Fintech, Regulatory Arbitrage, and the Rise of Shadow Banks

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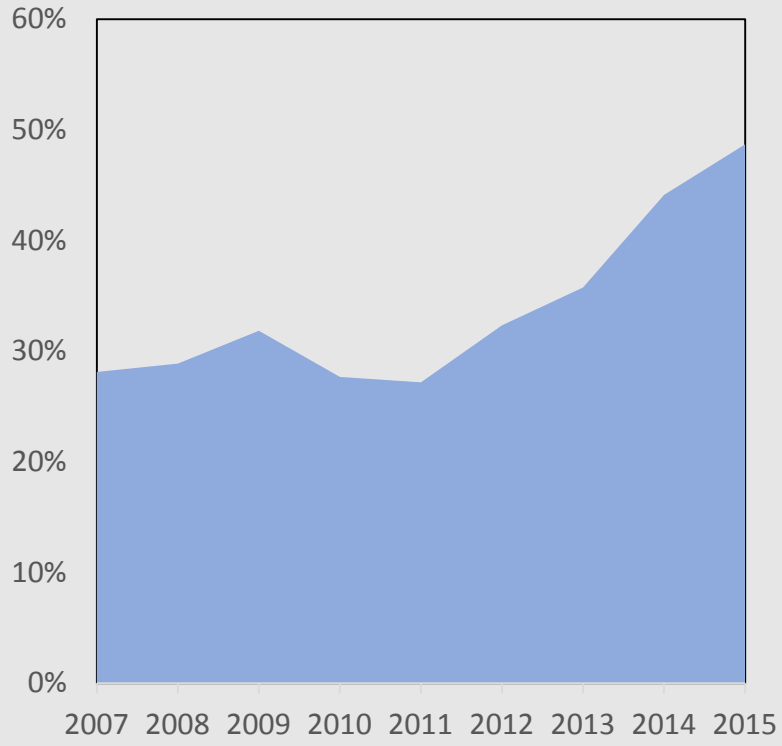
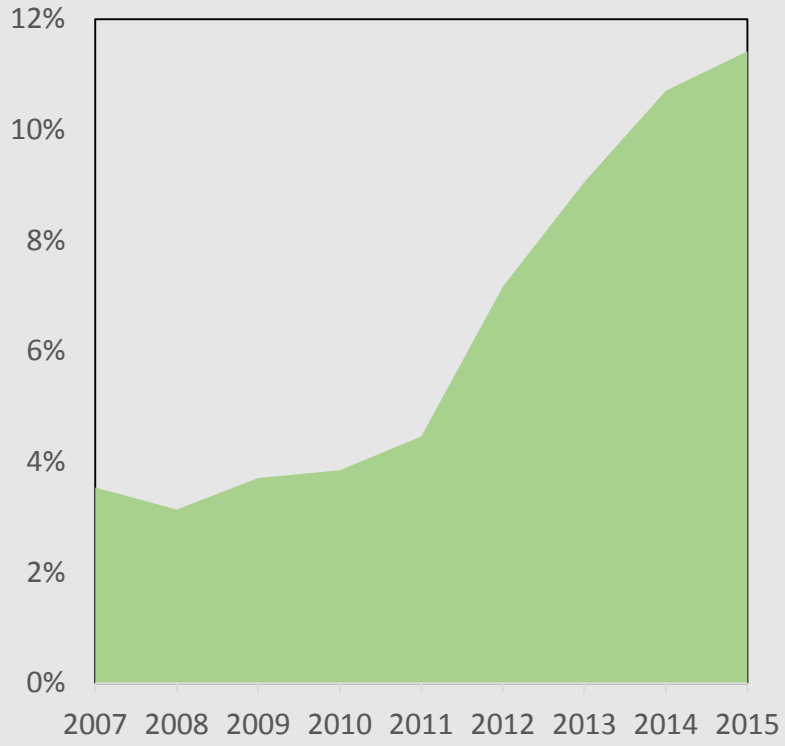
Two Trends in Residential Mortgages

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:

- Document and understand some facts about 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

