

The Rise of Shadow Banks: Evidence from Capital Regulation and Monetary Policy¹

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¹The 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.

This presentation

- ▶ The structure of credit markets has substantially changed over time.
- ▶ Rise of nonbank credit intermediaries; more stable nonbanks (such as pension funds and insurance companies); other, more unstable nonbanks (such as hedge funds, broker-dealers, investment funds, i.e. shadow banks).
- ▶ In two papers, Ralf and I (with different co-authors) analyze nonbanks and banks related to
 1. prudential (capital) regulation and
 2. monetary policy.
- ▶ We use U.S. (supervisory and publicly available) loan-level data that include bank and nonbank lending to firms and households, exploiting different policy changes.

The Rise of Shadow Banking: Evidence from Capital Regulation

Rustom M. Irani University of Illinois & CEPR

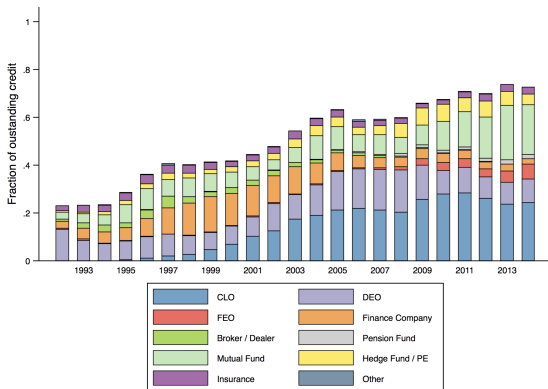
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Credit provision by shadow banks

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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Leveraged Loans

Syndicated Loan Market has two components:

1. Credit Lines
2. Term Loans

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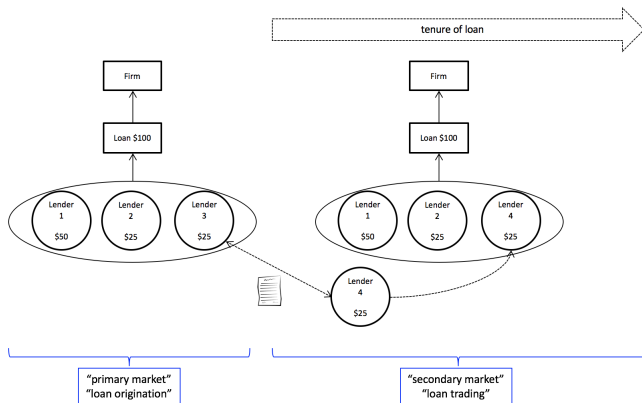
Leveraged Loans:

Syndicated term loans to non-investment grade borrowers

Leveraged Loan Characteristics:

- Bullet Payment (usually 5-year maturity)
- Sold to institutional investors
- Most new money is for M&A and LBO activity

Loan syndication and trading



- ▶ **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 institutions²

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

²At least 3 supervised institutions after 1999

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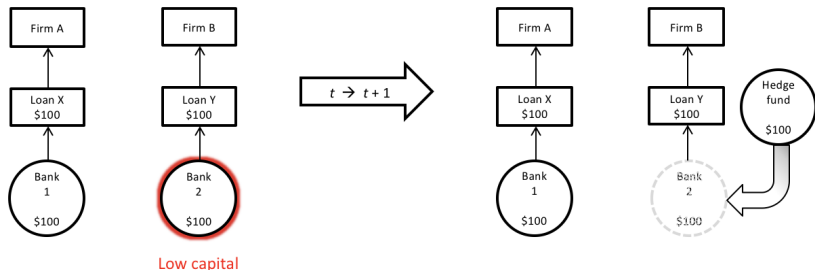
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Conjecture

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



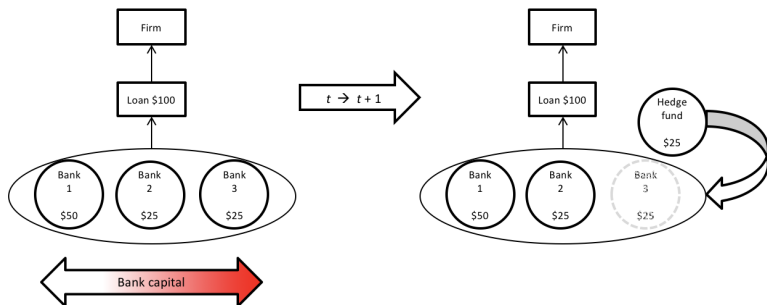
(1) Loan selection: low-capital banks may hold special loans

