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

Ralf R. Meisenzahl  Federal Reserve Board
José-Luis Peydró  UPF, CREI, Imperial College & CEPR

European Central Bank, Frankfurt, December 2018

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.
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, Rajkamal Iyer, Ralf R. Meisenzahl, José-Luis Peydró

University of Illinois & CEPR
Imperial College & CEPR
Federal Reserve Board
UPF, CREI, Imperial College & CEPR
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
This paper

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Leveraged Loans

Syndicated Loan Market has two components:

1. Credit Lines
2. Term Loans
Leveraged Loans

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1. Credit Lines
2. Term Loans

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

“primary market”
“loan origination”

“secondary market”
“loan 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 ≥ $20 million
  2. Syndicated by at least 2 supervised institutions

- **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
This paper

**Objectives:**
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**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
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 $E[R]$, 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**

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Std</th>
<th>25p</th>
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<tbody>
<tr>
<td><strong>Loan Sale</strong></td>
<td>161,794</td>
<td>0.370</td>
<td>0.483</td>
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<td><strong>Loan Share/Assets</strong></td>
<td>161,794</td>
<td>0.676</td>
<td>1.865</td>
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<td><strong>Loan Size</strong></td>
<td>161,794</td>
<td>274.0</td>
<td>619.0</td>
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<td><strong>Agent Bank</strong></td>
<td>161,794</td>
<td>0.181</td>
<td>0.385</td>
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<td>0</td>
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<td><strong>Non-Bank Share</strong></td>
<td>39,058</td>
<td>0.231</td>
<td>0.320</td>
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<td><strong>Tier 1 Capital</strong></td>
<td>161,794</td>
<td>0.100</td>
<td>0.049</td>
<td>0.076</td>
<td>0.089</td>
<td>0.111</td>
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</table>
Bank capital and loan sales

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

<table>
<thead>
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<tbody>
<tr>
<td>\text{Tier 1 Capital}/\text{RWA}</td>
<td>(-0.158***)</td>
<td>(-0.189**)</td>
<td>(-0.108*)</td>
<td>(-0.499***)</td>
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<tr>
<td></td>
<td>(0.057)</td>
<td>(0.910)</td>
<td>(0.060)</td>
<td>(0.196)</td>
</tr>
<tr>
<td>\text{Tier 1 Capital}/\text{RWA} \times TED</td>
<td>(-0.291***)</td>
<td></td>
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<tr>
<td></td>
<td>(0.112)</td>
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</table>

<table>
<thead>
<tr>
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<td>Loan controls \times TED</td>
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<td>Bank controls \times TED</td>
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<tr>
<td>Bank fixed effects</td>
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<tr>
<td>Loan-year fixed effects</td>
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<td>yes</td>
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<tr>
<td>N</td>
<td>97,238</td>
<td>13,479</td>
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<tr>
<td>( R^2 )</td>
<td>0.88</td>
<td>0.87</td>
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</table>

\[ 1\sigma_x \downarrow \implies \sim 0.79\% \text{pt} \uparrow \text{prob. loan share sale} \left(2.14\% \text{ of } \bar{y}\right) \]
### Bank capital and loan sales - Robustness

<table>
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<tr>
<td>Tier 1 Capital/RWA_{t-1}</td>
<td>-0.179***</td>
<td>-0.151**</td>
<td>0.051</td>
<td>-0.044</td>
<td>-0.198***</td>
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<td></td>
<td>(0.061)</td>
<td>(0.060)</td>
<td>(0.037)</td>
<td>(0.027)</td>
<td>(0.054)</td>
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<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td>Bank fixed effects</td>
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<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
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<tr>
<td>Loan-year fixed effects</td>
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<td>Y</td>
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<td>Observations</td>
<td>83,707</td>
<td>87,510</td>
<td>343,241</td>
<td>161,794</td>
<td>97,238</td>
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<td>$R^2$</td>
<td>0.878</td>
<td>0.878</td>
<td>0.712</td>
<td>0.860</td>
<td>0.100</td>
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</table>
Reallocation toward nonbanks