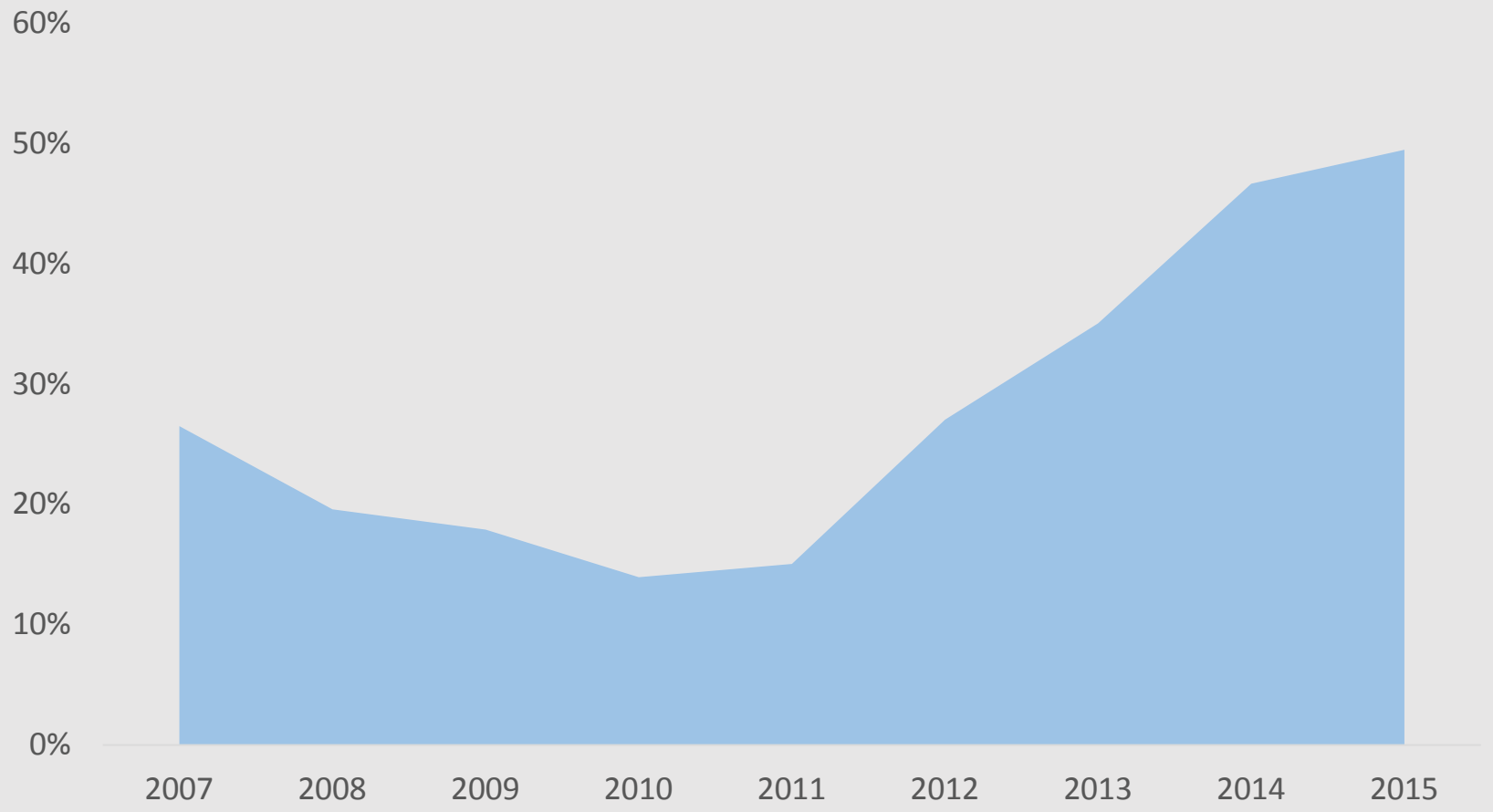
1. **Traditional bank vs. shadow bank**
   - Bank: Depository institution

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…)

