Fintech, Regulatory Arbitrage, and the Rise of Shadow Banks

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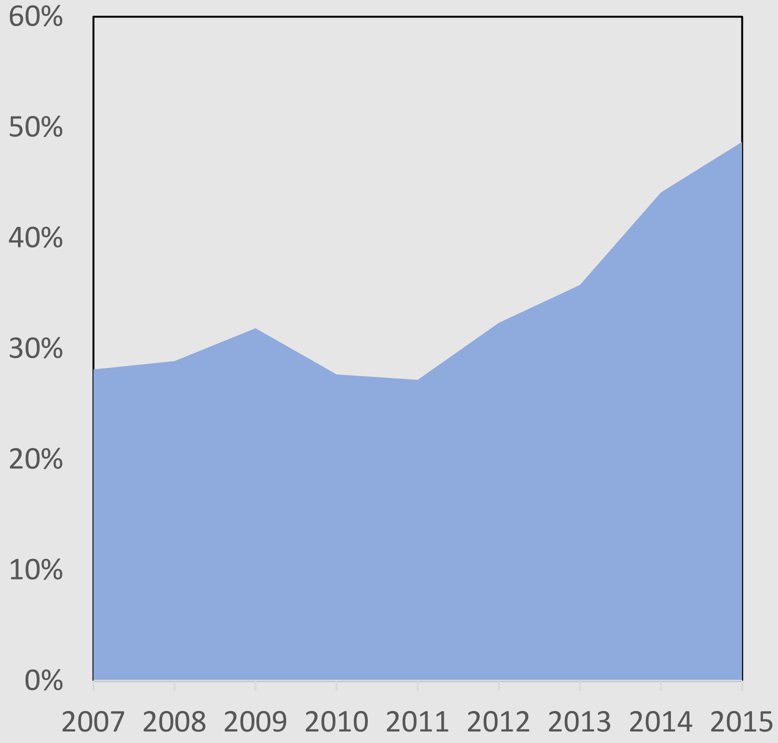
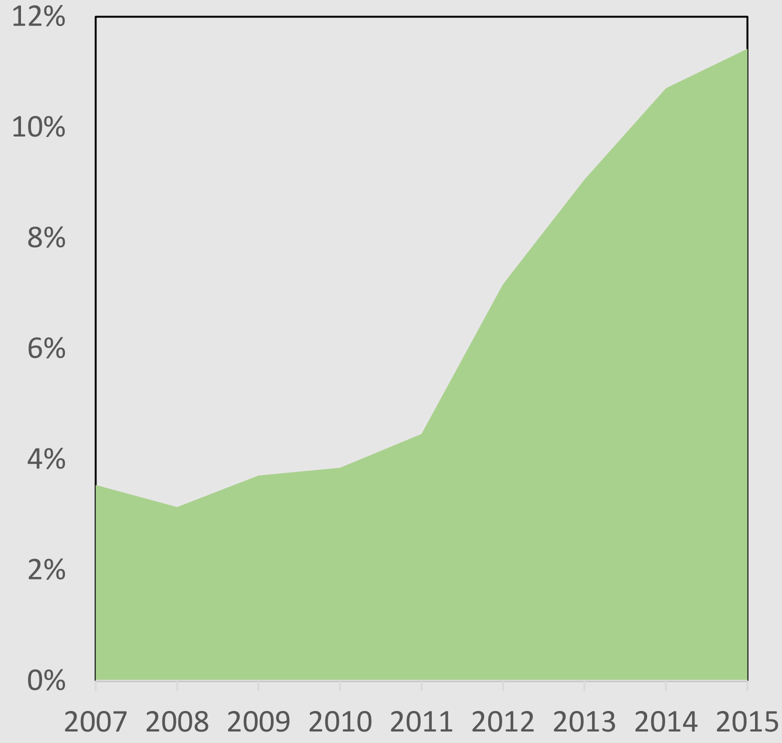
Two Trends in Residential Mortgages

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

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
   - 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