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

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</thead>
<tbody>
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<td><strong>Tier 1 Capital/RWA</strong></td>
<td>–1.547***</td>
<td>–1.582**</td>
<td>–1.334***</td>
<td>–1.406***</td>
</tr>
<tr>
<td></td>
<td>(0.470)</td>
<td>(0.640)</td>
<td>(0.467)</td>
<td>(0.304)</td>
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<td><strong>Tier 1 Capital/RWA \times TED</strong></td>
<td></td>
<td></td>
<td></td>
<td>–2.954***</td>
</tr>
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<td>–4.655***</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>(0.601)</td>
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<td></td>
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<td>(0.980)</td>
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<td>yes</td>
<td>yes</td>
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<tr>
<td>Bank controls</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Year fixed effects</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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<tr>
<td>N</td>
<td>29,121</td>
<td>29,121</td>
<td>29,107</td>
<td>29,121</td>
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<tr>
<td></td>
<td>5,380</td>
<td>5,380</td>
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<td></td>
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<tr>
<td>R²</td>
<td>0.102</td>
<td>0.203</td>
<td>0.196</td>
<td>0.210</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>0.266</td>
<td>0.270</td>
</tr>
</tbody>
</table>

\[ 1\sigma_X \downarrow \implies \sim 3.25\% \text{pt} \uparrow \text{nonbank share (14.1\% of } \bar{y}) \]
(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

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<table>
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<tr>
<th></th>
<th>N</th>
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<th>Std</th>
<th>25p</th>
<th>median</th>
<th>75p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Basel III Tier 1 Shortfall</strong></td>
<td>34,648</td>
<td>-0.030</td>
<td>0.013</td>
<td>-0.039</td>
<td>-0.027</td>
<td>-0.023</td>
</tr>
<tr>
<td><strong>Loan Sale</strong></td>
<td>34,648</td>
<td>0.025</td>
<td>0.156</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td><strong>Loan Share/Assets</strong></td>
<td>34,648</td>
<td>0.125</td>
<td>0.148</td>
<td>0.028</td>
<td>0.075</td>
<td>0.160</td>
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<tr>
<td><strong>Loan Size</strong></td>
<td>34,648</td>
<td>582.0</td>
<td>887.0</td>
<td>115.0</td>
<td>300.0</td>
<td>700.0</td>
</tr>
<tr>
<td><strong>Agent Bank</strong></td>
<td>34,648</td>
<td>0.164</td>
<td>0.370</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Tier 1 Capital</strong></td>
<td>34,648</td>
<td>0.127</td>
<td>0.02</td>
<td>0.112</td>
<td>0.124</td>
<td>0.144</td>
</tr>
</tbody>
</table>
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] $\text{Nonbank Share}_{i,t+1} = \alpha + \beta \text{Basel III Tier 1 Shortfall}_{i,t} + \gamma X_{i,t} + \epsilon_{i,t}$

<table>
<thead>
<tr>
<th></th>
<th>$\Delta \text{Basel III Tier 1/RWA}_{j,t+4}$</th>
<th>$\text{Loan Sale}_{i,j,t+1}$</th>
<th>$\text{Nonbank Share}_{i,t+1}$</th>
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<tbody>
<tr>
<td>Basel III Tier 1 Shortfall</td>
<td>$-0.152^{***}$ (0.041)</td>
<td>$-0.382^{***}$ (0.135)</td>
<td>$-0.095^{**}$ (0.044)</td>
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<td>Loan controls</td>
<td>n/a</td>
<td>n/a</td>
<td>yes</td>
</tr>
<tr>
<td>Bank controls</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Loan fixed effects</td>
<td>n/a</td>
<td>yes</td>
<td>n/a</td>
</tr>
<tr>
<td>N</td>
<td>838</td>
<td>218,252</td>
<td>2,121</td>
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<tr>
<td>$R^2$</td>
<td>0.17</td>
<td>0.14</td>
<td>0.14</td>
</tr>
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</table>

- $1\sigma_X \uparrow \text{Shortfall} \implies 0.5\text{ppt} \uparrow \text{in propensity to sell (20\% of } \bar{y})$
# Mortgage Servicing Rights

<table>
<thead>
<tr>
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<th>Loan Sale$_{i,j,t+1}$</th>
<th>Nonbank Share$_{i,t+1}$</th>
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<tr>
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<td>[1]</td>
<td>[2]</td>
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<tr>
<td><strong>High MSR Exposure</strong></td>
<td>0.014***</td>
<td>0.012***</td>
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<td></td>
<td>(0.003)</td>
<td>(0.003)</td>
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<tr>
<td><strong>Basel III Tier 1 Shortfall</strong></td>
<td>–0.279**</td>
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<tr>
<td></td>
<td>(0.165)</td>
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<td>Loan controls</td>
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<td>n/a</td>
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<tr>
<td>Bank controls</td>
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<td>yes</td>
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<td>Loan fixed effects</td>
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<td>yes</td>
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<tr>
<td>N</td>
<td>218,252</td>
<td>218,252</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.14</td>
<td>0.14</td>
</tr>
</tbody>
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This paper

