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 different models
Our Objective

Our objective:

• First comprehensive analysis of fintech and non-fintech lenders during recent expansion of shadow bank lending in the largest consumer loan market ($10 trillion)

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

Note: No cost / benefit analysis
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
   - Originator 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...)

3. Implementation
   • Manual classification
   • Fannie and Freddie: Classify all identified lenders (Top 50)
   • HMDA: F&F lenders plus next largest to get 80% market share
A “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
A “Fintech” Shadow Bank

ROCKET MORTGAGE
by Quicken Loans
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A “Fintech” Shadow Bank

Your rate is now locked!

Property Address:
123 Main Street, Detroit, MI, 48226

Here’s what you’ve locked in:

- **Interest Rate**: 4.125%
- **Loan Type**: 30-Year Fixed
- **Discount Points**: 0.12 (6264.56)
- **New Loan Amount**: $211,650
- **Your Rate Lock Expiration Date**: 01/06/2016

The Steps to Get You to Closing

- Use our powerful online tools to get you through the mortgage process with ease.
- Complete your simple to do list by 11/25/2015.

Save & Continue
Basic Facts:
The Decline of Traditional Banks
Shadow Bank Share: All Loans

- 0%
- 10%
- 20%
- 30%
- 40%
- 50%
- 60%

Shadow Bank Share: Conforming

- 0%
- 10%
- 20%
- 30%
- 40%
- 50%
- 60%
- 70%
- 80%
- 90%
- 100%


Graph showing the change in Shadow Bank Share from 2007 to 2015.
Fintech Shadow Bank Share: Conforming
Borrower Characteristics

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

2. FHA and FICO
   • Shadow banks originate roughly 75% of FHA loans
   • FHA loan segment: Particularly high risk (only 3% downpayment)
   • 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 mainly sell to GSEs** (even more fintech)
   • Shadow banks sell at a faster pace
Interest Rates and Performance

1. **Interest Rates (controlling for other observables)**
   - Non-fintech shadow banks **3-5 bps cheaper** than banks
   - Fintech lenders **14-16 bps more expensive** than banks

2. **Performance (given interest rates)**
   - Shadow banks loans **0.02%-0.04% more likely to default**
   - Shadow bank loans **2%-2.5% more likely to prepay**
Role of Regulation
County level shadow bank share (2008)
County level shadow bank share (2015)
Spatial Tests: County Level Changes

**Bartik Style:** County exposure to traditional banks shocks
- Changes in **Bank Capital Ratios**
- **Mortgage Servicing Rights** as a % of Tier 1 Capital
- Exposure to **Mortgage Lawsuits**

**Example:** Capital requirements
For every county from 2008-2015:

\[ \Delta Local \text{ Capital Ratio}_c = \text{lending-weighted change in local bank capital ratio} \]

\[ \Delta Shadow \text{ Bank Lending Share}_c = \text{Change in shadow bank share} \]

\[ \Delta Shadow \text{ Bank Lending Share}_c = \beta_0 + \beta_1 \Delta Local \text{ Capital Ratio}_c + X'_c \Gamma + \epsilon_c \]
Evidence: Regulatory Tests

• Tightening bank capital/regulatory constraints associated with a significant expansion of the shadow bank market share
  - Growth in Capital Ratios
    • Banks that rebuild capital ratio by 5% lose 2.7% market share
  - Mortgage Servicing Rights (MSR)
    • One S.D. higher MSR as % of T1 Capital banks lose 0.5% market share
  - Mortgage Lawsuits arising out of financial crisis
    • Mean lawsuit exposure associated with 6.5% loss of market share
Role of Technology
Technology and Rise of Fintech

1. Mortgage Interest Rate Levels:
   • **Fintech** charges **significant premium** versus non-fintech
   • Suggests fintech provides convenience rather than cost savings
     • **Fintech premium higher for more creditworthy**

2. Mortgage Interest Rate Pricing Models:
   • Look at explanatory power of standard credit variables
     • FICO, LTV, ..., within ZIP x Quarter
   • **$R^2$ much smaller for fintech**
   • Suggests fintech uses different data/models
Significance of Model Differences (R2)

Distribution of Bootstrapped R2
(with all controls)

Bank
Non-Fintech Shadow Bank
Fintech Shadow Bank
Model
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**
   - $\gamma_b$ scales probability of a bank lending to borrower $b$
   - i.i.d. across borrower-bank pairs
Model Setup: Supply

Find symmetric equilibrium within types

- Lender chooses entry and 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)
Model Setup: Equilibrium

• Interest rate markup depends on market share $s_i$:

$$r_i^* - \rho_i = \frac{1}{\alpha} \frac{1}{1 - s_i}$$

• Market share depends on rate, quality, and regulation:

$$S_b = \frac{\gamma_b N_b \exp(-\alpha r_b + q_b)}{\gamma_b N_b \exp(-\alpha r_b + q_b) + N_n \exp(-\alpha r_n + q_n) + N_f \exp(-\alpha r_f + q_f)}$$

$$S_n = \frac{N_n \exp(-\alpha r_n + q_n)}{\gamma_b N_b \exp(-\alpha r_b + q_b) + N_n \exp(-\alpha r_n + q_n) + N_f \exp(-\alpha r_f + q_f)}$$

$$S_f = \frac{N_f \exp(-\alpha r_f + q_f)}{\gamma_b N_b \exp(-\alpha r_b + q_b) + N_n \exp(-\alpha r_n + q_n) + N_f \exp(-\alpha r_f + q_f)}$$
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: Funding Costs

- Non-Fintech
- Fintech

Years: 2008 to 2015

Graph shows the funding costs for Non-Fintech and Fintech over the period 2008 to 2015.
Calibration: Lender Quality

- Non-Fintech
- Fintech

Calibration: Bank Ease of Lending
(Regulatory Burden)

Tightening bank constraints
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: Shadow Bank Growth

![Bar chart showing growth in shadow bank growth under different scenarios: No Changes, Regulatory Burden, Fintech Quality Increase, and Actual. The chart includes bars for Fintech and Non-Fintech categories.](image-url)
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 (FHA)
   - Shadow banks issue large amounts of guarantees on behalf of taxpayers in a lightly regulated market

2. **Technology does play role in the rise of fintech firms**
   - Fintech focuses on refinancing of already creditworthy
   - Does not appear to democratize credit access
   - Does not appear to reduce cost of credit (fintech premium)
   - Fintech uses different models/data

3. **Shadow Bank Expansion: 70% regulation, 30% technology**