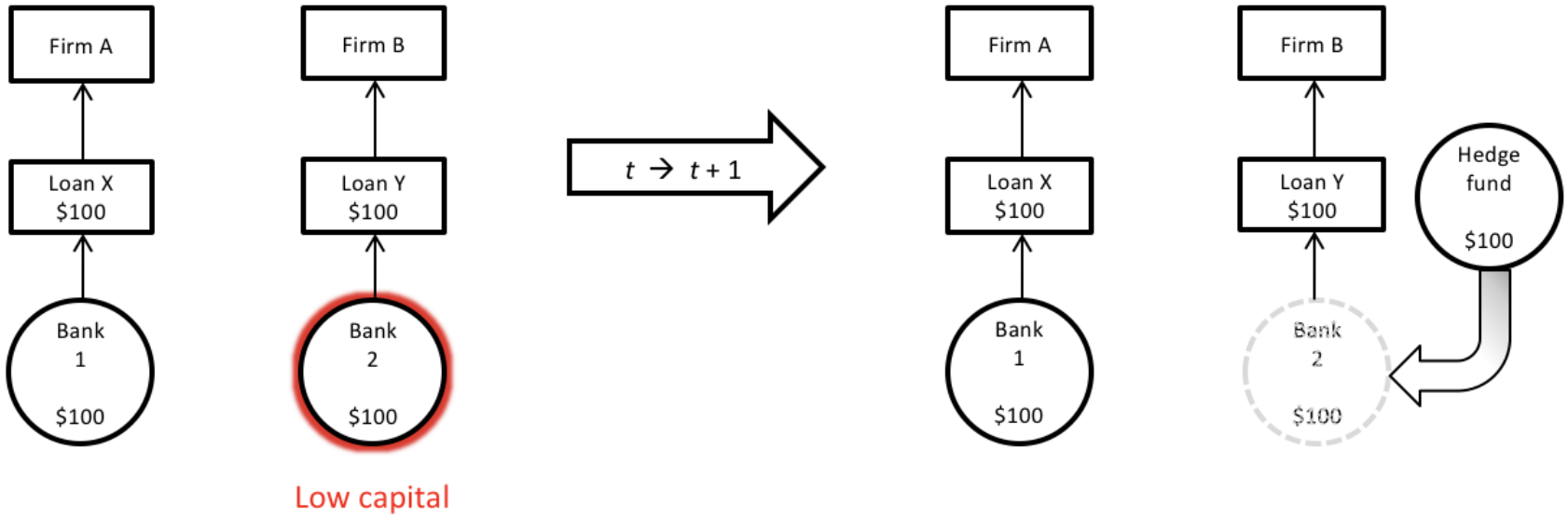
Conjecture

Insight: banks with low regulatory capital ratios Pennacchi ('98), Plantin ('14), Brunnermeier and Sannikov ('14), etc.

1. May improve capital ratios by reducing RWA
2. Stronger effects:
   a. Among assets with higher capital requirements
      - \$100 million AA– rated corporate loan = \$1.6 million capital
      - BB– = \$12 million
   b. When the cost of raising outside equity is high
3. Unregulated nonbanks fill gaps