Home / Home Refinance / Refinance Process / **Getting Approved For A Refinance**

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

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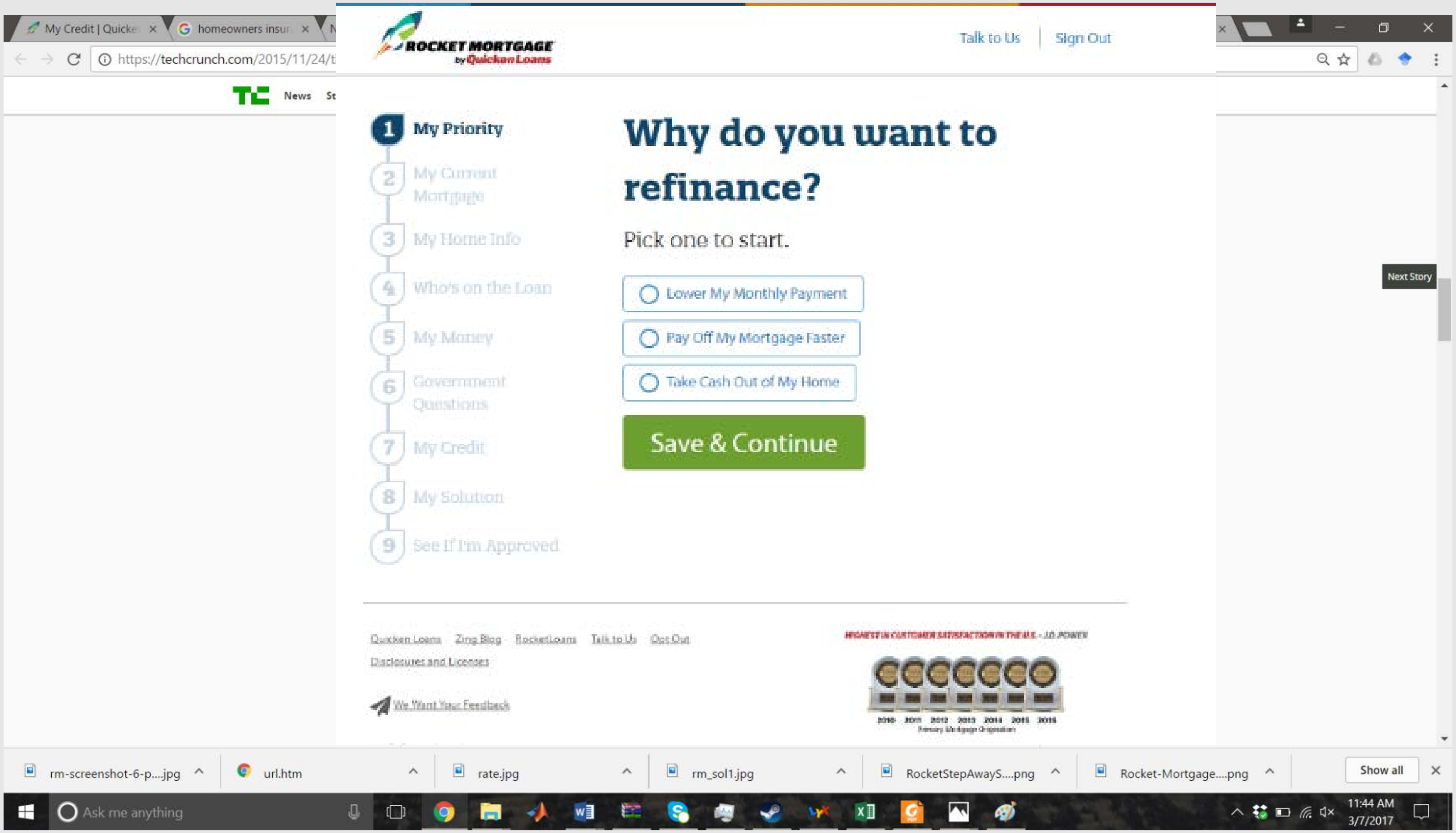
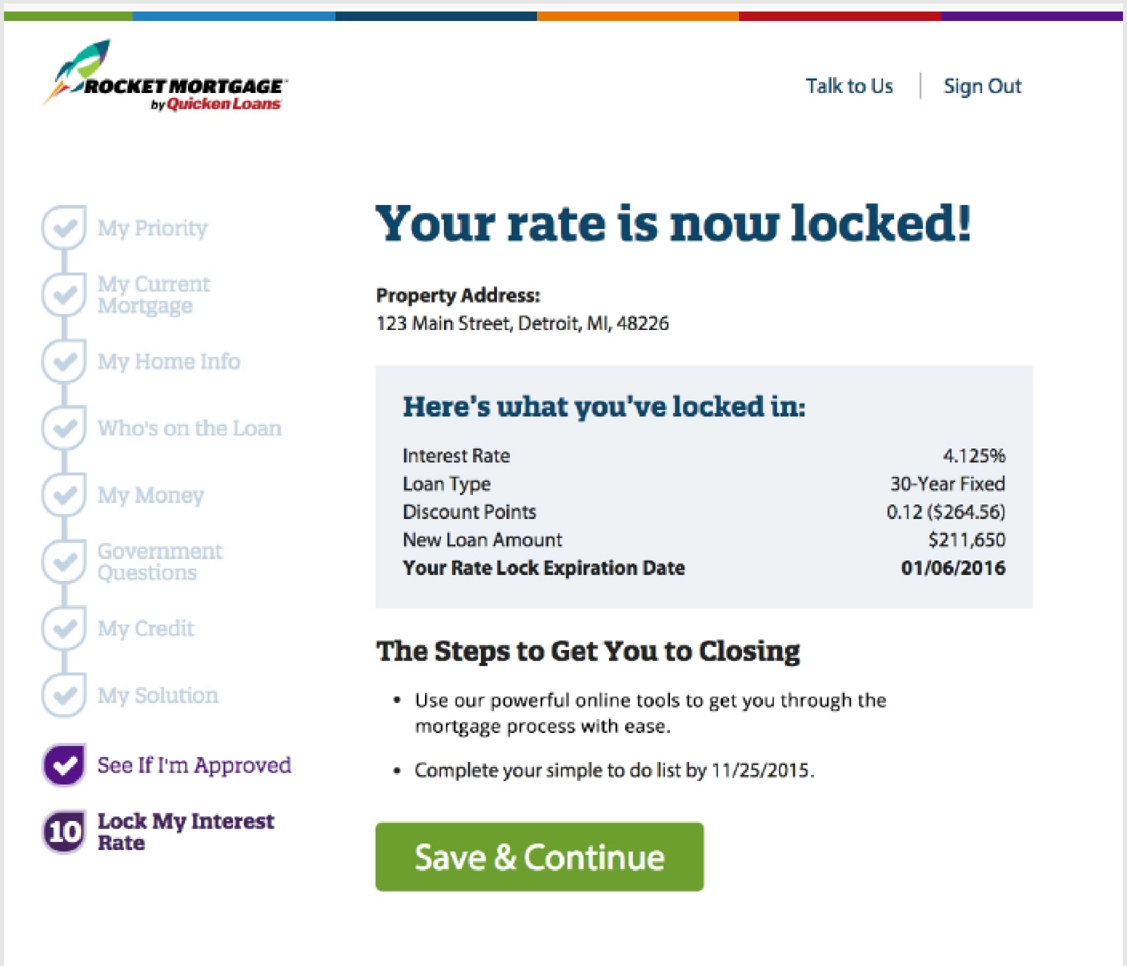
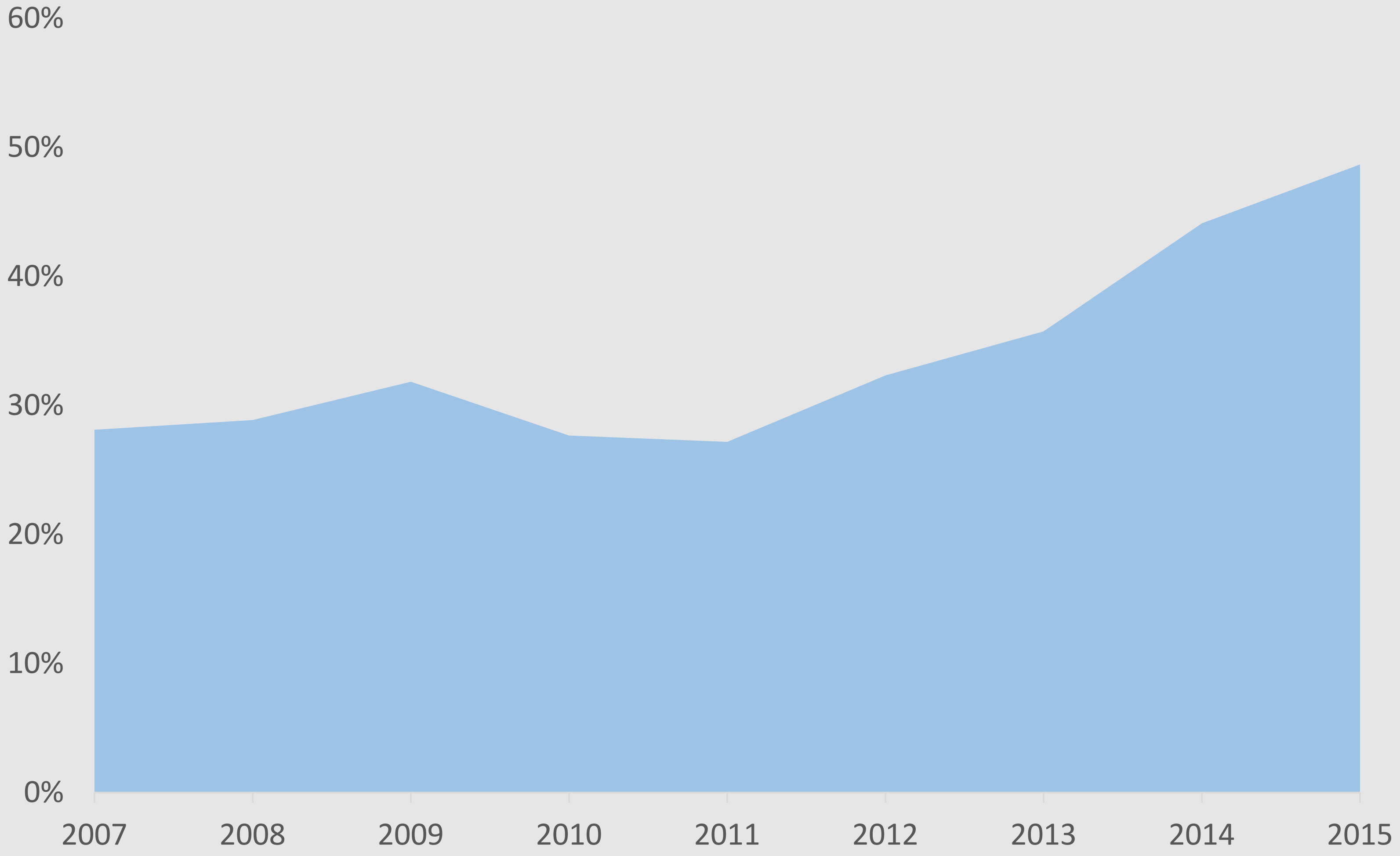