- ▶ 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

	N	Mean	Std	25p	median	75p
<i>Loan Sale</i>	161,794	0.370	0.483	0	0	1
<i>Loan Share/Assets</i>	161,794	0.676	1.865	0.027	0.104	0.383
<i>Loan Size</i>	161,794	274.0	619.0	34.5	95.0	256.0
<i>Agent Bank</i>	161,794	0.181	0.385	0	0	0
<i>Non-Bank Share</i>	39,058	0.231	0.320	0	0	0.403
<i>Tier 1 Capital</i>	161,794	0.100	0.049	0.076	0.089	0.111

Bank capital and loan sales

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

	All [1]	All [2]	Not Distressed [3]	Distressed [4]
<i>Tier 1 Capital/RWA</i>	-0.158*** (0.057)	-0.189** (0.910)	-0.108* (0.060)	-0.499*** (0.196)
<i>Tier 1 Capital/RWA</i> × <i>TED</i>		-0.291*** (0.112)		
Loan controls	yes	no	yes	yes
Bank controls	yes	no	yes	yes
Loan controls × <i>TED</i>	no	yes	no	no
Bank controls × <i>TED</i>	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

- ▶ $1\sigma_x \downarrow \implies \sim 0.79\% \text{pt} \uparrow \text{ prob. loan share sale (2.14\% of } \bar{y})$

Bank capital and loan sales - Robustness

Dependent variable: $Loan\ Sales_{ijt}$					
	Exclude FIRE [1]	No Amend [2]	Credit lines [3]	Alternate timing [4]	Exclude fixed effects [5]
$Tier\ 1\ Capital/RWA_{t-1}$	-0.179*** (0.061)	-0.151** (0.060)	0.051 (0.037)	-0.044 (0.027)	-0.198*** (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

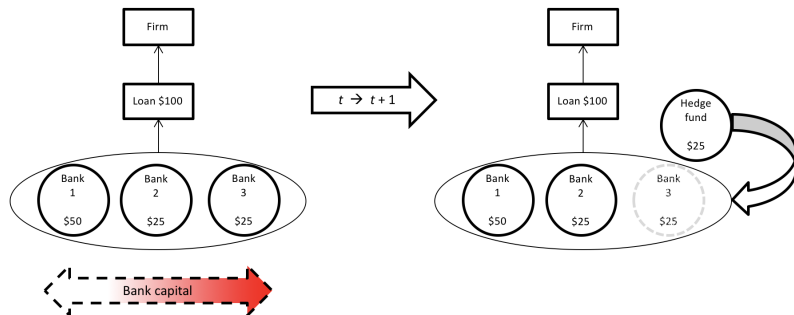
Reallocation toward nonbanks

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

	Mean [1]	Mean [2]	Median [3]	Mean [4]	Distressed [5]	Distressed [6]
<i>Tier 1 Capital/RWA</i>	-1.547*** (0.470)	-1.582** (0.640)	-1.334*** (0.467)	-1.460*** (0.183)	-1.406*** (0.304)	-1.025*** (0.316)
<i>Tier 1 Capital/RWA</i> × <i>TED</i>				-2.954*** (0.601)		-4.655*** (0.980)
Loan controls	no	yes	yes	yes	yes	yes
Bank controls	yes	yes	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes	yes	yes
N	29,121	29,121	29,107	29,121	5,380	5,380
R ²	0.102	0.203	0.196	0.210	0.266	0.270

▶ $1\sigma_x \downarrow \implies \sim 3.25\% \text{pt} \uparrow$ 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, High Volatility CRE
 - 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 III – Basel I) as of 2012:Q2

Note: tier 1 capital (Basel III – Basel I) as of 2012:Q2 is negative for all banks in the sample.