Identification challenges



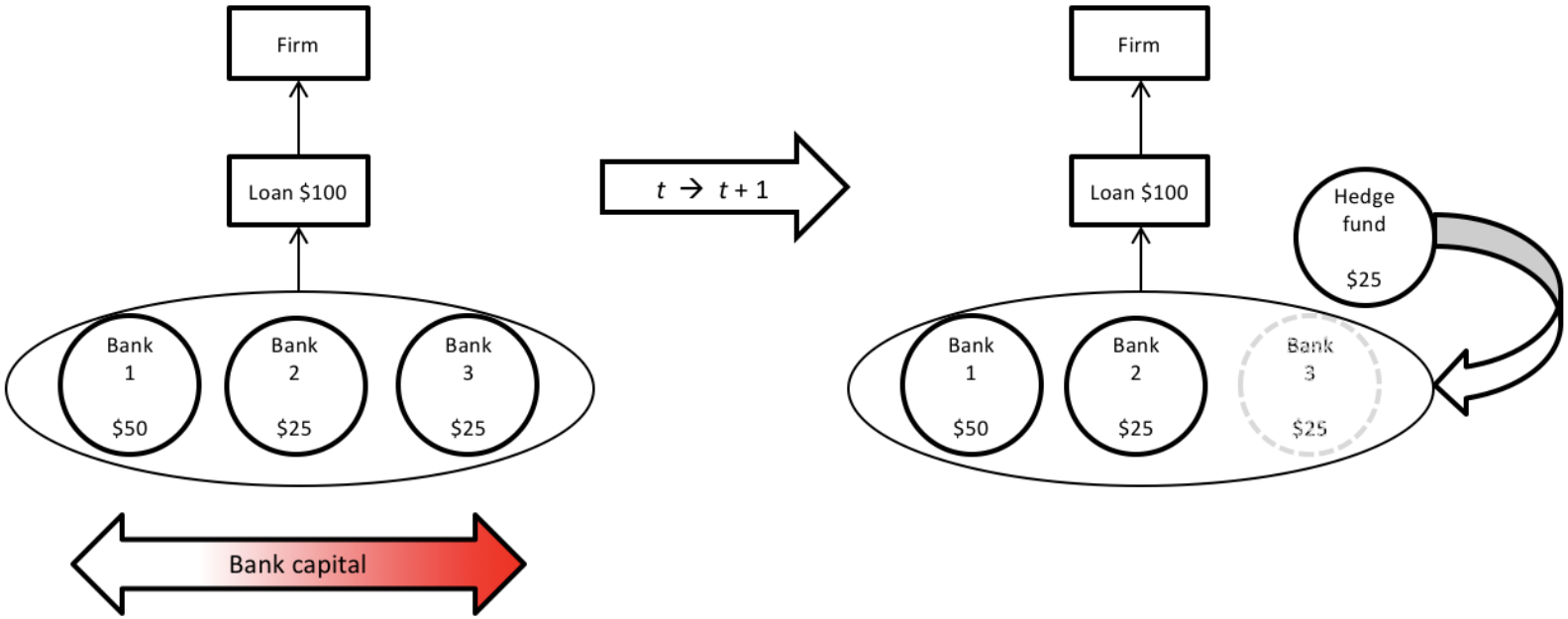
(1) Loan selection: low-capital banks may hold special loans

- Ex: high $\mathbb{E}[R]$, strong covenants/collateral, etc.
- Attractive for institutional investors

(2) Omitted bank variables: low-capital banks may differ

- Ex: risk-averse banks choose to sell risky loans (capital as a "sideshow")

Addressing loan selection



(1) Loan selection: low-capital banks may hold special loans

... solution: loan-year fixed effects

Khwaja and Mian ('08)

Summary Statistics

Table: Loan-Level Summary Statistics

Loan Sale	161,794	0.370	0.483	0	0	1
Loan Share/Assets	161,794	0.676	1.865	0.027	0.104	0.383
Loan Size	161,794	274.0	619.0	34.5	95.0	256.0
Agent Bank	161,794	0.181	0.385	0	0	0
Non-Bank Share	39,058	0.231	0.320	0	0	0.403
Tier 1 Capital	161,794	0.100	0.004	0.076	0.089	0.111

Bank capital and loan sales

$$\textit{Loan Sale}_{i,j,t} = \alpha_{i,t} + \alpha_j + \beta\, \textit{Tier 1 Capital/RWA}_{j,t-1} + \gamma X_{j,t-1} + \epsilon_{i,j,t}$$

	All [1]	All [2]	Not Distressed [3]	Distressed [4]
Tier 1 Capital/RWA	−0.158***	−0.189**	−0.108*	−0.499***
	(0.057)	(0.910)	(0.060)	(0.196)
Tier 1 Capital/RWA × *TED*		−0.291***		
		(0.112)		
Loan controls	yes	no	yes	yes
Bank controls	yes	no	yes	yes
Loan controls × *TED*	no	yes	no	no
Bank controls × *TED*	no	yes	no	no
Bank fixed effects	yes	yes	yes	yes
Loan-year fixed effects	yes	yes	yes	yes
N	97,238	97,238	83,759	13,479
R^2	0.88	0.88	0.88	0.87