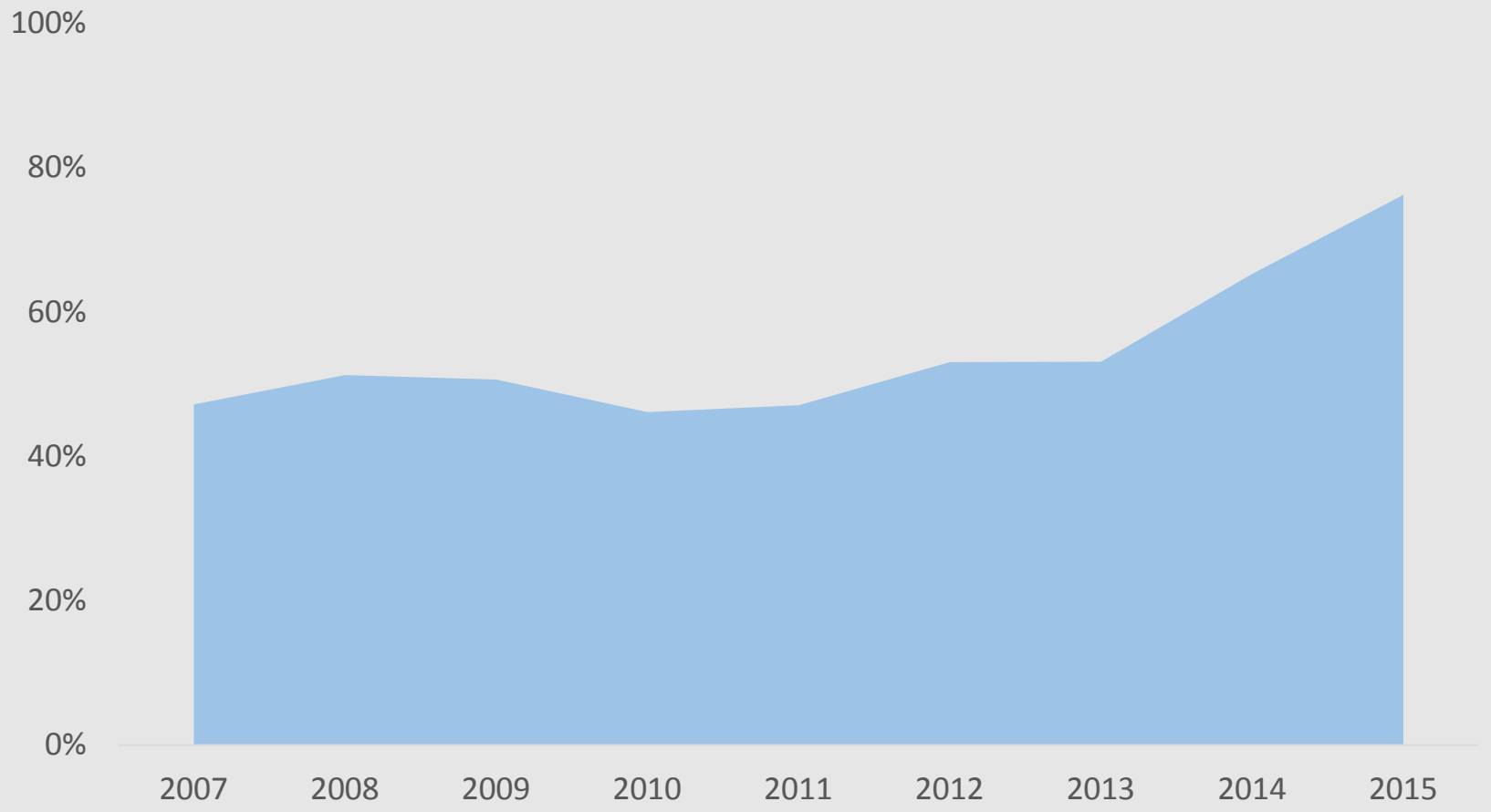
3. **Implementation**
   - Manual classification
   - Fannie and Freddie: Classify all identified lenders (Top 50)
   - HMDA: F&F lenders plus next largest to get 80% market share

