Fintech, Regulatory Arbitrage, and the Rise of Shadow Banks

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Two Trends in Residential Mortgages

Assess role of technology and regulation in recent increase of market disruptors: Focus on largest consumer finance market

1. Growth of shadow bank origination share

2. Growth of fintech origination share
Possible Mechanisms

1. **Regulation:** Shadow banks fill regulatory gaps.
   - Traditional banks face rising capital costs.
   - Traditional banks face greater capital constraints.
   - Traditional banks face greater regulatory scrutiny.

2. **Technology:** Fintech possesses better technology.
   - Fintech lends at lower cost.
   - Fintech offers higher quality products.
   - Fintech uses big data and better models to screen better.
Our Objective

Our objective:

• First comprehensive analysis of fintech and non-fintech lenders during recent expansion of shadow bank lending in a $10 trillion loan market.

• How much of shadow bank and fintech growth is regulation, how much is better technology?

Note: No cost / benefit analysis
Basic Approach

1. **Effects of Regulation**
   - Compare banks to shadow banks.
   - Look for differences associated with regulations.

2. **Role of Technology**
   - *Within* shadow banks, compare fintech and non-fintech.
   - Holding regulation constant, look for differences across types.

3. **Disentangling the Effects**
   - Structural model of lender choice and entry.
   - Contribution of regulation and technology to big-picture market trends.
Road Map

1. Data and definitions
2. Facts on shadow banking and fintech loans
3. Effect of regulation
4. Effect of technology
5. Model
Data and Definitions
Data

1. **HMDA**
   - All loans (can analyze entry)
   - Originator name, borrower demographics
   - No loan outcomes

2. **Fannie Mae and Freddie Mac**
   - Conforming loans purchased by Fannie Mae or Freddie Mac
   - Originatory name, FICO, interest rates, location, purpose
   - **Includes** loan outcomes

3. **Regulatory Data**
   - Lawsuit settlements arising out of Financial Crisis (Law360, SEC, SNL Financial)
   - Bank capital ratios, mortgage assets (Federal Reserve)

4. **Census**
   - County-level demographic information
Lender Classification

1. **Traditional bank vs. shadow bank**
   - Bank: Depository institution

2. **Within shadow banks: Fintech vs. non-fintech**
   - Fintech: all or nearly all of origination process is online, including **firm rate offer**
   - Platform automatically aids in data collection (wage, assets, etc.)

3. **Implementation**
   - Manual classification
   - Fannie and Freddie: Classify all identified lenders (top 50 from each quarter)
   - HMDA: F&F lenders plus next largest to get 80% market share coverage as of 2010.
Basic Facts:
The Decline of Traditional Banks
Shadow Bank Share: Conforming
Fintech Share: Conforming
Basic Facts

Which segments see growth of shadow banks and fintech?

Idea: Comparative Advantage
  • Larger growth = larger comparative advantage

Approach:
  • Banks vs. Shadow Banks (different regulation)
  • Fintech vs. Non-Fintech (same regulation, different tech.)

Analysis:
  • Within Market (loan level)
  • Market level analysis (across markets)
Borrower Characteristics

1. **Race/Ethnicity**
   - Shadow banks more active among minorities
   - Fintech shadow active among non-minorities

2. **FHA and FICO**
   - Shadow banks originate roughly 75% of FHA loans
   - FHA loan segment: Particularly high risk
   - Both fintech and non-fintech active among lower FICO borrowers

3. **Economic Situations**
   - Shadow banks more active in high-unemployment areas
   - Fintech shadow banks more active in low-unemployment areas
   - Shadow banks borrowers less-likely to be first-time borrowers
Purpose and Financing

1. Loan Purpose
   • 75% of fintech loans are refinances vs. 50% for others
   • Likely possess comparative advantage in refinance

2. Loan Financing
   • Banks more likely to retain mortgages on balance sheet
   • Shadow banks sell to GSEs or private buyers
   • Sell at a faster pace
Interest Rates and Performance

1. How did shadow banks increase market share?
   • Cheaper mortgages?

2. Is the cost of regulation passed through to consumers?

3. Non-price characteristics (performance)
1. **Interest Rates**
   - Non-fintech shadow banks 2-3 bps **cheaper** than banks
   - Fintech shadow banks 13-14 bps **more expensive** than banks

2. **Performance (given interest rates)**
   - Shadow banks loans 0.02% more likely to default
   - Shadow bank loans 2%-2.5% more likely to prepay
Basic Facts Summary

1. **Loan Types, Purposes, and Financing**
   - Shadow banks specialize in high risk FHA sector
   - Fintech specifically specializes in refinesances
   - Shadow banks rely on originate-to-distribute (GSE)

2. **Borrower Characteristics**
   - Shadow banks target higher risk borrowers

3. **Pricing and Performance**
   - Fintech charges significant premium, suggests higher quality or convenience value
   - Shadow banks perform slightly worse
Role of Regulation
Spatial Tests: County level changes

Bartik Style: County exposure to shocks

Ex: Capital requirements

For every county from 2008-2015:

\[ \Delta Local \ Capital \ Ratio_c = \text{lending-weighted change in local bank capital ratio} \]
\[ \Delta Shadow \ Bank \ Lending \ Share_c = \text{Change in shadow bank share} \]

\[ \Delta Shadow \ Bank \ Lending \ Share_c = \beta_0 + \beta_1 \Delta Local \ Capital \ Ratio_c + X'_c \Gamma + \epsilon_c \]
1. **Growth in capital ratios**
   - **Hypothesis:** Banks re-growing capital forego lending, shadow banks enter.