- $1\sigma_x \downarrow \Longrightarrow$ ~0.79%pt↑ prob. loan share sale (2.14% of $\bar{y}$)

Bank capital and loan sales - Robustness

Dependent variable: *Loan Sale*$_{ijt}$	Exclude FIRE [1]	No Amend [2]	Credit lines [3]	Alternate timing [4]	Exclude fixed effects [5]
Tier 1 Capital/RWA$_{t-1}$	–0.179***	–0.151**	0.051	–0.044	–0.198***
	(0.061)	(0.060)	(0.037)	(0.027)	(0.054)
Bank controls	Y	Y	Y	Y	Y
Bank fixed effects	Y	Y	Y	Y	N
Loan-year fixed effects	Y	Y	Y	Y	N
Observations	83,707	87,510	343,241	161,794	97,238
R^2	0.878	0.878	0.712	0.860	0.100

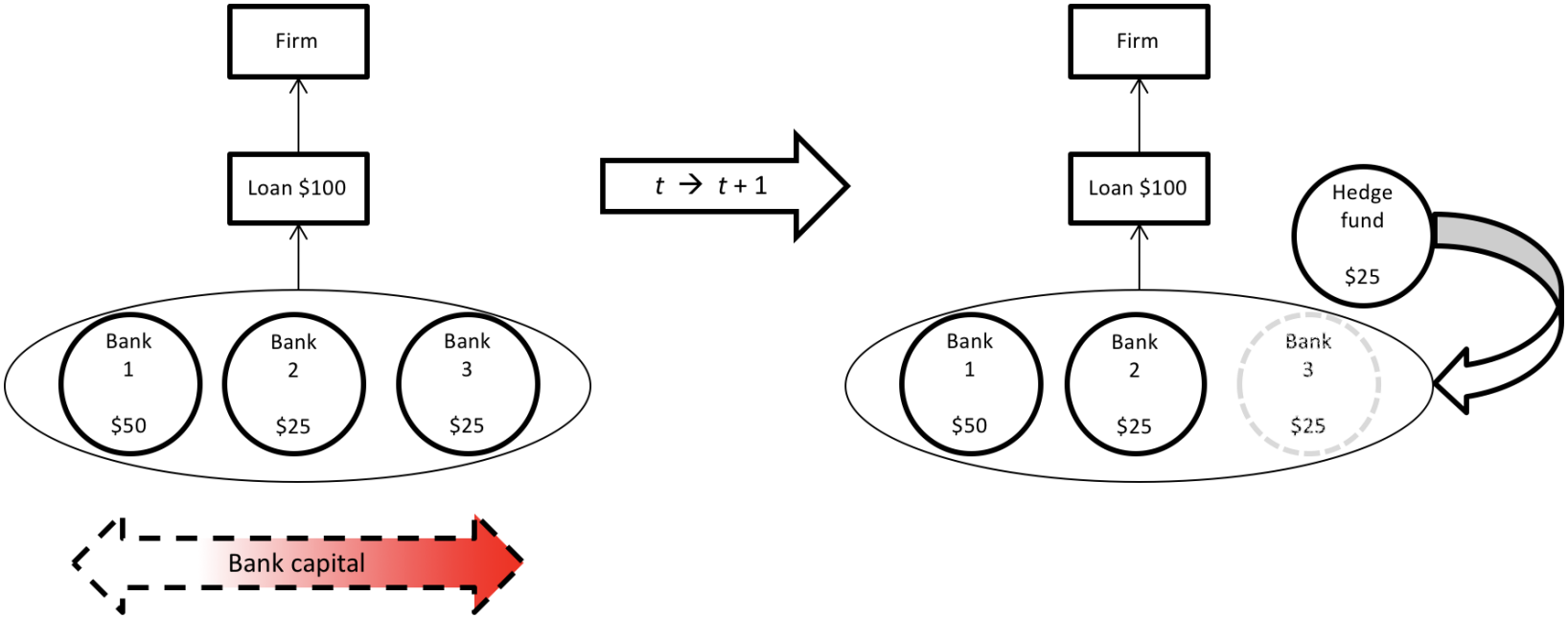
Reallocation toward nonbanks

$$\textit{Nonbank Share}_{i,t} = \alpha_t + \beta \overline{\textit{Tier 1 Capital/RWA}}_{i,t-1} + \gamma X_{i,t-1} + \epsilon_{i,t}$$

	Mean		Median	Mean	Distressed	
	[1]	[2]	[3]	[4]	[5]	[6]
Tier 1 Capital/RWA	−1.547***	−1.582**	−1.334***	−1.460***	−1.406***	−1.025***
	(0.470)	(0.640)	(0.467)	(0.183)	(0.304)	(0.316)
Tier 1 Capital/RWA × TED				−2.954***		−4.655***
				(0.601)		(0.980)
Loan controls	yes	yes	yes	yes	yes	yes
Bank controls	yes	yes	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes	yes	yes
Loan fixed effects	yes	yes	yes	yes	yes	yes
N	39,058	29,121	29,107	29,121	5,380	5,380
R^2	0.102	0.203	0.196	0.210	0.266	0.270

- $1\sigma_x \downarrow \Longrightarrow$ ~3.25%pt↑ nonbank share (14.1% of $\bar{y}$)

Addressing omitted variables



(2) Omitted bank variables: low-capital banks may differ

... solution: bank-specific shocks to required capital