Basic Facts:
The Decline of Traditional Banks

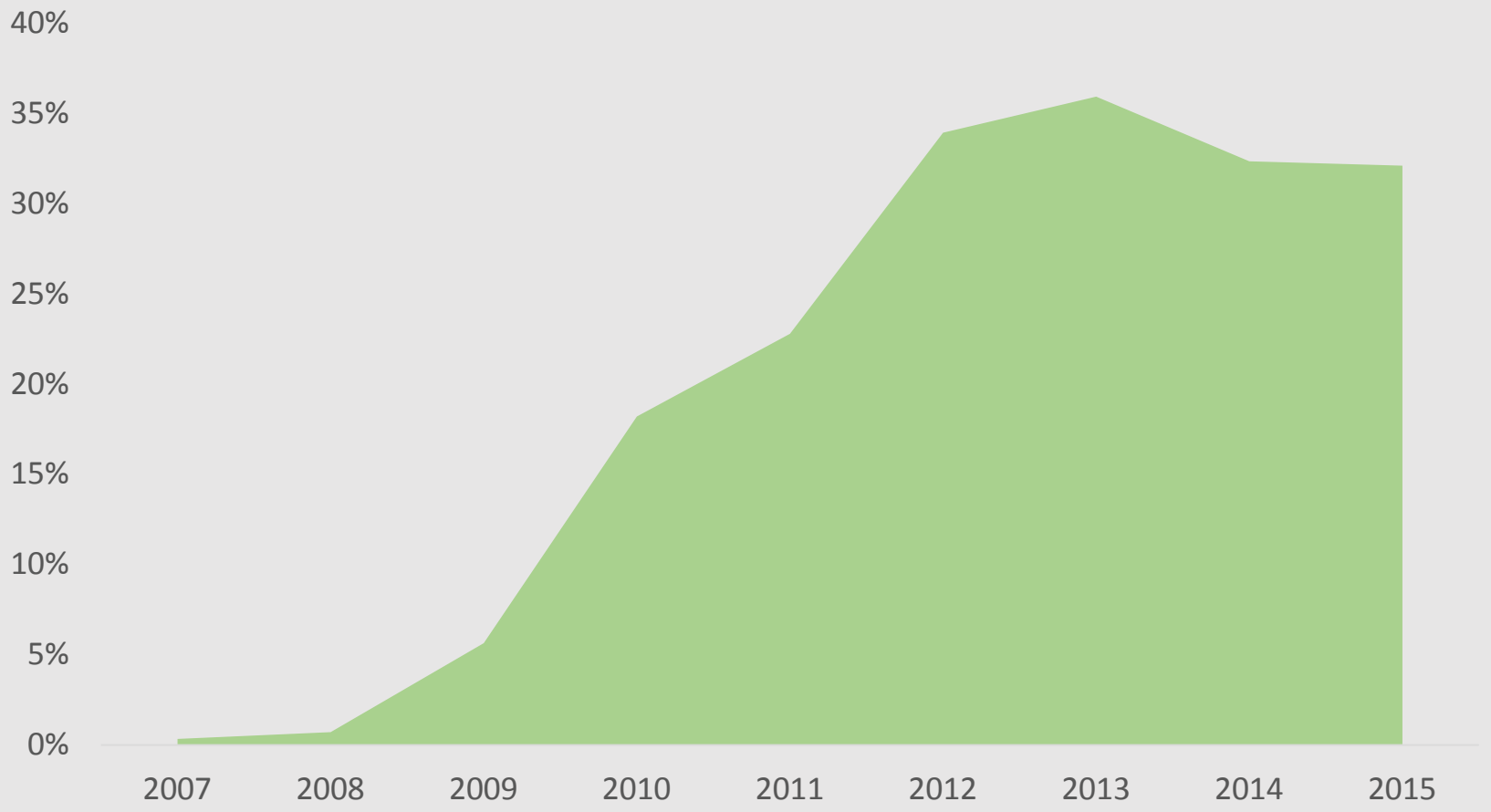
Shadow Bank Share: Conforming



Shadow Bank Share: FHA



Fintech Shadow Bank 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 banks 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. **How did shadow banks increase market share?**
   - Cheaper mortgages?

