Regulation, Technology and Shadow Banks
A Decade after Lehman

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Based on 1) "Fintech, Regulatory Arbitrage and the Rise of Shadow Banks" in Journal of Financial Economics and 2) "The Limits of Shadow Banks". Coauthored with Buchak, Matvos and Piskorski
Dramatic Change in Lending over last Decade

- Regulatory framework and research: Banks are key suppliers of loans to household & firms
  - Raise capital requirements → reduced bank lending including fewer loans, higher rates

- Overlooks entry of shadow banks and FinTech lenders

**FIGURE 1A: RISE OF SHADOW BANKS**

- Shadow bank share in the US personal loan market
- Shadow bank share in the US residential mortgage market
Dramatic Change in Lending over last Decade

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**Figure 1B: Shadow Banks in Mortgage Sector**

- **Shadow bank share in the US residential mortgage market**
  - **1/3rd FinTech**
  - **2007-2017**

**Largest Mortgage Lenders, by Originations in Q1 2018**
- In $ billions, purchase mortgages & refis
- **"Shadow banks" in red**

- Quicken Loans: $17.0
- Wells Fargo: $14.5
- JP Morgan Chase: $8.6
- LoanDepot: $6.4
- United Wholesale Mortgage: $6.0
- Bank of America: $5.9
- Caliber Home Loans: $5.4
- Fairway Independent Mortgage: $3.8
- Guaranteed Rate: $2.6
- US Bank: $3.6
Mechanisms

- How much of the growth driven by Regulation? And how much by Technology?
  - Regulation: capital costs, scrutiny/supervision burden, legal costs
  - Technology: lower costs, better/higher quality products, better models

**Figure 2A: Increased Regulation?**

**Figure 2B: Better Technology?**
Regulation?
Regulation?

- Extensive regulation of banks after crisis
  - Dodd Frank
  - Basel III
  - Changes in regulators, enforcement, …

- Evidence reveals that regulation dampens bank lending
  - Traditional banks face rising capital costs
  - Traditional banks face greater capital constraints
  - Traditional banks face greater regulatory scrutiny

- Shadow banks fill regulatory gaps
County Level Shadow Bank Share: 2008
County Level Shadow Bank Share: 2015
Regulation?

- **Source of Variation**
  - Banks are exposed to national-level regulatory shocks
  - Counties exposed through 2008 bank lending market share
  - County-level variation from differential exposure to differentially shocked banks

- **Regulatory Changes**
  1. **Higher Capital Requirements**
     - *Bank Capitalization*: Banks rebuilding capital $\rightarrow$ Lend less
  2. **Basel III**
     - *Mortgage Servicing Rights*: Banks with more MSR $\rightarrow$ Lend less
  3. **Enforcement / Legal Risk**
     - *Lawsuits*: Banks exposed to more mortgage-related lawsuits $\rightarrow$ Lend less
  4. **Tighter regulatory supervision:**
     - *OTS Closure*: Banks supervised by OTS $\rightarrow$ Lend Less

- **Outcome**
  - Find changes in shadow bank market share from 2008 *positively related* with regulatory changes
Where are the loans?

- What do banks and shadow banks do with their loans?
  - Banks: Retention on balance-sheet (30-50%)
  - Shadow Banks: Sell primarily to GSEs (~90%)
Technology?
Technology?

Figure: Fintech Shadow Bank Share

1/3rd of this growth due to fintech lenders
Technology?

- Technology allows for several novel aspects that banks may find difficult to copy
  - Lower costs of reaching the customer
  - Offer better/convenient/higher quality products,
  - Use big data and better models to profile risk or price discriminate (better back out WTP)
Technology?
Aside: Non Fintech Shadow Bank

What to expect.

Understand the refinance process from application through closing.

Here is a quick overview of the approval process. A Home Loan Specialist can answer any questions you may have.

Initial review

You are assigned a loan processor who works with you through your closing - organizing your paperwork and making sure your documentation is complete prior to the final review.

Underwriting

Once we have your documentation, an underwriter reviews your loan package to make sure it fits loan guidelines, evaluates your loan application, and then makes a credit decision. In some cases, we may request additional information before making a decision. Your loan processor can assist you with this.

Approval decision

Once your loan is approved, a closing date will be set. At least three business days before your closing date, we will
Fintech lenders operate in a different manner
  - Target refinancing where they have comparative advantage
Fintech lenders operate in a different manner

- Target refinancing where they have comparative advantage
- Leverage and process consumer data faster
Technology? Other Data?