Summary Statistics

Table: Loan-Level Summary Statistics

	N	Mean	Std	25p	median	75p
<i>Basel III Tier 1 Shortfall</i>	34,648	-0.030	0.013	-0.039	-0.027	-0.023
<i>Loan Sale</i>	34,648	0.025	0.156	0	0	0
<i>Loan Share/Assets</i>	34,648	0.125	0.148	0.028	0.075	0.160
<i>Loan Size</i>	34,648	582.0	887.0	115.0	300.0	700.0
<i>Agent Bank</i>	34,648	0.164	0.370	0	0	0
<i>Tier 1 Capital</i>	34,648	0.127	0.02	0.112	0.124	0.144

Recapitalization via lower loan retention

$$[1] \Delta \text{Basel III Tier 1/RWA}_{j,t+4} = \beta \text{Basel III Tier 1 Shortfall}_{j,t} + \gamma X_{j,t} + \epsilon_{j,t}$$

$$[2] \text{Loan Sale}_{i,j,t+1} = \alpha_i + \beta \text{Basel III Tier 1 Shortfall}_{j,t} + \gamma X_{j,t} + \epsilon_{i,j,t}$$

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

	$\Delta \text{Basel III Tier 1/RWA}_{j,t+4}$ [1]	$\text{Loan Sale}_{i,j,t+1}$ [2]	$\text{Nonbank Share}_{i,t+1}$ [3]
<i>Basel III Tier 1 Shortfall</i>	-0.152*** (0.041)	-0.382*** (0.135)	-0.095*** (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

- ▶ $1\sigma_x \uparrow \text{Shortfall} \implies 0.5\text{ppt} \uparrow$ in propensity to sell (20% of \bar{y})

Mortgage Servicing Rights

	<i>Loan Sale_{i,j,t+1}</i>		<i>Nonbank Share_{i,t+1}</i>
	[1]	[2]	[3]
<i>High MSR Exposure</i>	0.014*** (0.003)	0.012*** (0.003)	0.006*** (0.002)
<i>Basel III Tier 1 Shortfall</i>		-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
- ▶ Firms more dependent on nonbank funding experienced reduction in credit supply

Context: loan selloff in 2008

1. Data:

- ▶ Loan Sales and Trading Association (LSTA)
- ▶ Publicly-posted dealer quotes
- ▶ Hand-match 116 loans to SNC
⇒ **we observe complete holdings for these loans in 2006Q4**

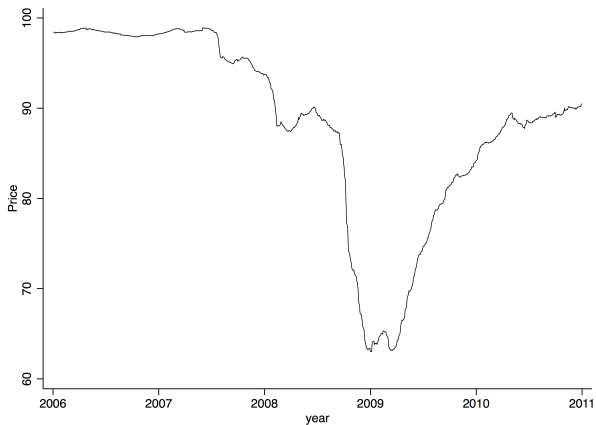
2. Prices:

- ▶ \overline{Price}_t = average daily bid-ask-midpoint in year t
- $\Delta Price = \overline{Price}_{2008} - \overline{Price}_{2007}$

3. Lender classification:

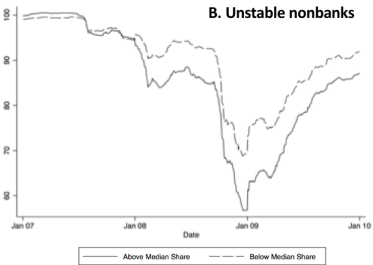
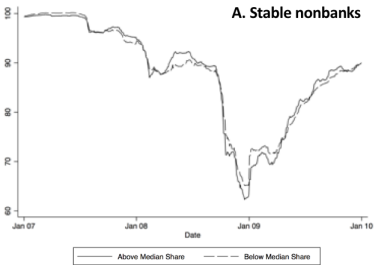
- ▶ Banks versus nonbanks
- ▶ Stable nonbanks: pension funds, insurance companies
- ▶ Unstable nonbanks: hedge funds, broker-dealers, other investment funds
- *Stable and Unstable Nonbank Share* as of 2006:Q4