A “Fintech” Shadow Bank

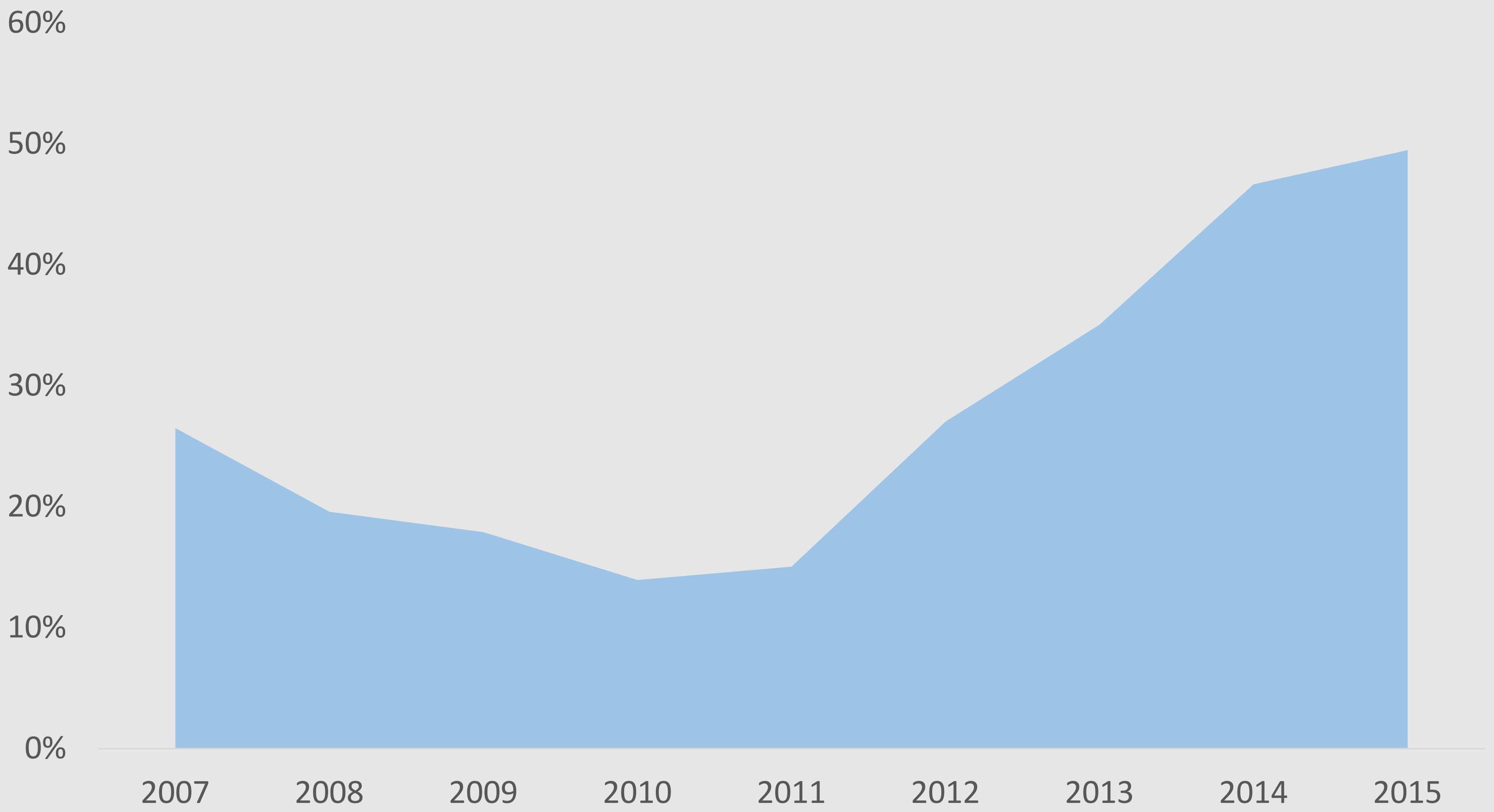


Basic Facts:
The Decline of Traditional Banks

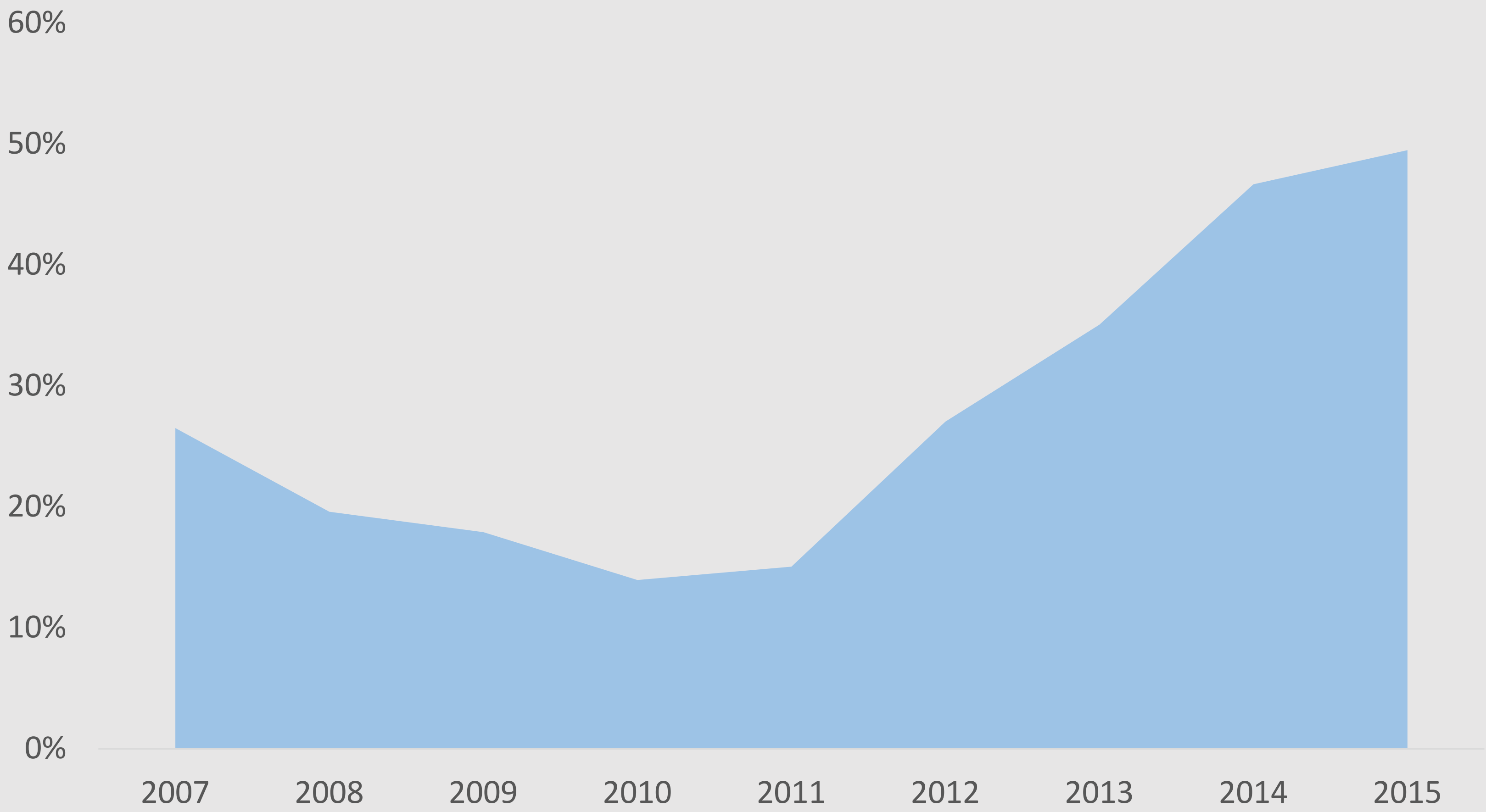
Shadow Bank Share: All Loans



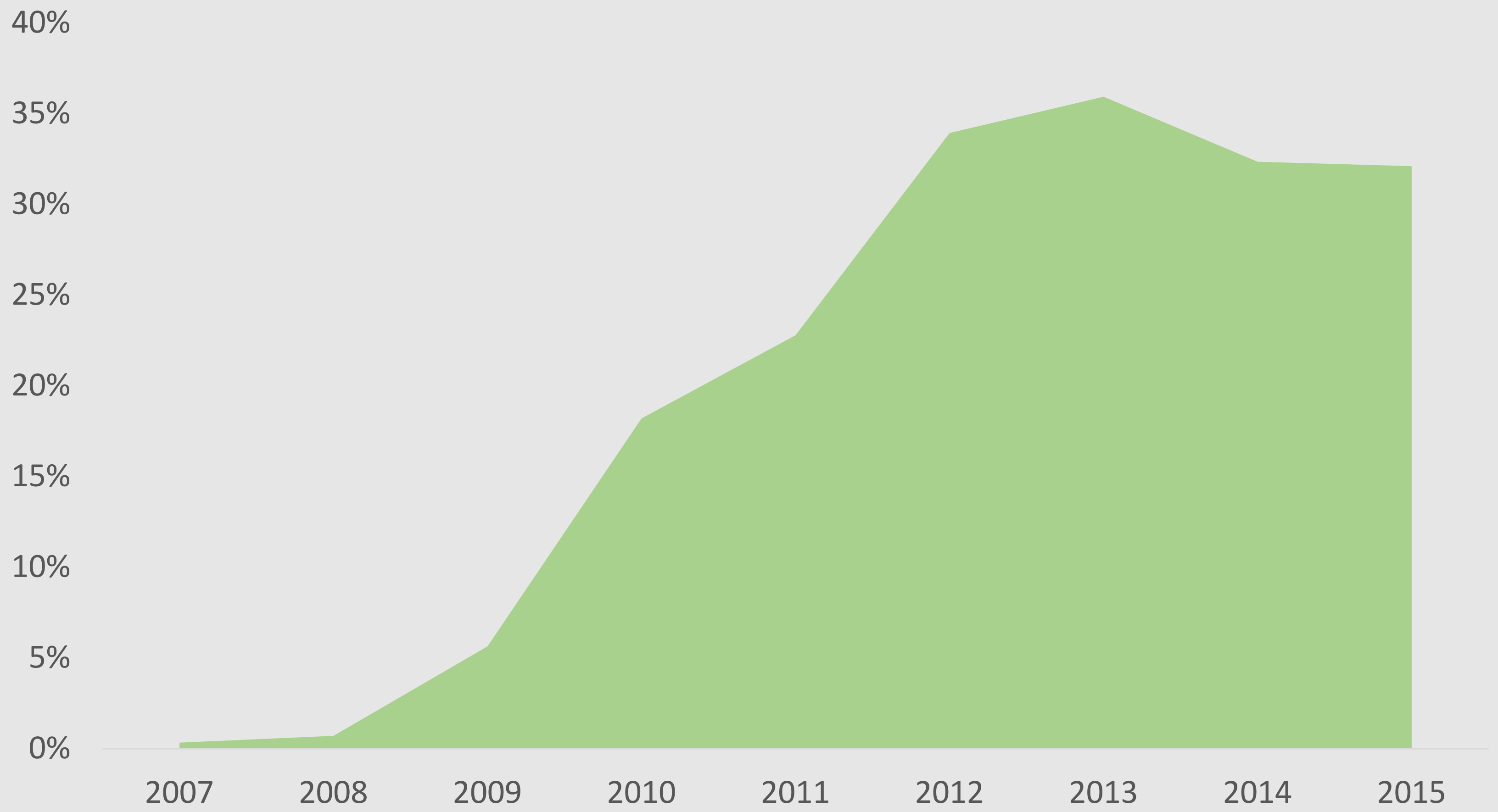
Shadow Bank Share: Conforming