Bank capital shocks

Setting: Basel III implementation

- BCBS announces capital reforms (2010/10)
- Fed announces stricter U.S. implementation (2012/06)
  - Risk-weights: RRE, HVCRE
  - Tier 1 capital: unrealized losses/gains in AFS, TruPru
  - Dramatic changes in treatment of **mortgage servicing rights**

Idea: **unforeseen** U.S. adjustments creates "winners" / "losers"

- Exposure: tier 1 capital (Basel I – Basel III) as of 2012:Q2

Summary Statistics

Table: Loan-Level Summary Statistics

Loan Sale	34,648	0.025	0.156	0	0	0
Loan Share/Assets	34,648	0.125	0.148	0.028	0.075	0.160
Loan Size	34,648	582.0	887.0	115.0	300.0	700.0
Agent Bank	34,648	0.164	0.370	0	0	0
Tier 1 Capital	34,648	0.127	0.02	0.112	0.124	0.144

Recapitalization via lower loan retention

[1] $\Delta Basel\ III\ Tier\ 1/RWA_{j,t+4} = \beta Basel\ III\ Tier\ 1\ Shortfall_{j,t} + \gamma X_{j,t} + \epsilon_{j,t}$

[2] $Loan\ Sale_{i,j,t+1} = \alpha_i + \beta Basel\ III\ Tier\ 1\ Shortfall_{j,t} + \gamma X_{j,t} + \epsilon_{i,j,t}$

[3] $Nonbank\ Share_{i,t+1} = \alpha + \beta \overline{Basel\ III\ Tier\ 1\ Shortfall}_{i,t} + \gamma X_{i,t} + \epsilon_{i,t}$

	$\Delta Basel\ III\ Tier\ 1/RWA_{j,t+4}$ [1]	$Loan\ Sale_{i,j,t+1}$ [2]	$Nonbank\ Share_{i,t+1}$ [3]
Basel III Tier 1 Shortfall	–0.152***	–0.382***	–0.095**
	(0.041)	(0.135)	(0.044)
Loan controls	n/a	n/a	yes
Bank controls	yes	yes	yes
Loan fixed effects	n/a	yes	n/a
N	838	218,252	2,121
R^2	0.17	0.14	0.14