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

3. **Non-price characteristics (performance)**

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

Basic Facts Summary

1. **Loan Types, Purposes, and Financing**
   - Shadow banks specialize in high risk FHA sector
   - Fintech specifically specializes in refinances
   - 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:

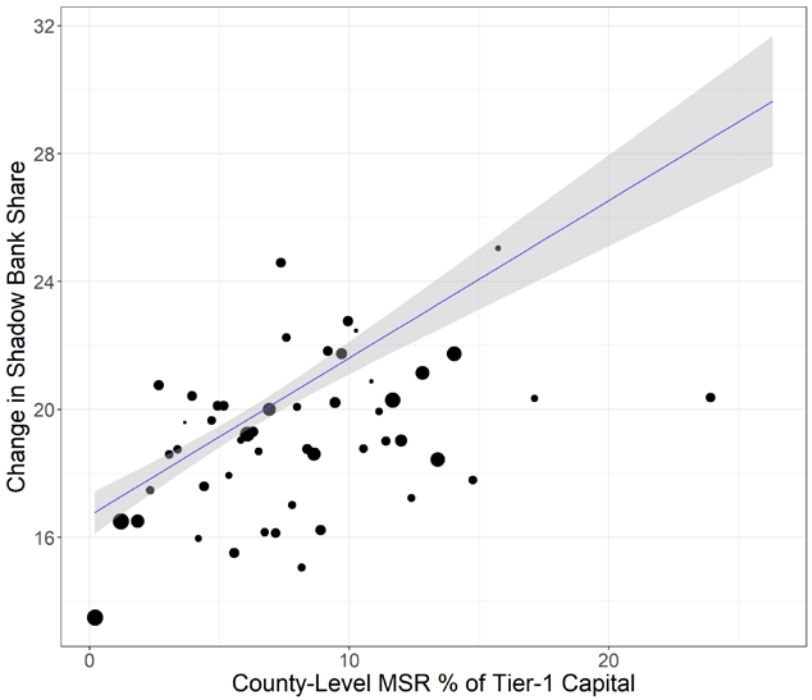
$\Delta Local\ Capital\ Ratio_c =$ lending-weighted change in local bank capital ratio

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

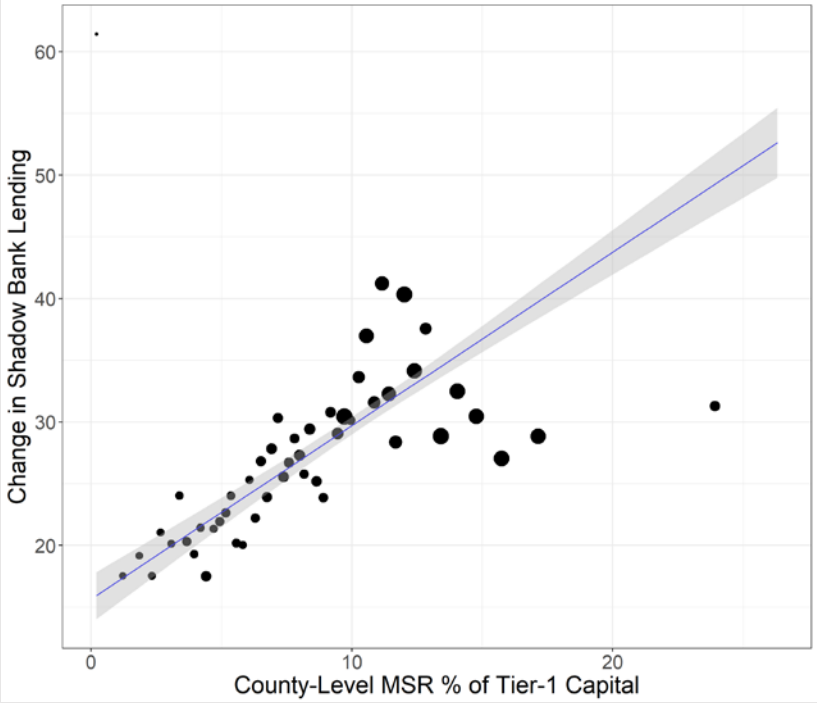
$$\Delta Shadow\ Bank\ Lending\ Share_c = \beta_0 + \beta_1 \Delta Local\ Capital\ Ratio_c + X_c'\Gamma + \epsilon_c$$