Shadow Bank Share: Conforming



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

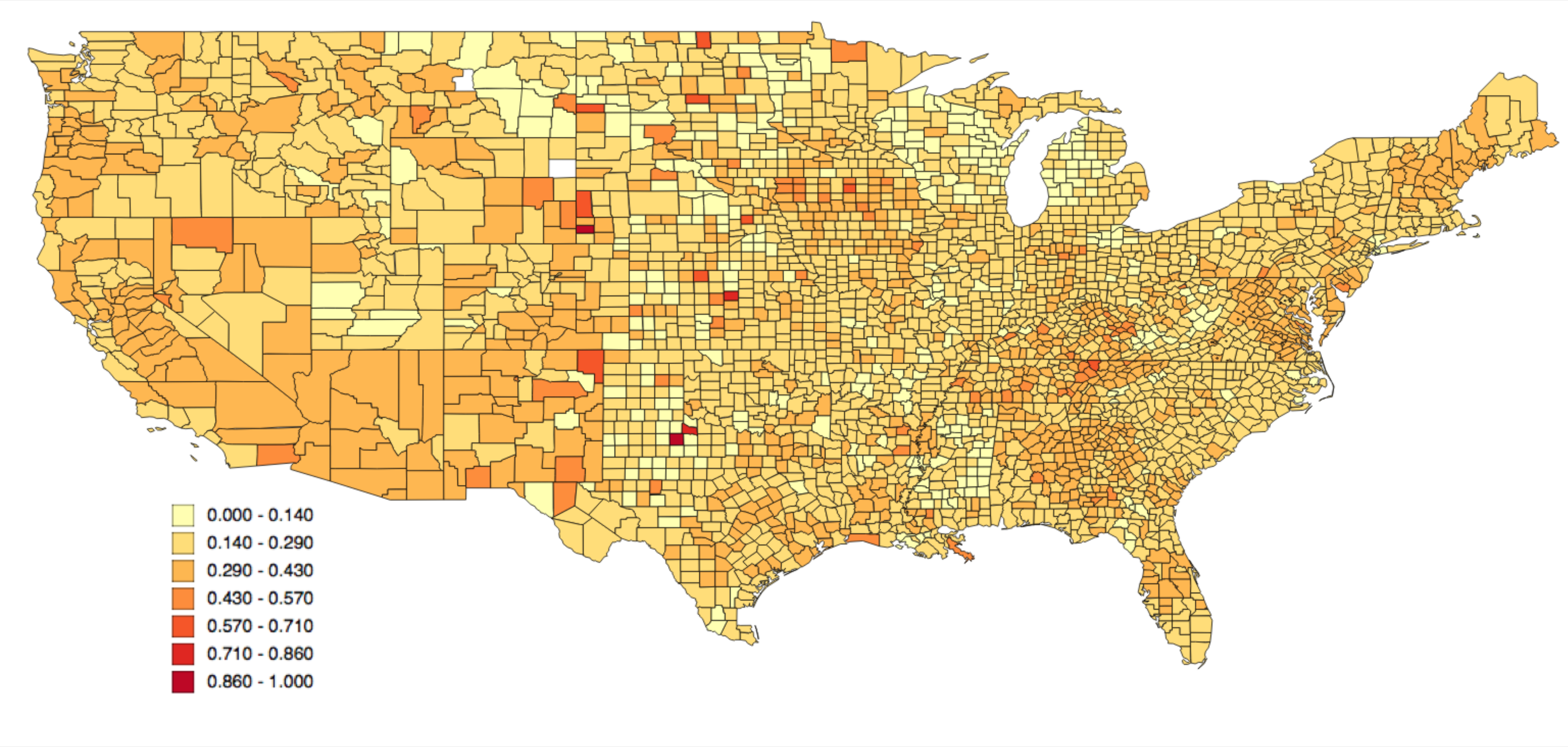
Interest Rates and Performance

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

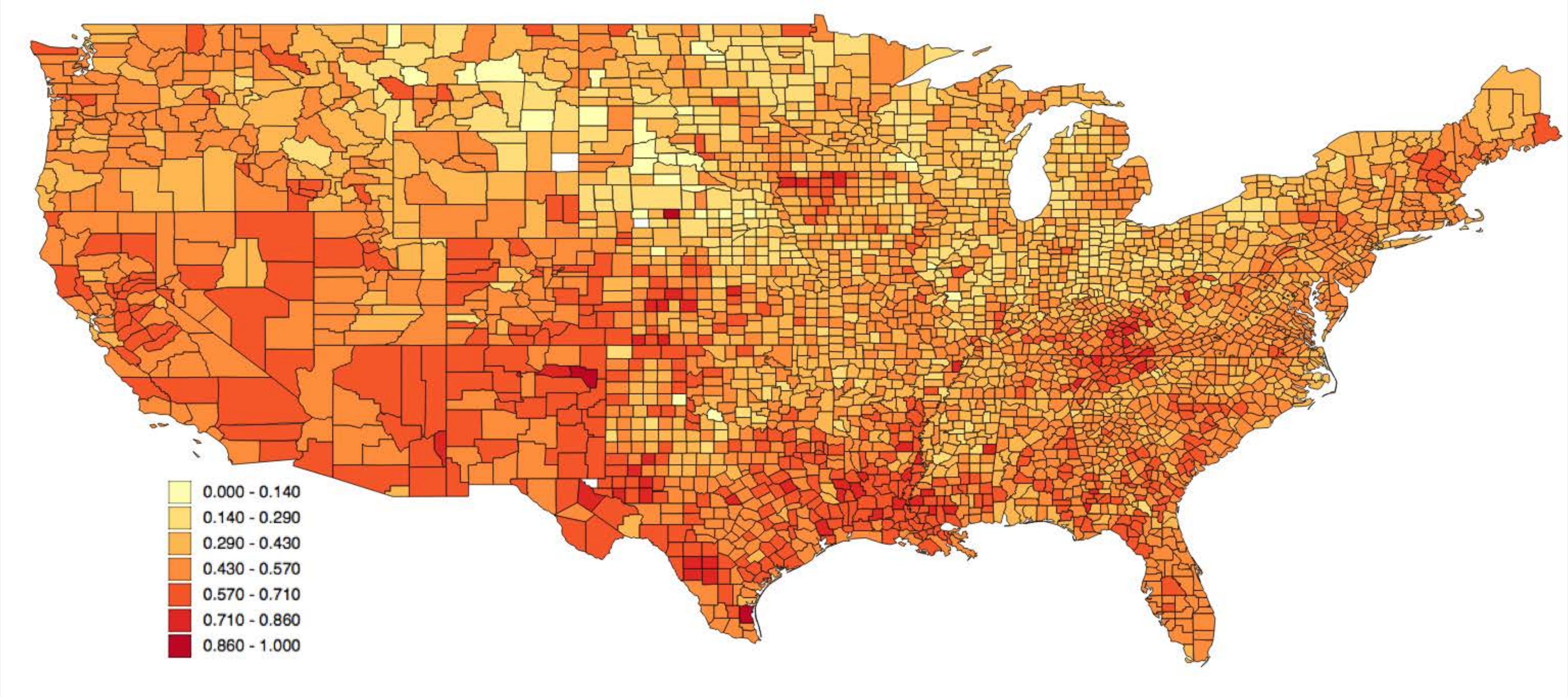
2. **Performance (given interest rates)**
   - Shadow banks loans 0.02%-0.04% more likely to default
   - Shadow bank loans 2%-2.5% more likely to prepay

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:

$\Delta Local\ Capital\ Ratio_c$ = lending-weighted change in local bank capital ratio