Mortgage Servicing Rights

	Loan Sale$_{i,j,t+1}$		*Nonbank Share*$_{i,t+1}$
	[1]	[2]	[3]
High MSR Exposure	0.014***	0.012***	0.006***
	(0.003)	(0.003)	(0.002)
Basel III Tier 1 Shortfall		–0.279**	
		(0.165)	
Loan controls	n/a	n/a	yes
Bank controls	yes	yes	yes
Loan fixed effects	yes	yes	n/a
N	218,252	218,252	2,121
R^2	0.14	0.14	0.14

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Nonbank funding and loan price volatility

Insight: during periods of market stress and high liquidity demand

Hanson, Shleifer, Stein, and Vishny (2015), Fahri and Tirole (2017), Goldstein, Jiang, and Ng (2017)

1. **Banks:** government guarantees, central bank liquidity
2. **Nonbanks:** lack explicit government support
   - May be forced to sell assets
   - Especially nonbanks with **fragile funding**

Implications: loans funded by nonbanks with fragile funding

1. Sold more frequently
2. Trade at deeper discounts

Context: loan selloff in 2008

1. **Data:**
   - Loan Sales and Trading Association (LSTA)
   - Publicly-posted dealer quotes
   - Hand-match 116 loans to SNC
     $\Longrightarrow$ **we observe complete holdings for these loans in 2006Q4**

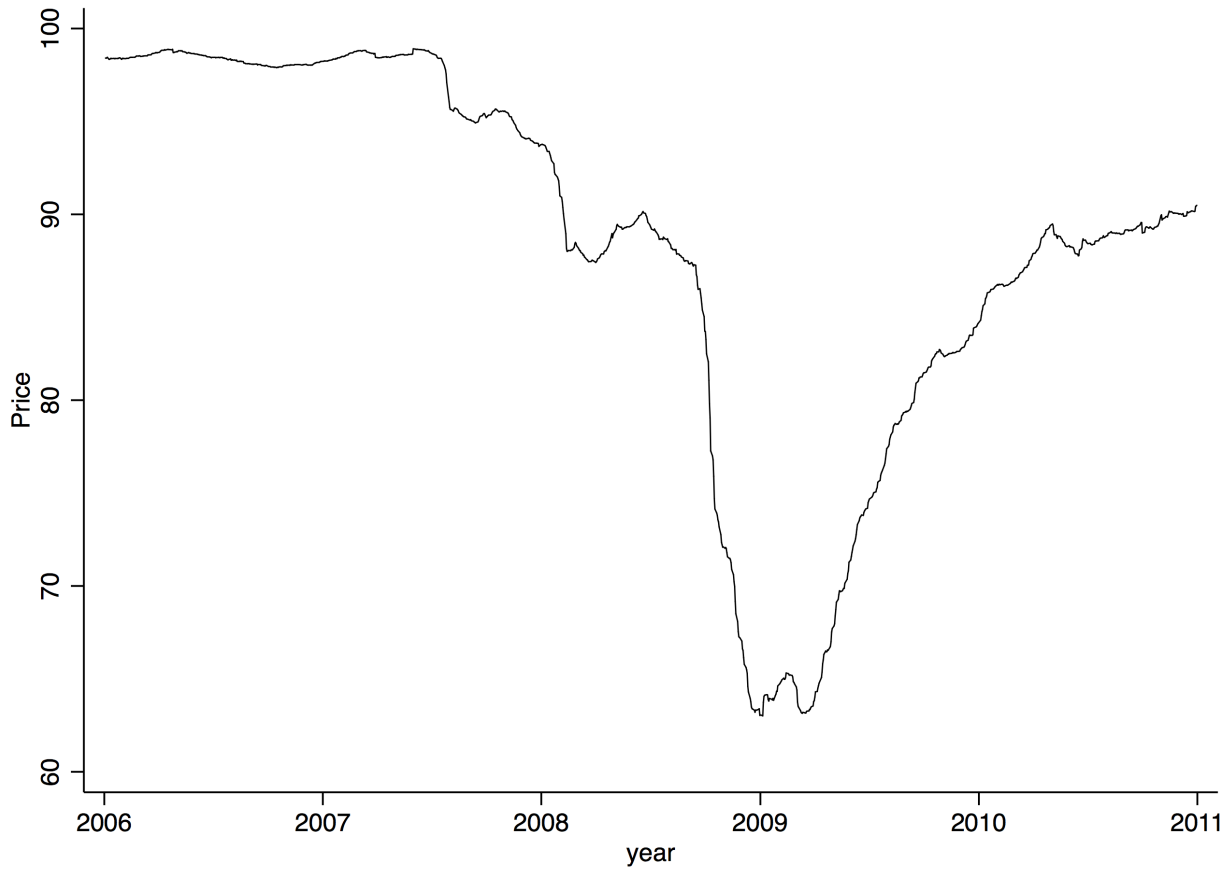
2. **Prices:**
   - $\overline{Price}_t$ = average daily bid-ask-midpoint in year t