Mortgage Servicing Rights

SB Market Share Growth



SB Lending Volume Growth



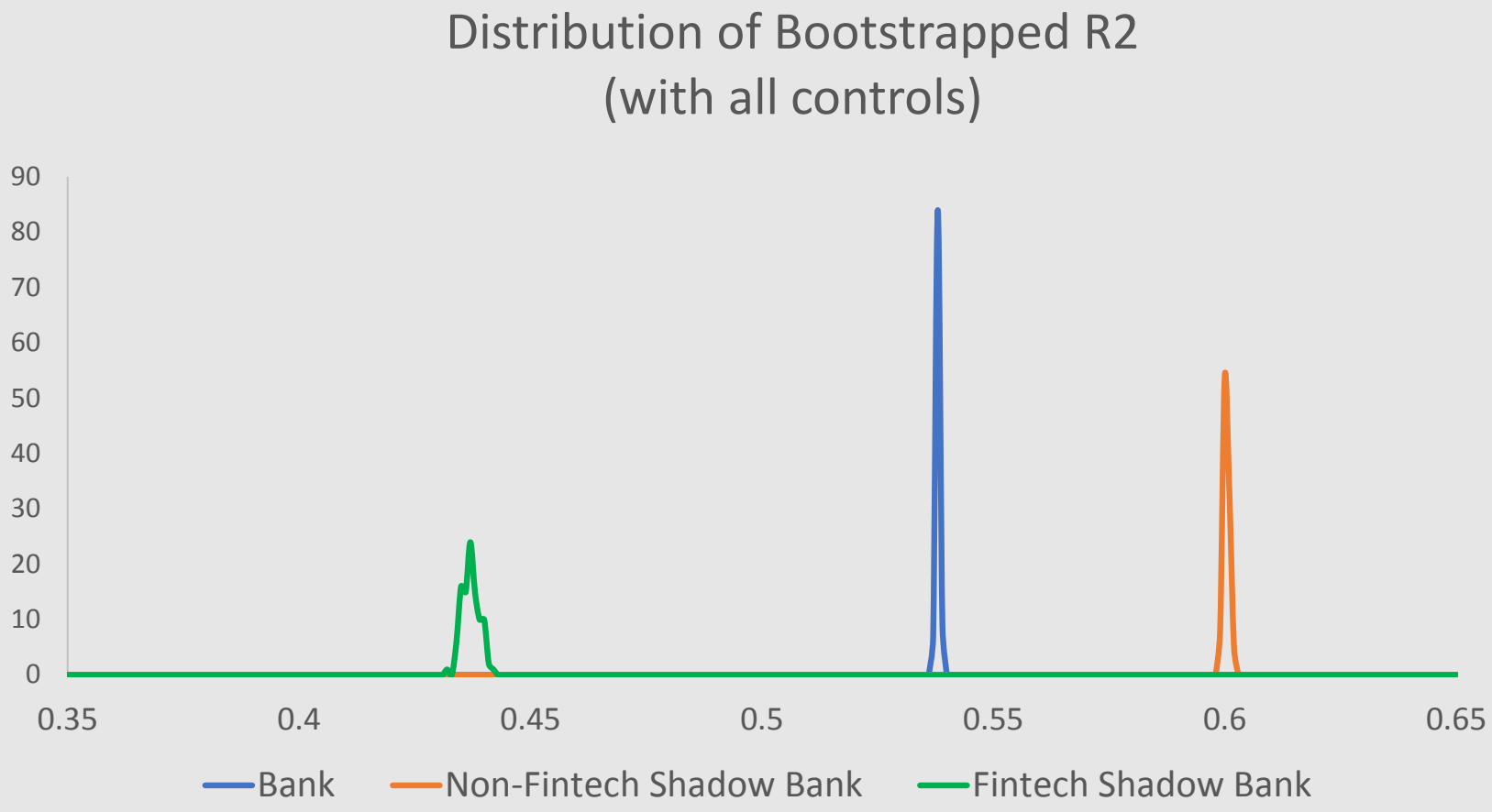
Role of Technology

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 smaller for fintech**
   - Suggests fintech uses different data/models

Significance of Model Differences (R2)



Model

Objective

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 different model.