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

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

A. Stable nonbanks

B. Unstable nonbanks
Summary Statistics

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
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<tr>
<td><strong>Panel A: Loan characteristics</strong></td>
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<tr>
<td>Loan Price Change</td>
<td>116</td>
<td>-0.088</td>
<td>0.072</td>
<td>-0.118</td>
<td>-0.070</td>
<td>-0.041</td>
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<td>Loan Price Level</td>
<td>116</td>
<td>0.979</td>
<td>0.024</td>
<td>0.973</td>
<td>0.986</td>
<td>0.992</td>
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<td>Log(Remaining Maturity)</td>
<td>116</td>
<td>3.664</td>
<td>1.157</td>
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<td>4.5</td>
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<td>Non-Pass</td>
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<td>0.198</td>
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<td><strong>Panel B: Syndicate member characteristics</strong></td>
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<td>Nonbank Share</td>
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<td>0.344</td>
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<td>Unstable Nonbank Share</td>
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<td>0.095</td>
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<td>0.057</td>
<td>0.147</td>
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<td>Stable Nonbank Share</td>
<td>116</td>
<td>0.018</td>
<td>0.032</td>
<td>0</td>
<td>0</td>
<td>0.024</td>
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<td>Tier 1 Capital/RWA</td>
<td>116</td>
<td>0.105</td>
<td>0.051</td>
<td>0.079</td>
<td>0.083</td>
<td>0.102</td>
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### Regression evidence - Prices

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

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</thead>
<tbody>
<tr>
<td><strong>Nonbank</strong></td>
<td>0.018***</td>
<td>−0.049**</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>(0.003)</td>
<td>(0.019)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Nonbank Share</strong></td>
<td></td>
<td>−0.222***</td>
<td>−0.182**</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.062)</td>
<td>(0.091)</td>
<td></td>
</tr>
<tr>
<td><strong>Unstable Nonbank Share</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Stable Nonbank Share</strong></td>
<td></td>
<td>−0.114</td>
<td>0.020</td>
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<tr>
<td></td>
<td></td>
<td>(0.251)</td>
<td>(0.288)</td>
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</tr>
<tr>
<td>Loan controls</td>
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<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Bank controls (synd. avg.)</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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<td>Loan-year fixed effects</td>
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<td>N</td>
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<td>116</td>
<td>116</td>
<td>79</td>
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<tr>
<td>R²</td>
<td>0.64</td>
<td>0.46</td>
<td>0.51</td>
<td>0.57</td>
</tr>
</tbody>
</table>

- \(1\sigma_x \uparrow\) 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)

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

<table>
<thead>
<tr>
<th></th>
<th>Amount 2009</th>
<th>Amount 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[1]</td>
<td>[2]</td>
</tr>
<tr>
<td><strong>Nonbank Share 2006</strong></td>
<td>-51.00</td>
<td>-50.96</td>
</tr>
<tr>
<td></td>
<td>(33.41)</td>
<td>(48.75)</td>
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<tr>
<td><strong>Nonbank Share 2006 \times Term Loan</strong></td>
<td>-142.60*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(66.91)</td>
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</tr>
<tr>
<td>Loan controls</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Loan Purpose</td>
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<td>yes</td>
</tr>
<tr>
<td>Industry FE</td>
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<td>yes</td>
</tr>
<tr>
<td>N</td>
<td>820</td>
<td>820</td>
</tr>
<tr>
<td>(R^2)</td>
<td>0.96</td>
<td>0.96</td>
</tr>
</tbody>
</table>
Regression evidence - Credit Supply (Extensive Margin)

\[
\begin{align*}
\text{Exit}_{i,t} &= \alpha + \beta \text{Nonbank Share}_{i,2006} + \gamma X_{i,t-1} + \epsilon_{i,t} \\
\text{Credit Growth}_{i,t} &= \alpha + \beta \text{Nonbank Share}_{i,2006} + \gamma X_{i,t-1} + \epsilon_{i,t}, \quad \text{where} \\
\text{Credit Growth} &= \frac{\text{Credit}_{i,t} - \text{Credit}_{i,2006}}{0.5 \times \text{Credit}_{i,t} + 0.5 \times \text{Credit}_{i,2006}}
\end{align*}
\]