   $\rightarrow$ $\Delta Price = \overline{Price}_{2008}$ - $\overline{Price}_{2007}$

3. **Lender classification:**
   - Banks versus nonbanks
   - Stable nonbanks: pension funds, insurance companies
   - Unstable nonbanks: hedge funds, broker-dealers, other investment funds

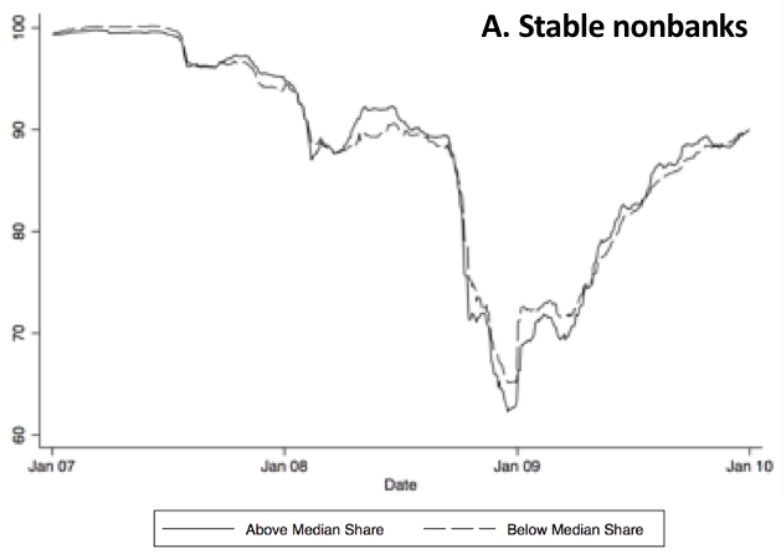
   $\rightarrow$ *Stable* and *Unstable Nonbank Share* as of 2006:Q4