$\Delta Shadow\ Bank\ Lending\ Share_c$ = Change in shadow bank share

$$\boldsymbol{\Delta Shadow\ Bank\ Lending\ Share_c} = \beta_0 + \beta_1 \boldsymbol{\Delta Local\ Capital\ Ratio_c} + X_c'\Gamma + \epsilon_c$$

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

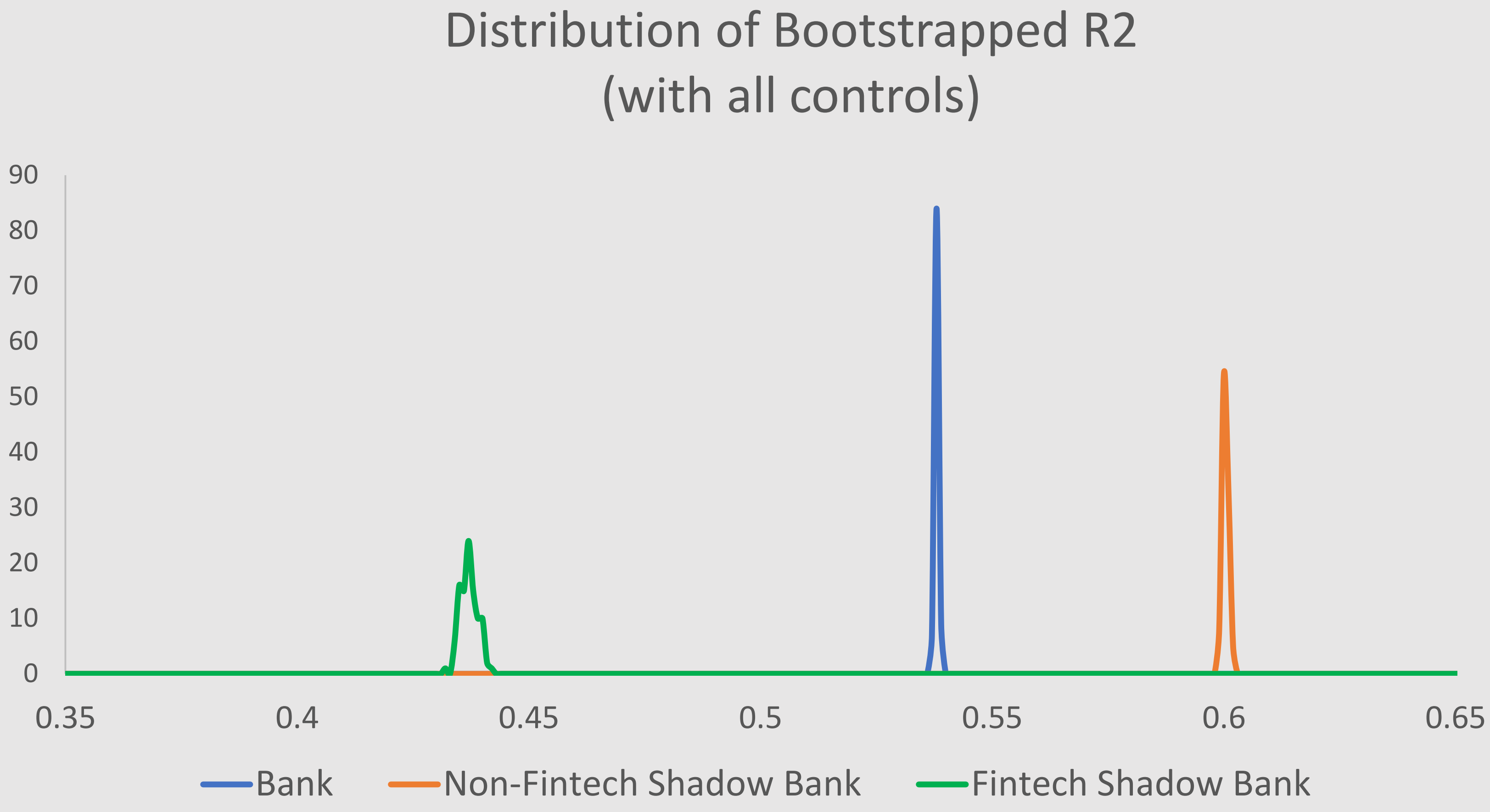
Role of Technology

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)



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 ϵ_{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:**

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

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.
   - $\boldsymbol{q_i} \in \{\boldsymbol{q_b}, \boldsymbol{q_n}, \boldsymbol{q_f}\}$
3. **Banks differ on regulatory burden**
   - γ_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:

$$\mathrm{r_i^*} = \underset{\mathrm{r_i}}{\mathrm{argmax}}\,(r_i - \rho_i)p_{ib}(r_i, q_i; \{r_j, q_j\})$$

- Given fixed cost (c), lender profit is

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

- Free entry → 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:

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

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

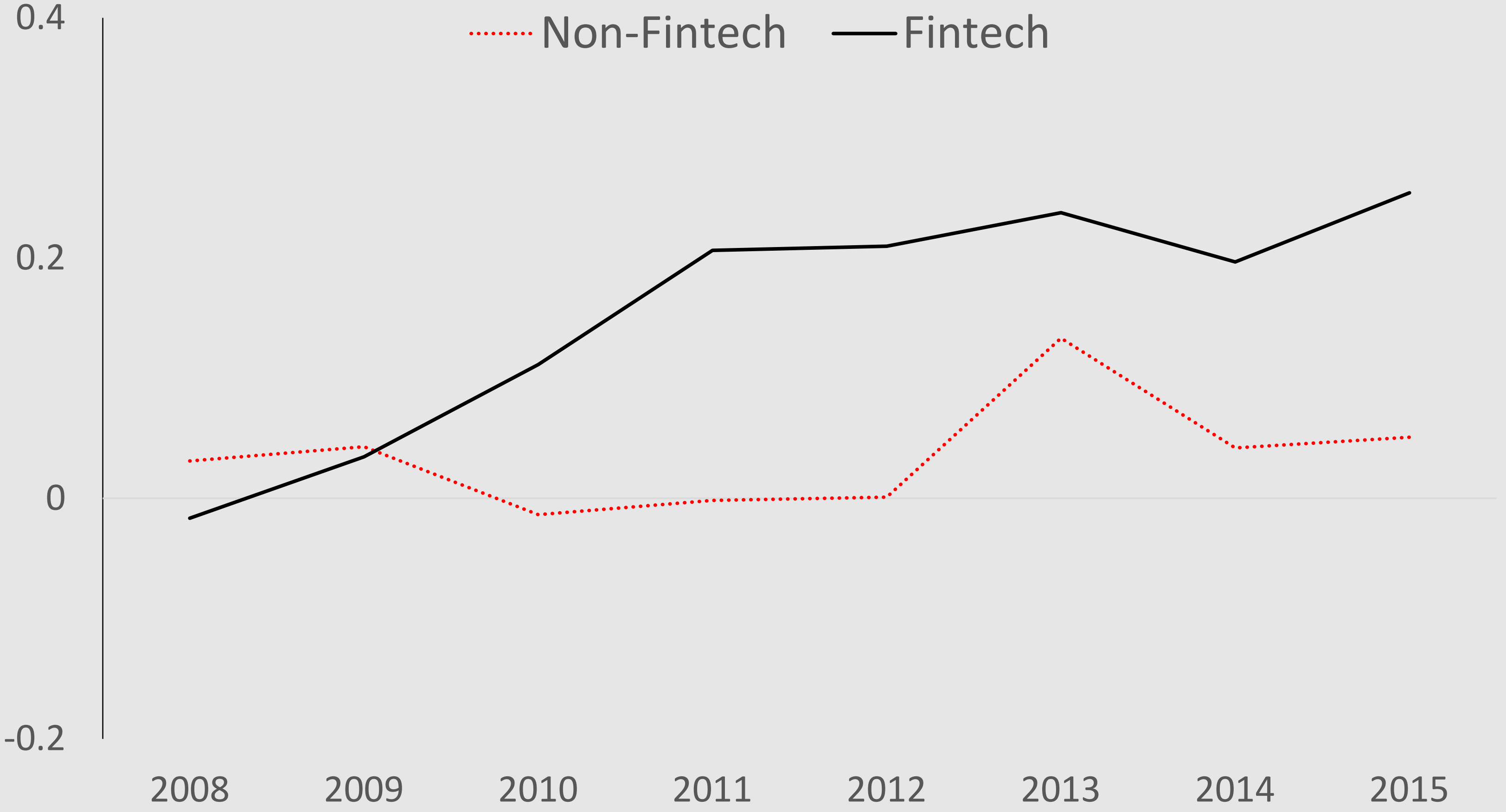
$$S_f = \frac{N_f \exp(-\alpha r_f + q_f)}{\gamma_b N_b \exp(-\alpha r_b + q_b) + N_n \exp(-\alpha r_n + q_n) + N_f \exp(-\alpha r_f + q_f)}$$