Loan prices during crisis



- ▶ Peak-to-trough change $\sim 35\%$

Nonbank balance sheets matter



Summary Statistics

	N	Mean	Std	25p	median	75p
Panel A: Loan characteristics						
<i>Loan Price Change</i>	116	-0.088	0.072	-0.118	-0.070	-0.041
<i>Loan Price Level</i>	116	0.979	0.024	0.973	0.986	0.992
<i>Log(Remaining Maturity)</i>	116	3.664	1.157	3	4	4.5
<i>Non-Pass</i>	116	0.198	0.400	0	0	0
Panel B: Syndicate member characteristics						
<i>Nonbank Share</i>	116	0.453	0.344	0.119	0.398	0.837
<i>Unstable Nonbank Share</i>	116	0.095	0.112	0	0.057	0.147
<i>Stable Nonbank Share</i>	116	0.018	0.032	0	0	0.024
<i>Tier 1 Capital/RWA</i>	116	0.105	0.051	0.079	0.083	0.102

Regression evidence - Prices

$$\Delta \text{Loan Price}_{i,t} = \alpha + \beta \text{Nonbank Share}_{i,t-1} + \gamma X_{i,t-1} + \epsilon_{i,t}$$

	<i>Loan Sale</i>		$\Delta \text{Loan Price}$	
	[1]	[2]	[3]	[4]
<i>Nonbank</i>	0.018*** (0.003)			
<i>Nonbank Share</i>		-0.049** (0.019)		
<i>Unstable Nonbank Share</i>			-0.222*** (0.062)	-0.182** (0.091)
<i>Stable Nonbank Share</i>			-0.114 (0.251)	0.020 (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 \implies 1.66%pt \downarrow price (19.2% of \bar{y})
- ▶ Results are not driven by ex ante selection.

Regression evidence - Credit Supply (Refinancing)

$$\text{Loan Amount}_{i,t} = \alpha + \beta \text{Nonbank Share}_{i,2006} + \delta \text{Loan Amount}_{i,2006} + \gamma X_{i,t-1} + \epsilon_{i,t}$$

	<i>Amount 2009</i>		<i>Amount 2010</i>	
	[1]	[2]	[3]	[4]
<i>Nonbank Share 2006</i>	-51.00 (33.41)	-50.96 (48.75)	-72.92* (38.52)	-68.43 (63.82)
<i>Nonbank Share 2006 x Term Loan</i>		-142.60* (66.91)		-194.80** (76.84)
Loan controls	yes	yes	yes	yes
Loan Purpose	yes	yes	yes	yes
Industry FE	yes	yes	yes	yes
N	820	820	820	820
R ²	0.96	0.96	0.92	0.92

Regression evidence - Credit Supply (Extensive Margin)

$$Exit_{i,t} = \alpha + \beta Nonbank Share_{i,2006} + \gamma X_{i,t-1} + \epsilon_{i,t}$$

$$Credit Growth_{i,t} = \alpha + \beta Nonbank Share_{i,2006} + \gamma X_{i,t-1} + \epsilon_{i,t}, \text{ where}$$

$$Credit Growth = \frac{Credit_{i,t} - Credit_{i,2006}}{0.5 * Credit_{i,t} + 0.5 * Credit_{i,2006}}$$

	Exit 2009 [1]	Exit 2010 [2]	Growth 2009 [3]	Growth 2010 [4]
<i>Nonbank Share 2006</i>	0.164*** (0.03)	0.102*** (0.03)	-0.311*** (0.06)	-0.210*** (0.04)
Loan controls	yes	yes	yes	yes
Loan Purpose	yes	yes	yes	yes
Industry FE	yes	yes	yes	yes
N	6,439	6,439	6,439	6,439
R ²	0.10	0.08	0.09	0.05

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$$Exit_{i,t} = \alpha + \beta Nonbank Share_{i,2006} + \gamma X_{i,t-1} + \epsilon_{i,t}$$

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	Exit 2009 [1]	Exit 2010 [2]	Growth 2009 [3]	Growth 2010 [4]
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Industry FE	yes	yes	yes	yes
N	6,439	6,439	6,439	6,439
R ²	0.10	0.08	0.09	0.05

Conclusion

- ▶ Capital constrained banks sell more loans and nonbanks increase their share
 - Exploit (i) some details of Basel III implementation in US which were not expected, and (ii) administrative, supervisory credit register with nonbanks and banks
- ▶ Selection not key:
 - Identical estimated coefficient if we do not control for bank FE and loan-time FE (which explain more than 70 p.p.)
 - Results for nonbanks increase is identical between risky and non-risky loans
- ▶ Nonbanks exacerbate loan price volatility, and decrease access to credit during the 2007-2009 crisis
- ▶ Implications?
 - Financial crisis → more prudential regulation
 - Additional regulations might be counterproductive if risks migrate to shadow banks with volatile funding
 - Monetary policy may instead affect both banks and nonbanks (Stein's advantage of MP —over prudential policy— is that it “get in all the cracks”)