2. **Changing treatment of mortgage servicing rights**
   - **Hypothesis:** New regulation disadvantages MSR as a component of capital. Banks with high MSR% of Tier-1 Capital reduce lending, shadow banks enter.

3. **Lawsuits arising out of financial crisis**
   - **Hypothesis:** Post-crisis lawsuits fell on banks, shadow banks enter.

**Gap filling (treatment vs not):**
- Traditional banks decrease volume relative to 2008
- Shadow banks increase volume relative to 2008
Role of Technology
Technology and Rise of Fintech

1. **Pricing levels:**
   - Fintech charges significant premium versus non-fintech
   - Suggests fintech provides quality rather than cost savings

2. **Pricing models:**
   - “Big data” vs loan officers
   - Explanatory power of standard credit variables
     - FICO, LTV, ..., within ZIP x Quarter
   - $R^2$ much smaller for fintech
   - Suggests fintech uses different data in pricing loans
Model
1. **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 significant premium and appears to use better models.

2. **Model objectives:**
   - Combine regulatory and technology effects.
   - Decomposition: source of comparative advantage?
   - Counterfactuals turning on/off channels.
Model Setup: Borrowers

1. Borrower $b$ with mortgage of face value $F$ faces $N$ offers
   - Interest rate $r_i$
   - Non-price attributes
     I. Vertical ("quality") $q_i$
     II. Horizontal $\epsilon_{ib}$

2. Utility from offer $i$ is:

   $$u_{ib} = -\alpha r_i + q_i + \epsilon_{ib}$$

3. Borrower’s optimal choice implies probability of choosing $i$ is:

   $$p_{ib}(r_i, q_i; \{r_j, q_j\}) = \frac{\exp(-\alpha r_i + q_i)}{\sum_{j=1}^{N} \exp(-\alpha r_j + q_j)}$$
Model Setup: Lenders

1. Lender types
   • Banks
   • Non-fintech shadow banks
   • Fintech shadow banks

2. Endogenous number of lenders, $N_b, N_n, N_f$

3. Lenders differ in
   • Costs
   • Quality
   • Regulatory burden
Model Setup: Lenders

1. **Lenders differ on costs**
   - Funding cost $\rho_i \in \{\rho_b, \rho_n, \rho_f\}$
   - Operating (fixed) cost $c_i \in \{c_b, c_n, c_f\}$

2. **Lenders differ on quality**
   - Quality measures service quality, convenience, ease of access.
   - $q_i \in \{q_b, q_n, q_f\}$

3. **Banks differ on regulatory burden**
   - Probability $1 - \gamma_b$ a bank cannot lend to borrower $b$
   - i.i.d. across borrower-bank pairs
Model Setup: Supply

Find **symmetric equilibrium** within types

- Lenders choose entry and sets rate $r_i$ to maximize expected profit:

  $$r_i^* = \arg\max_{r_i} (r_i - \rho_i)p_{ib}(r_i, q_i; \{r_j, q_j\})$$

- Given fixed cost $(c)$, lender profit is

  $$\pi_i = (r_i^* - \rho_i)\gamma_i s_i(r_i^*, q_i; \{r_j, q_j\})F - c_i$$

- Free entry $\rightarrow$ zero profit condition (taking costs into account)
Calibration: Approach

1. Aggregate HMDA data to year level and calibrate to observed data in mean zip
   - Calibrate model each year
   - Market Shares, rates, number of lenders

2. Normalizations needed for identification
   - Funding costs: relative to bank and 10-year yield
   - Regulatory burden relative to 2008., $\gamma_{b2008} = 1$
   - Quality trend only in fintech, i.e., $q_{nt} = q_{n2008}$
Calibration: Lender (Variable) Costs

- Non-Fintech
- Fintech
Calibration: Regulatory Burden
Validation with Actual Data

Cross-validate model by running MSR regression on cumulative market share changes year-by-year.
Counterfactuals

1. No fintech, no changes in regulations
2. No fintech, changes in regulations
3. Fintech, no changes in regulation

Observe changes in non-fintech and fintech market shares under each counterfactual
Counterfactuals

- No Changes
- Regulatory Burden
- Fintech Quality Increase
- Actual

Fintech: 5%
Non-Fintech: 0%
Robustness

1. Analysis w/ county x year FE; ZIP x year FE
2. Sample
   • FHA sample for interest rates
   • Top 50 lender analysis
   • Fintech activity of banks
   • Classification: Wayback machine
3. Non-linear
4. Origination fees
5. Do rates predict performance?
6. $R^2$
   1. Non-linear controls
   2. Bootstrapped SE
Conclusion

Assess role of technology and regulation in recent increase of market disruptors: Focus on largest consumer finance market

1. **Regulatory arbitrage seems the dominant force**
   - Shadow banks now control riskiest segment
   - Shadow banks issue large amounts of guarantees on behalf of taxpayers in a lightly regulated market

2. **Technology does play role in rise of fintech firms**
   - Fintech focuses on refinancing already creditworthy borrowers at a high price.
   - Does not appear to democratize credit access
   - Does not appear to reduce cost of credit

3. **70% regulation, 30% technology**