Calibration: Approach

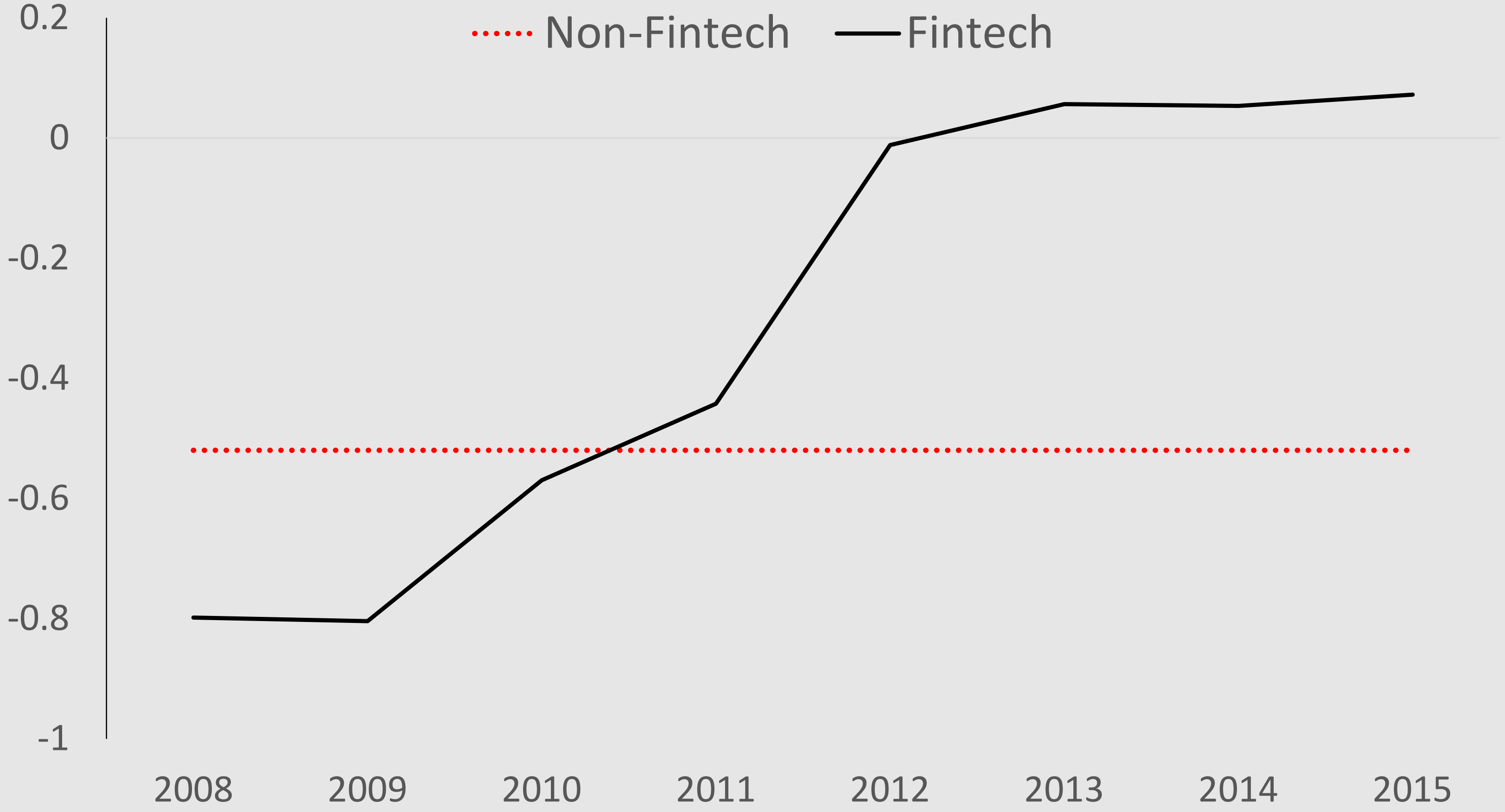
1. **Aggregate HMDA data to year level and calibrate to observed data in mean zip**
   - Calibrate model each year
   - Market Shares, rates, number of lenders