Nonbanks, Banks, and Monetary Policy: U.S. Loan-Level Evidence

work in progress - draft available upon request

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Motivation

- ▶ Credit markets have dramatically changed, with nonbank credit intermediaries being crucial nowadays.
- ▶ A large literature shows that banks cut their credit supply in response to a tightening of monetary policy (MP), hence it is crucial to test nonbanks' credit channel of MP.
- ▶ MP may affect *both* bank and nonbanks: Bernanke (2007), following BGG, or Stein (2013) 's advantage of MP (for prudential policy) is that it “get in all the cracks,” as it directly acts on market rates and spreads that affect everybody.
- ▶ MP may affect *bank credit more*, following Kashyap and Stein (1995, 2000) and Stein (1998) via bank reserves, or Drechsler, Savov, Schnabl (2017) via bank deposits.
- ▶ Hence, a key empirical question is what extent MP differently affects banks' and nonbanks' lending—that is, whether nonbanks attenuate or strengthen the credit channel.

Question and Identification

- ▶ We analyze the effects of MP on credit supply of nonbanks.
- ▶ For identification, we exploit U.S. loan-level data for both, firms and households, since the 1990s in conjunction with monetary policy.
 - ▶ We exploit Gertler-Karadi (2015) monetary policy shocks, based on monetary policy surprises; for robustness we also use shadow rates
 - ▶ For corporate loans, we use syndicated loans from Dealscan
 - ▶ Consumer Loans: NYFED/Equifax Consumer Credit Panel

Preview of Findings

- ▶ Contractionary MP shifts credit to the real economy from banks to nonbanks.
- ▶ Nonbank credit supply relatively expands, demand factors matter, and effects are stronger for ex-ante riskier loans.
- ▶ In the corporate loan market, nonbanks relatively increase credit supply by 12% in response to a one standard deviation MP shock, but overall substitution is limited.
- ▶ In the consumer credit market, the corresponding overall increase in nonbank credit supply is 10%, completely offsetting the retrenchment by banks.
- ▶ Our results suggests that nonbank lenders significantly attenuate the credit channel of monetary policy, especially in loans to consumers, which are based on hard information.

Monetary Policy and MMF Flows

Asset Growth is the quarterly growth rate of total MMF sector assets. CP/Bond growth is the quarterly growth rate of holdings of open market paper and corporate bonds. The sample period is 1990-2012.

	(1)	(2)	(3)	(4)
	Asset Growth		CP/Bond Growth	
	All	Pre-2008	All	Pre-2008
GK Lagged	0.0826***	0.105***	0.103***	0.103***
	(0.0249)	(0.0204)	(0.0296)	(0.0240)
GDP Lagged	0.000538	0.000941	0.00377	0.00434
	(0.00170)	(0.00221)	(0.00273)	(0.00331)
GDP Forecast Lagged	0.000882	0.00422	-0.00207	-0.00571
	(0.00728)	(0.00757)	(0.00997)	(0.00923)
VIX Lagged	-0.000280	-0.000832	-0.000973	-0.00254
	(0.000868)	(0.00114)	(0.00112)	(0.00167)
Inflation lagged	0.00597	-0.0143	-0.00580	-0.00876
	(0.00615)	(0.00856)	(0.0102)	(0.0107)
Trends	YES	YES	YES	YES
Observations	86	67	86	67
R^2	0.332	0.297	0.347	0.299

Aggregate Syndicated Loans: Substitution across Banks and Nonbanks

GK refers to lagged cumulative sums of the monetary policy shocks of Gertler and Karadi (2015) for the US.