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nonbank Share 2006</strong></td>
<td>0.164***</td>
<td>0.102***</td>
<td>−0.311***</td>
<td>−0.210***</td>
</tr>
<tr>
<td></td>
<td>(0.03)</td>
<td>(0.03)</td>
<td>(0.06)</td>
<td>(0.04)</td>
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<tr>
<td>Loan controls</td>
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<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Loan Purpose</td>
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<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Industry FE</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>N</td>
<td>6,439</td>
<td>6,439</td>
<td>6,439</td>
<td>6,439</td>
</tr>
<tr>
<td>R²</td>
<td>0.10</td>
<td>0.08</td>
<td>0.09</td>
<td>0.05</td>
</tr>
</tbody>
</table>
Regression evidence - Credit Supply (Extensive Margin)

\[
Exit_{i,t} = \alpha + \beta \text{Nonbank Share}_{i,2006} + \gamma \text{X}_{i,t-1} + \epsilon_{i,t}
\]

\[
\text{Credit Growth}_{i,t} = \alpha + \beta \text{Nonbank Share}_{i,2006} + \gamma \text{X}_{i,t-1} + \epsilon_{i,t}, \text{ where}
\]

\[
\text{Credit Growth} = \frac{\text{Credit}_{i,t} - \text{Credit}_{i,2006}}{0.5 * \text{Credit}_{i,t} + 0.5 * \text{Credit}_{i,2006}}
\]

<table>
<thead>
<tr>
<th></th>
<th>Exit 2009</th>
<th>Exit 2010</th>
<th>Growth 2009</th>
<th>Growth 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nonbank Share 2006</strong></td>
<td>0.164***</td>
<td>0.102***</td>
<td>-0.311***</td>
<td>-0.210***</td>
</tr>
<tr>
<td></td>
<td>(0.03)</td>
<td>(0.03)</td>
<td>(0.06)</td>
<td>(0.04)</td>
</tr>
<tr>
<td>Loan controls</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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<tr>
<td>Loan Purpose</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Industry FE</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>N</td>
<td>6,439</td>
<td>6,439</td>
<td>6,439</td>
<td>6,439</td>
</tr>
<tr>
<td>R²</td>
<td>0.10</td>
<td>0.08</td>
<td>0.09</td>
<td>0.05</td>
</tr>
</tbody>
</table>
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

David Elliott  Imperial College & Bank of England
Ralf R. Meisenzahl  Federal Reserve Board
José-Luis Peydró  UPF, CREI, Imperial College & CEPR
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.

<table>
<thead>
<tr>
<th></th>
<th>(1) Asset Growth</th>
<th>(2) CP/Bond Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All Pre-2008</td>
<td>All Pre-2008</td>
</tr>
<tr>
<td>GK Lagged</td>
<td>0.0826***</td>
<td>0.105***</td>
</tr>
<tr>
<td></td>
<td>(0.0249)</td>
<td>(0.0204)</td>
</tr>
<tr>
<td>GDP Lagged</td>
<td>0.000538</td>
<td>0.000941</td>
</tr>
<tr>
<td></td>
<td>(0.00170)</td>
<td>(0.00221)</td>
</tr>
<tr>
<td>GDP Forecast Lagged</td>
<td>0.000882</td>
<td>0.00422</td>
</tr>
<tr>
<td></td>
<td>(0.00728)</td>
<td>(0.00757)</td>
</tr>
<tr>
<td>VIX Lagged</td>
<td>-0.000280</td>
<td>-0.000832</td>
</tr>
<tr>
<td></td>
<td>(0.000868)</td>
<td>(0.00114)</td>
</tr>
<tr>
<td>Inflation lagged</td>
<td>0.00597</td>
<td>-0.0143</td>
</tr>
<tr>
<td></td>
<td>(0.00615)</td>
<td>(0.00856)</td>
</tr>
<tr>
<td>Trends</td>
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<td>YES</td>
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<tr>
<td>Observations</td>
<td>86</td>
<td>67</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.332</td>
<td>0.297</td>
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</tbody>
</table>

**Notes:**
- *****:** Significance level at 1%.
- All equations include a constant term (not shown here).
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.