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., $q_{nt} = q_{n2008}$

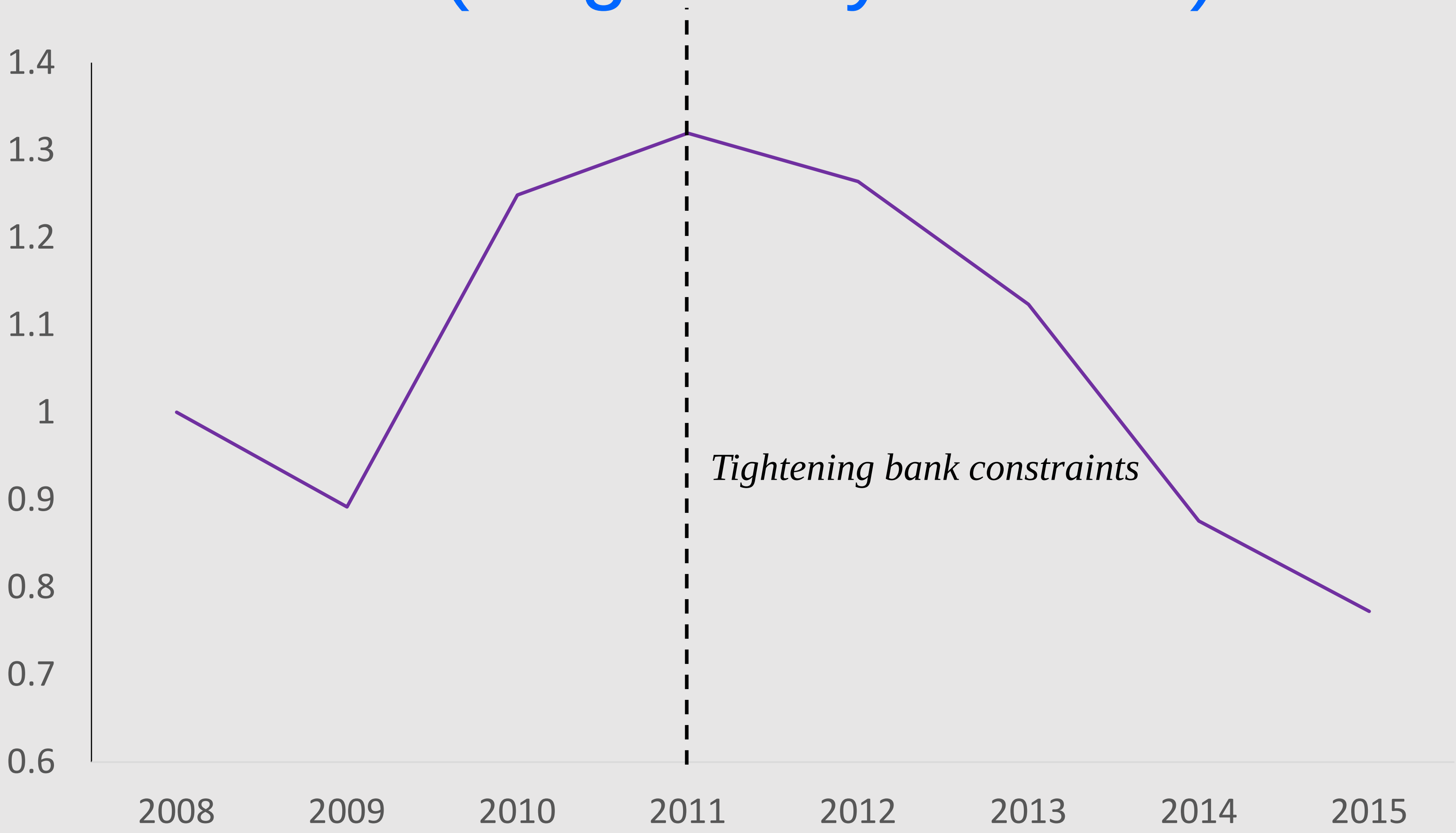
Calibration: Funding Costs



Calibration: Lender Quality



Calibration: Bank Ease of Lending (Regulatory Burden)



Counterfactuals

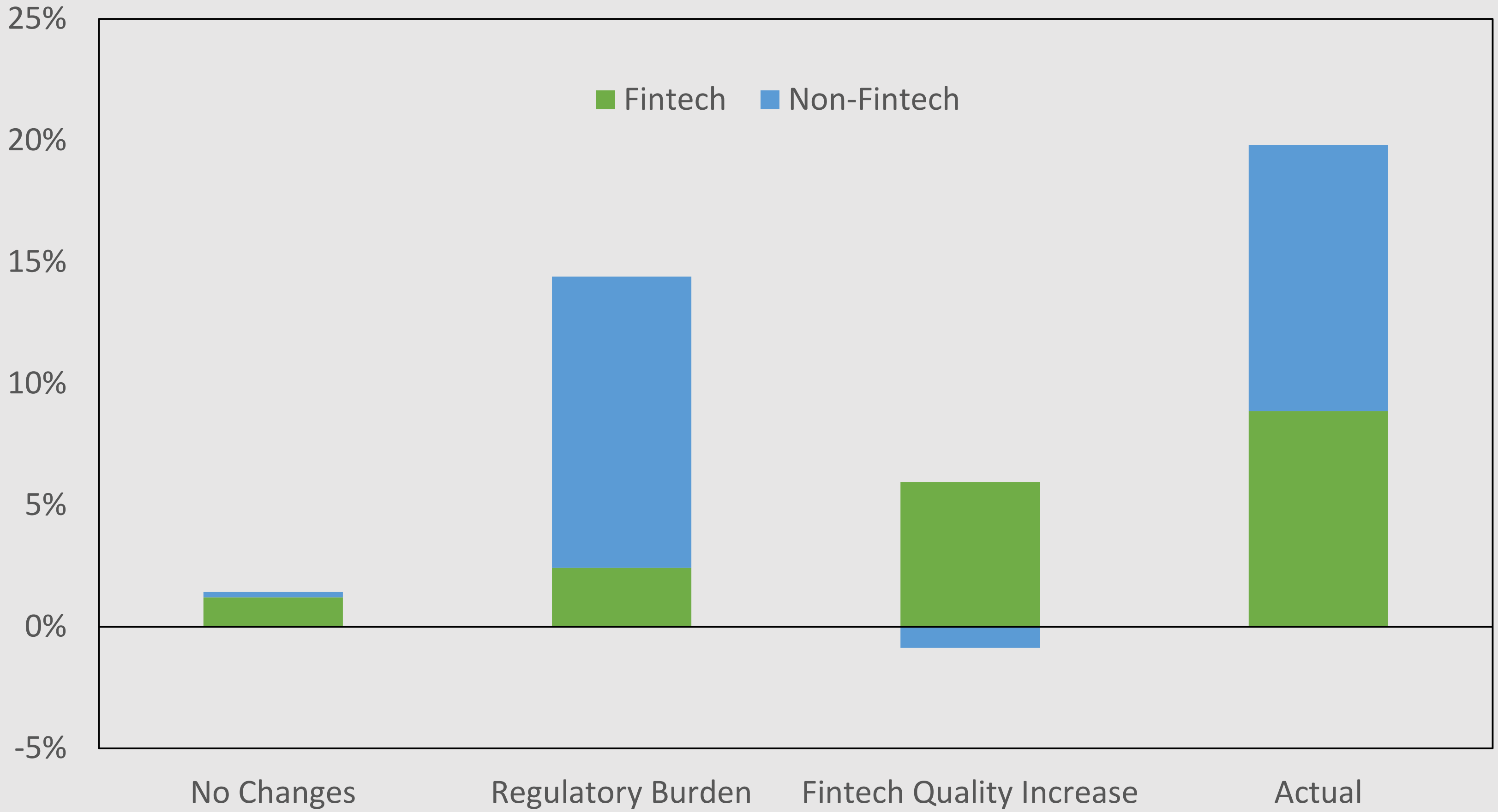
1. No fintech, no changes in regulations

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



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**