	Nonbank Amount (1)	Bank Amount (2)	Nonbank Share (3)	Nonbank Amount (4)	Bank Amount (5)	Nonbank Share (6)
GK	-0.522*** (0.0407)	-0.885*** (0.0410)	0.633*** (0.0280)	-0.503*** (0.0392)	-0.807*** (0.0367)	0.562*** (0.0272)
VIX	0.0124 (0.00792)	0.0340*** (0.0101)	-0.0203*** (0.00635)	0.00953 (0.00705)	0.0260*** (0.00806)	-0.0173*** (0.00569)
Inflation	0.202*** (0.0373)	0.195*** (0.0443)	-0.105*** (0.0300)	0.190*** (0.0317)	0.173*** (0.0357)	-0.0734*** (0.0270)
GDP growth	-0.00848 (0.0162)	-0.0198 (0.0256)	0.00736 (0.0169)	-0.00807 (0.0132)	-0.00884 (0.0214)	0.00190 (0.0151)
GDP growth forecast	0.0765 (0.0543)	0.223*** (0.0728)	-0.0494 (0.0482)	0.0509 (0.0467)	0.131** (0.0579)	-0.0138 (0.0469)
Industry FEs	No	No	No	Yes	Yes	Yes
Observations	5349	15195	5349	5041	14598	5041
Number of borrowers	3876	9508	3876	3572	8923	3572
Number of quarters	90	90	90	90	90	90
R-squared	0.0942	0.154	0.216	0.278	0.364	0.369

The regressions are at quarterly frequency. The sample consists of loans where the borrower country is the USA. Standard errors clustered by borrower and quarter.

Impact of US monetary policy on US corporate lending

	Log(Total Credit Amount)					
	All Loans (1)	Term Loans (2)	Revolvers (3)	All Loans (4)	Term Loans (5)	Revolvers (6)
<i>Panel A: Borrower-quarter fixed effects</i>						
Nonbank x GK	0.135*** (0.0309)	0.193*** (0.0488)	0.0585** (0.0268)	0.0549 (0.0387)	0.308** (0.128)	-0.0135 (0.0512)
Nonbank x High yield x GK				0.205*** (0.0456)	-0.0261 (0.103)	0.194*** (0.0520)
Nonbank x High yield				0.0748* (0.0395)	0.190** (0.0861)	0.0255 (0.0506)
Double Interactions	Yes	Yes	Yes	Yes	Yes	Yes
Triple Interactions	No	No	No	Yes	Yes	Yes
Borrower-quarter FEs	Yes	Yes	Yes	Yes	Yes	Yes
Lender FEs	Yes	Yes	Yes	Yes	Yes	Yes
Observations	92971	14956	54312	46900	4887	25107
R-squared	0.811	0.817	0.829	0.792	0.819	0.804
<i>Panel B: No borrower fixed effects</i>						
Nonbank x GK	0.105** (0.0408)	0.0839 (0.0916)	-0.0116 (0.0514)	0.147* (0.0883)	0.428** (0.165)	-0.00855 (0.0567)
Nonbank x High yield x GK				0.109 (0.0718)	-0.236 (0.148)	0.135* (0.0785)
Nonbank x High yield				-0.468*** (0.0699)	-0.445*** (0.133)	-0.363*** (0.0622)
Double Interactions	Yes	Yes	Yes	Yes	Yes	Yes
Triple Interactions	No	No	No	Yes	Yes	Yes
Quarter FEs	Yes	Yes	Yes	Yes	Yes	Yes
Lender FEs	Yes	Yes	Yes	Yes	Yes	Yes
Observations	98851	16736	58124	47280	4996	25294
R-squared	0.335	0.393	0.289	0.291	0.536	0.314

Impact of US monetary policy on US corporate lending by prior nonbank relationship