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

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

#### Panel A: Borrower-quarter fixed effects

<table>
<thead>
<tr>
<th></th>
<th>All Loans (1)</th>
<th>Term Loans (2)</th>
<th>Revolvers (3)</th>
<th>All Loans (4)</th>
<th>Term Loans (5)</th>
<th>Revolvers (6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonbank × GK</td>
<td>0.135***</td>
<td>0.193***</td>
<td>0.0585**</td>
<td>0.0549</td>
<td>0.308**</td>
<td>-0.0135</td>
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<tr>
<td></td>
<td>(0.0309)</td>
<td>(0.0488)</td>
<td>(0.0268)</td>
<td>(0.0387)</td>
<td>(0.128)</td>
<td>(0.0512)</td>
</tr>
<tr>
<td>Nonbank × High yield × GK</td>
<td>0.205***</td>
<td>-0.0261</td>
<td>0.194***</td>
<td>0.0395</td>
<td>0.0861</td>
<td>0.194***</td>
</tr>
<tr>
<td></td>
<td>(0.0456)</td>
<td>(0.103)</td>
<td>(0.0520)</td>
<td>(0.0395)</td>
<td>(0.0861)</td>
<td>(0.0506)</td>
</tr>
<tr>
<td>Nonbank × High yield</td>
<td>0.0748*</td>
<td>0.190**</td>
<td>0.0255</td>
<td>0.0395</td>
<td>0.0861</td>
<td>0.0255</td>
</tr>
<tr>
<td></td>
<td>(0.0395)</td>
<td>(0.0861)</td>
<td>(0.0506)</td>
<td>(0.0395)</td>
<td>(0.0861)</td>
<td>(0.0506)</td>
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<tr>
<td>Double Interactions</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Triple Interactions</td>
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<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Borrower-quarter FEs</td>
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<td>Yes</td>
<td>Yes</td>
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<td>Yes</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>0.829</td>
<td>0.792</td>
<td>0.819</td>
<td>0.804</td>
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</table>

#### Panel B: No borrower fixed effects

<table>
<thead>
<tr>
<th></th>
<th>All Loans (1)</th>
<th>Term Loans (2)</th>
<th>Revolvers (3)</th>
<th>All Loans (4)</th>
<th>Term Loans (5)</th>
<th>Revolvers (6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonbank × GK</td>
<td>0.105**</td>
<td>0.0839</td>
<td>-0.0116</td>
<td>0.147*</td>
<td>0.428**</td>
<td>-0.00855</td>
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<tr>
<td></td>
<td>(0.0408)</td>
<td>(0.0916)</td>
<td>(0.0514)</td>
<td>(0.0883)</td>
<td>(0.165)</td>
<td>(0.0567)</td>
</tr>
<tr>
<td>Nonbank × High yield × GK</td>
<td>0.109</td>
<td>-0.236</td>
<td>0.135*</td>
<td>0.0718</td>
<td>0.148</td>
<td>0.0785</td>
</tr>
<tr>
<td></td>
<td>(0.0718)</td>
<td>(0.148)</td>
<td>(0.0785)</td>
<td>(0.0718)</td>
<td>(0.148)</td>
<td>(0.0785)</td>
</tr>
<tr>
<td>Nonbank × High yield</td>
<td>-0.468***</td>
<td>-0.445***</td>
<td>-0.363***</td>
<td>0.0699</td>
<td>0.133</td>
<td>0.0622</td>
</tr>
<tr>
<td></td>
<td>(0.0699)</td>
<td>(0.133)</td>
<td>(0.0622)</td>
<td>(0.0699)</td>
<td>(0.133)</td>
<td>(0.0622)</td>
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<tr>
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<td>Lender FEs</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>Yes</td>
</tr>
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<td>Observations</td>
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<td>16736</td>
<td>58124</td>
<td>47280</td>
<td>4996</td>
<td>25294</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.335</td>
<td>0.393</td>
<td>0.289</td>
<td>0.291</td>
<td>0.536</td>
<td>0.314</td>
</tr>
</tbody>
</table>
### Impact of US monetary policy on US corporate lending by prior nonbank relationship

<table>
<thead>
<tr>
<th></th>
<th>(1) Borrowing</th>
<th>(2) Total debt</th>
<th>(3) Leverage</th>
<th>(4) Liquid asset ratio</th>
<th>(5) PPE / Assets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonbank relation x GK</td>
<td>0.156***</td>
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Aggregate Auto Loans: Substitution across Banks and Nonbanks (County-Level Results)

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Dependence on Nonbank Auto Credit in 1999

County-Level Dependence (1999Q1)

Source: Federal Reserve Board / Equifax
## County-Level Effects on Auto Loans

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# Household-Level Effects on Auto Loans

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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

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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

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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

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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.