- Fintech lenders operate in a different manner
  - Target refinancing where they have comparative advantage
  - Leverage and process consumer data faster

**Figure:** % with Declared White
Technology? Quality

Mortgage Customer Satisfaction Increases as Lenders Adopt New Technology, Improve Efficiency

2015 U.S. Primary Mortgage Origination Satisfaction Study | J.D. Power
Technology? Quality

J.D. POWER

2015 U.S. Primary Mortgage Origination Satisfaction Study℠

Mortgage Origination Customer Satisfaction Index Ranking
(Based on a 1,000-point scale)

<table>
<thead>
<tr>
<th>Bank</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quicken Loans</td>
<td>850</td>
</tr>
<tr>
<td>Fifth Third Mortgage</td>
<td>812</td>
</tr>
<tr>
<td>Bank of America</td>
<td>811</td>
</tr>
<tr>
<td>BB&amp;T (Branch Banking &amp; Trust Co.)</td>
<td>811</td>
</tr>
<tr>
<td>CitiMortgage</td>
<td>809</td>
</tr>
<tr>
<td>U.S. Bank Home Mortgage</td>
<td>798</td>
</tr>
<tr>
<td>Chase</td>
<td>795</td>
</tr>
</tbody>
</table>

JDPower.com
Power Circle Ratings℠
for consumers:
Technology? Willingness to Pay

- Fintech lenders operate in a different manner...and charge more!
  - Target refinancing where they have comparative advantage
  - Leverage and process consumer data faster

**Figure: Price Discrimination**
Markets Targeted and Funding
- Shadow banks specialize in high risk segments (including FHA)
- Fintech shadow banks specialize in refinancing market, target unreported race

Interest Rates
- Overall shadow banks and banks charge similar rates relative to traditional banks
- Fintech shadow banks are 14-16 bp more expensive

Performance/Models
- Defaults similar across lenders…
  …Yet…
- Shadow and fintech bank borrowers more likely to Prepay → higher turnover and fees for lenders
QUANTITATIVE ASSESSMENT
What we know so far:

- Shadow banks gain market share in areas where banks are subject to more regulatory oversight.
- Within shadow banks, fintech commands rate premium and appears to process/sell loans faster

Model objectives:

- Combine regulatory and technology effects
- Decomposition: how much in technology and how much is regulation
- Informed by the data (market shares, prices)

Estimate that 60-70% of shadow bank growth due to regulation and rest due to technology
Model Ingredients

- **Borrowers**
  - Utility depends on interest rate and non-price attributes (quality/convenience)
  - Choose among traditional banks, non fintech shadow banks and fintech shadow banks

- **Lenders**
  - Differ in costs, quality and regulatory burden
  - Choose whether to enter and if they do, interest rate to charge

- **Equilibrium and calibration**
  - Lenders chose entry and rate to maximize profits
  - Free entry $\rightarrow$ zero profit condition
  - Calibrate model to observed data in zip-year

- **Key Patterns**
  - Bank vs Shadow bank: Banks losing mkt share due to higher regulatory costs or interest rates?
  - Fintech vs Non Fintech: Fintech gain mkt share despite higher interest rates?
Banks Lose Market Share

Funding Costs?

Bank Market Share

Market Share %

0.8
0.75
0.7
0.65
0.6

Bank Premium over Non-Fintech

Rate %

1
0.5
0
-0.5
-1

Bank Funding Cost Relative to Non-Fintech

-1
-0.5
0
0.5
1

Not in the data
Banks Lose Market Share

Regulation?
FinTech Gain Market Share

Funding Costs?
FinTech Gain Market Share

Quality?
Counterfactuals

- No changes in fintech quality and regulations
- No changes in fintech quality, changes in regulations
- Changes in fintech quality, no changes in regulation
- Under each scenario compute changes in market shares for
  - Fintech lenders
  - Non-fintech lenders
Counterfactuals: Shadow Bank Growth

- No Changes
- Regulatory Burden
- Fintech Quality Increase
- Actual
INTEGRATED INTERMEDIATION
Penetration of Shadow Banks Not Uniform

**Figure: Bank Market Share**

- **Conforming**
- **Jumbo**
Bigger Questions

- Which type of activities migrate to shadow banks and which do not?

- Why?