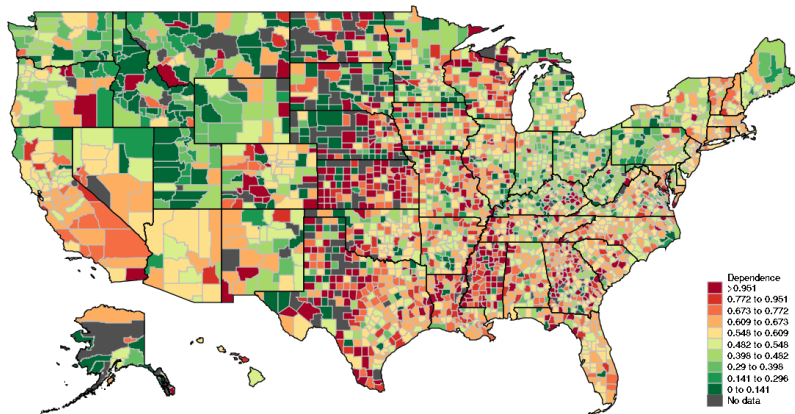
	(1)	(2)	(3)	(4)	(5)
	Borrowing	Total debt	Leverage	Liquid asset ratio	PPE / Assets
Nonbank relation x GK	0.156*** (0.0384)	0.0420** (0.0182)	0.0371** (0.0180)	-0.0654*** (0.0240)	0.0326** (0.0137)
Nonbank relation x VIX	0.000944 (0.00413)	0.000953 (0.00114)	0.00172* (0.00102)	0.00196 (0.00129)	-0.000793 (0.000598)
Nonbank relation x Inflation	0.0178 (0.0325)	-0.00752 (0.00567)	-0.0124* (0.00652)	0.00429 (0.00783)	-0.000985 (0.00304)
Nonbank relation x GDP	0.00616 (0.00885)	0.000285 (0.00202)	0.000477 (0.00184)	-0.00248 (0.00269)	-0.000204 (0.00113)
Nonbank relation x GDP forecast	-0.0193 (0.0317)	0.00947 (0.00695)	0.0212*** (0.00730)	-0.000485 (0.00957)	-0.000983 (0.00389)
Log(Borrower assets)	0.373*** (0.0212)	0.841*** (0.0149)	0.0218* (0.0110)	-0.208*** (0.00914)	0.0333*** (0.00777)
Borrower FEs	Yes	Yes	Yes	Yes	Yes
Industry-quarter FEs	Yes	Yes	Yes	Yes	Yes
Observations	23027	340613	340560	502396	476752
Number of borrowers	5776	9748	9747	10633	10225
Number of quarters	90	90	90	90	90
R-squared	0.844	0.925	0.549	0.630	0.872

Aggregate Auto Loans: Substitution across Banks and Nonbanks (County-Level Results)

	Log New Loan Amount		
	Nonbank (1)	Bank (2)	Total (3)
GK	0.207***	-0.269***	-0.00996
	(0.0474)	(0.0467)	(0.0420)
Inflation	0.0323**	-0.0237	0.00153
	(0.0157)	(0.0149)	(0.0142)
VIX	-0.0132***	-0.00930***	-0.0120***
	(0.00340)	(0.00278)	(0.00266)
GDP	0.0449***	-0.0570***	-0.00358
	(0.00806)	(0.00745)	(0.00658)
GDP Forecast	0.0755***	0.165***	0.113***
	(0.0285)	(0.0221)	(0.0228)
Time-varying County Controls	YES	YES	YES
County FE	YES	YES	YES
Observations	169216	169216	169216
R^2	0.499	0.509	0.530

Dependence on Nonbank Auto Credit in 1999

County-Level Dependence (1999Q1)



Source: Federal Reserve Board / Equifax

County-Level Effects on Auto Loans

	Log New Credit Amount		
	(1) Nonbank	(2) Bank	(3) Total
GK x Nonbank Share 1999	0.503*** (0.0986)	-0.587*** (0.119)	0.109 (0.107)
Inflation x Nonbank Share 1999	-0.0258 (0.0343)	0.0572** (0.0244)	0.0182 (0.0318)
VIX x Nonbank Share 1999	0.0215*** (0.00588)	-0.0197* (0.0106)	0.00125 (0.00891)
GDP x Nonbank Share 1999	0.0186 (0.0182)	-0.0127 (0.0219)	0.0257 (0.0178)
GDP Forecast x Nonbank Share 1999	0.0804 (0.0484)	-0.0879 (0.0702)	-0.0108 (0.0557)
Time-varying County Controls	YES	YES	YES
Time FE	YES	YES	YES
County FE	YES	YES	YES
Observations	158461	158461	158461
R^2	0.489	0.490	0.502

Household-Level Effects on Auto Loans

	Log Amount			New Loan		
	Nonbank (1)	Bank (2)	Total (3)	Nonbank (4)	Bank (5)	Any (6)
GK x Share 1999	0.0312*** (0.00715)	-0.0318*** (0.00664)	-0.000376 (0.00113)	0.00339*** (0.000771)	-0.00377*** (0.000733)	-0.000542 (0.0104)
Double Interactions	YES	YES	YES	YES	YES	YES
HH Controls	YES	YES	YES	YES	YES	YES
County FE	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES
Birth Year FE	YES	YES	YES	YES	YES	YES
Observations	54243317	54243317	54243317	54243317	54243317	54243317
R ²	0.005	0.007	0.010	0.005	0.007	0.010

Standard errors clustered by county and quarter.

Household controls include risk score, mortgage balance, consumer loan balance, credit card balance, bankruptcy indicator, and county-level income.