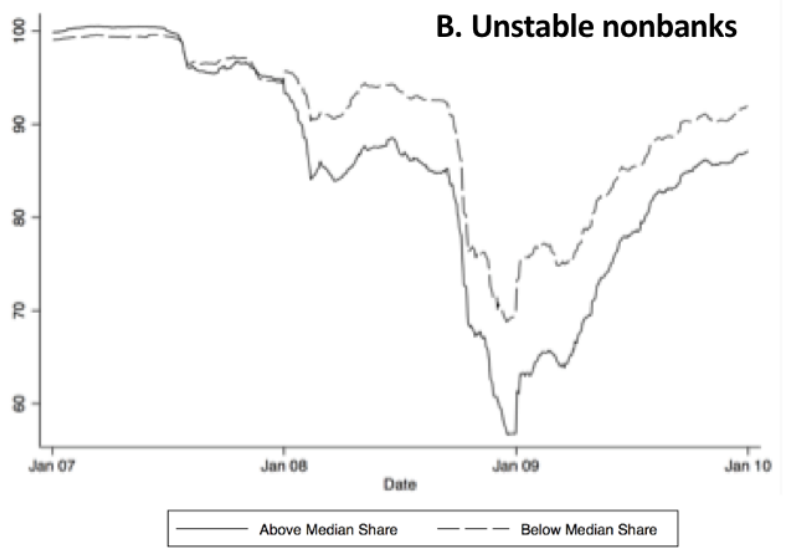
Loan prices during crisis



- Peak-to-trough change ~35%

Nonbank balance sheets matter





Summary Statistics

Panel A: Loan characteristics						
Loan Price Change	116	–0.088	0.072	–0.118	–0.070	–0.041
Loan Price Level	116	0.979	0.024	0.973	0.986	0.992
Log(Remaining Maturity)	116	3.664	1.157	3	4	4.5
Non-Pass	116	0.198	0.400	0	0	0
Panel B: Syndicate member characteristics						
Nonbank Share	116	0.453	0.344	0.119	0.398	0.837
Unstable Nonbank Share	116	0.095	0.112	0	0.057	0.147
Stable Nonbank Share	116	0.018	0.032	0	0	0.024
Tier 1 Capital/RWA	116	0.105	0.051	0.079	0.083	0.102

Regression evidence

$$\Delta Loan\ Price_{i,t} = \alpha + \beta Nonbank\ Share_{i,t-1} + \gamma X_{i,t-1} + \epsilon_{i,t}$$

	Loan Sale		*ΔLoan Price*	
	[1]	[2]	[3]	[4]
Nonbank	0.018***			
	(0.003)			
Nonbank Share		–0.049**		
		(0.019)		
Unstable Nonbank Share			–0.222***	–0.182**
			(0.062)	(0.091)
Stable Nonbank Share			–0.114	0.020
			(0.251)	(0.288)
Loan controls	yes	yes	yes	yes
Bank controls (synd. avg.)	no	yes	yes	yes
Loan-year fixed effects	yes	no	no	no
N	204,553	116	116	79
R^2	0.64	0.46	0.51	0.57

- $1\sigma_x \uparrow$ pre-crisis nonbank share $\Longrightarrow$ 1.66%pt$\downarrow$ price (19.2% of $\bar{y}$)

Conclusion

- Loans reallocated from capital constrained banks to nonbanks
  - esp. when funding conditions worsen.
  - Nonbanks with fragile funding exacerbate price volatility
- Implications?
  - Financial crisis → more prudential regulation
  - **Additional regulations might be counterproductive** if risks migrate to shadow banks with volatile funding
- What's missing?
  - How big are the benefits? Other (real) costs?
  - Other credit markets?

Common across all credit markets

Product	Regulation	Who does it impact?	Who does it create opportunity for?
Personal Lending	Stricter capital requirements for consumer loans, CARD Act	Banks have to hold more capital diluting returns Raised credit card interest rates	Non-banks (LC) can circumvent higher capital requirements and price below banks
Small Business Lending	Regulatory focus on concentration and pricing, Fed stress test (CCAR)	Regulated banks are unable to adequately price risk in lower credit loans	Non-banks (ONDK) can charge higher rates on higher risk loans
Leverage Lending	OCC Guidance, CCAR, "Skin in the Game" rules for securitizers	Regulated banks are unable to participate in riskier deals	Non-banks (PE, BDCs, foreign banks) to take riskier deal fees
Commercial Real Estate Lending	Basel III risk weighting, CCAR losses	Banks have to hold more capital diluting returns	Transitional and mezzenine lenders can engage in more complex deals
Mortgage Banking (origination and servicing)	Basel III, Qualified Mortgage rules for underwriting, "Skin in the Game" rules for securitizers, Home Mortgage Disclosure Act	Banks have been selling MSRs and cutting back on mortgage originations.	Non-banks' mkt share of originations has doubled and has reached an all-time high of 42%; Specialty mortgage servicers (OCN, NSM, WAC) have also grown rapidly.
Student Lending	Increased oversight by CFPB, elimination of FFEL loan program in 2010, potential for student loan bankruptcy reform	Larger banks (JPM, BAC, and C) have stopped originating student loans and are now divesting run-off portfolios.	NAVI has been acquiring run-off bank portfolios, and marketplace lenders (SoFi, CommonBond) biz model is focused on refinancing student loans at lower rates

Source: Goldman Sachs Global Investment Research

- Financial crisis → more prudential regulation → nonbank entry