- How much? (quantitative importance)
Bigger Questions

- Traditional Banks
  - Balance sheet capacity → dominate portfolio lending (Low capitalization → low portfolio lending)
  - Can shift their business model (jumbo vs conforming, % retained) with their capitalization

- Shadow banks
  - Lower regulatory burden
  - Originate-to-distribute market
QUANTITATIVE ASSESSMENT
Integrated view of Financial Intermediation

- Credit market framework needs to recognize importance of shadow banks and alternative bank business models
  - Equilibrium interaction between traditional and shadow banks
  - Bank choice of business model

- Why do we care?
  - Impact on aggregate lending amplified or dampened depending on the policy shock
  - Bank stability: Who bears risk and what is bank’s business model?
  - Redistribution: Who gets credit and at what price?
## Counterfactuals: Capital Ratios

### Capital Requirements 6% → 7.5%

<table>
<thead>
<tr>
<th>Lender</th>
<th>Loan Type</th>
<th>Financing Source</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>-</td>
<td>-</td>
<td>-$13b</td>
</tr>
<tr>
<td>Bank</td>
<td>Jumbo</td>
<td>Portfolio</td>
<td>-$38b</td>
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<tr>
<td>Bank</td>
<td>Conforming</td>
<td>Portfolio</td>
<td>-$204b</td>
</tr>
<tr>
<td>Bank</td>
<td>Conforming</td>
<td>GSE</td>
<td>+$215b</td>
</tr>
<tr>
<td>Shadow Bank</td>
<td>Conforming</td>
<td>GSE</td>
<td>+$b</td>
</tr>
</tbody>
</table>

**FIGURE: LENDING VOLUMES ($B) AND CAPITAL REQUIREMENTS**
Counterfactuals: Capital Ratios

Figure: Lending Volume Changes ($B)

Without shadow banks
Counterfactuals: Capital Ratios

**Figure: Lending Volume Changes ($B)**

- With shadow banks
- Shadow banks “dampen” the response
- Without shadow banks

Y-axis: $0, $50, $100, $150, $200, $250
X-axis: 3%, 4.5%, 6%, 7.5%, 9%, 12%
Counterfactuals: QE and GSE Market Intervention

**GSE Financing Cost -10bps**

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<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>-</td>
<td>-</td>
<td>+$61b</td>
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<tr>
<td>Bank</td>
<td>Jumbo</td>
<td>Balance Sheet</td>
<td>-$4b</td>
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<tr>
<td>Bank</td>
<td>Conforming</td>
<td>Balance Sheet</td>
<td>-$357b</td>
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<tr>
<td>Bank</td>
<td>Conforming</td>
<td>GSE</td>
<td>+$389b</td>
</tr>
<tr>
<td>Shadow Bank</td>
<td>Conforming</td>
<td>GSE</td>
<td>+$33b</td>
</tr>
</tbody>
</table>

**Figure: Lending Volumes ($b)**

- Shadow Bank GSE Conforming
- Bank GSE Conforming
- Bank Balance Sheet Conforming
- Bank Balance Sheet Jumbo
Counterfactuals: QE and GSE Market Intervention

**Figure: Lending Volume Changes ($B)**

- Without shadow banks

![Graph showing changes in lending volume with different baseline adjustments.](image-url)
Counterfactuals: QE and GSE Market Intervention

**Figure: Lending Volume Changes ($B)**

- With shadow banks
- Shadow banks “amplify” the response
- Without shadow banks
IMPLICATIONS
Discussion

- Regulatory and technological forces have contributed to tremendous growth of shadow banks

- Relative comparative advantage of traditional banks (TB) and shadow banks (SB)
  - TB benefit from greater balance sheet capacity, dominate balance sheet based lending
  - SB benefit from lower regulatory burden, specialize in originate to distribute
  - Aggregate bank capitalization closely commoves with relative prices and market volumes

- Current financial regulation framework mainly focused on TB
  - Tighter bank regulation can push lending into shadows with little regulatory oversight
  - Tighter securitization market can lead to potentially bigger contraction in overall lending
  - Critical to account for SB response in considering polices/regulations
Broader Implications

- SB lack balance sheet capacity
  - Very dependent on securitization market (e.g., GSEs) and short-term warehouse financing
  - Can shutdown in face of problems (like in 2007)
  - Can lead to price pressure induced contagion due to fire sales

- SB issue hundred billions of loans per year guaranteed by US taxpayers (risk with GSEs)
  - They do so in a lightly regulated way, can potentially increase taxpayers’ liability in the crisis
  - Shocks in SB sector can ripple back into banking sector since financed entirely by banks