Household-Level Effects on Auto Loans

	Log Amount			New Loan		
	Nonbank (1)	Bank (2)	Total (3)	Nonbank (4)	Bank (5)	Any (6)
GK x Share 1999	0.0312*** (0.00715)	-0.0318*** (0.00664)	-0.000376 (0.00113)	0.00339*** (0.000771)	-0.00377*** (0.000733)	-0.000542 (0.0104)
Double Interactions	YES	YES	YES	YES	YES	YES
HH Controls	YES	YES	YES	YES	YES	YES
County FE	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES
Birth Year FE	YES	YES	YES	YES	YES	YES
Observations	54243317	54243317	54243317	54243317	54243317	54243317
R ²	0.005	0.007	0.010	0.005	0.007	0.010

Standard errors clustered by county and quarter.

Household controls include risk score, mortgage balance, consumer loan balance, credit card balance, bankruptcy indicator, and county-level income.

Household-Level Effects on Auto Loans: Risk

	Log Amount		
	Nonbank (1)	Bank (2)	Total (3)
GK x Nonbank Share 1999 x Score	-0.0913*** (0.0307)	0.147*** (0.0229)	0.0521 (0.0387)
Observations	54243555	54243555	54243555
R^2	0.009	0.012	0.014

	New Loan		
	Nonbank (1)	Bank (2)	Total (3)
GK x Nonbank Share 1999 x Score	-0.00972*** (0.00335)	0.0162*** (0.00250)	0.00601 (0.00416)
Observations	54243555	54243555	54243555
R^2	0.009	0.012	0.014
Triple Interactions	YES	YES	YES
Lower Interactions	YES	YES	YES
HH Controls	YES	YES	YES
County-Time FE	YES	YES	YES
Birth Year FE	YES	YES	YES

Standard errors clustered by county and quarter. Coefficient multiplied by 1000.

Household controls include risk score, mortgage balance, consumer loan balance, credit card balance, bankruptcy indicator, and county-level income.

Household-Level Effects on Auto Loans: Risk

	Log Amount		
	Nonbank (1)	Bank (2)	Total (3)
GK x Nonbank Share 1999 x Score	-0.0913*** (0.0307)	0.147*** (0.0229)	0.0521 (0.0387)
Observations	54243555	54243555	54243555
R^2	0.009	0.012	0.014

	New Loan		
	Nonbank (1)	Bank (2)	Total (3)
GK x Nonbank Share 1999 x Score	-0.00972*** (0.00335)	0.0162*** (0.00250)	0.00601 (0.00416)
Observations	54243555	54243555	54243555
R^2	0.009	0.012	0.014
Triple Interactions	YES	YES	YES
Lower Interactions	YES	YES	YES
HH Controls	YES	YES	YES
County-Time FE	YES	YES	YES
Birth Year FE	YES	YES	YES

Standard errors clustered by county and quarter. Coefficient multiplied by 1000.

Household controls include risk score, mortgage balance, consumer loan balance, credit card balance, bankruptcy indicator, and county-level income.

Summary

- ▶ We analyze the effects of MP on nonbank credit supply. For identification, we exploit U.S. loan-level data for both, firms and households, since the 1990s in conjunction with MP.
- ▶ Contractionary MP shifts credit to the real economy from banks to nonbanks.
- ▶ Nonbank credit supply relatively expands, demand factors matter, and effects are stronger for ex-ante riskier loans.
- ▶ In the corporate loan market, nonbanks relatively increase credit supply by 12% in response to a one standard deviation MP shock, but overall substitution is limited.
- ▶ In the consumer credit market, the corresponding increase is 10%, completely offsetting banks' retrenchment.
- ▶ Our results suggests that nonbank lenders significantly attenuate the credit channel of MP, especially in loans to consumers, which are based on hard information.

Conclusion

- ▶ Tighter MP implies more funding for nonbanks (as their funding rates increase more than bank deposit rates).
- ▶ Thereby increasing relatively nonbank vis-a-vis bank credit supply (weakening the credit channel of MP).
- ▶ Substitution between banks and nonbanks is perfect in auto loans but not in corporate loans, demand matters.
- ▶ This generates real effects of MP via nonbank credit supply, and firm-nonbank relationships matter.
- ▶ As nonbanks on the margin pay more than banks as MP rates up, then nonbanks take on riskier loans, thereby weakening the risk-taking channel of MP.