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 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:**

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

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.
   - $\boldsymbol{q_i} \in \{\boldsymbol{q_b}, \boldsymbol{q_n}, \boldsymbol{q_f}\}$
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:

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

- Given fixed cost (c), lender profit is

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

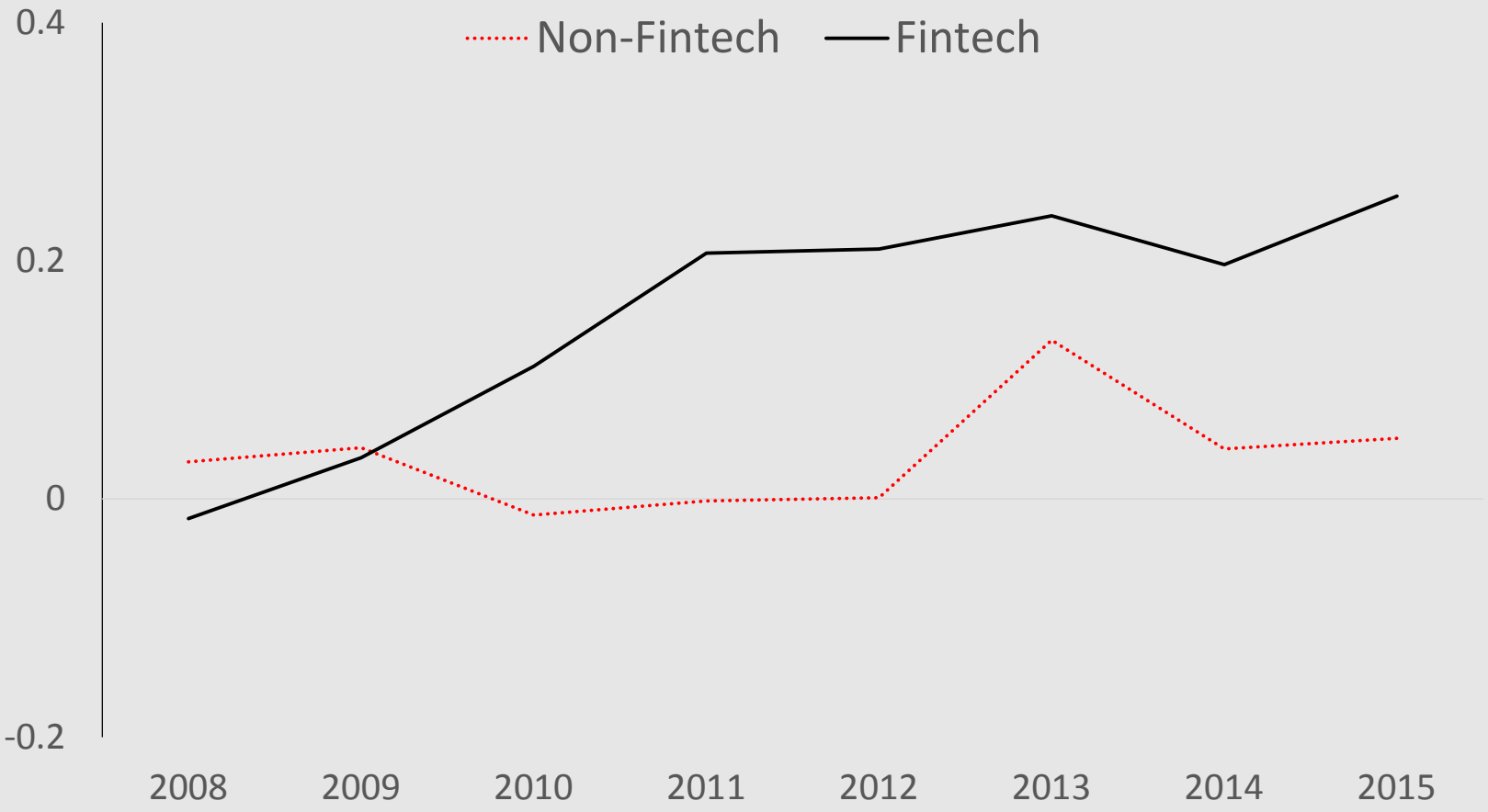
- Free entry → zero profit condition (taking costs into account)

Calibration: Approach

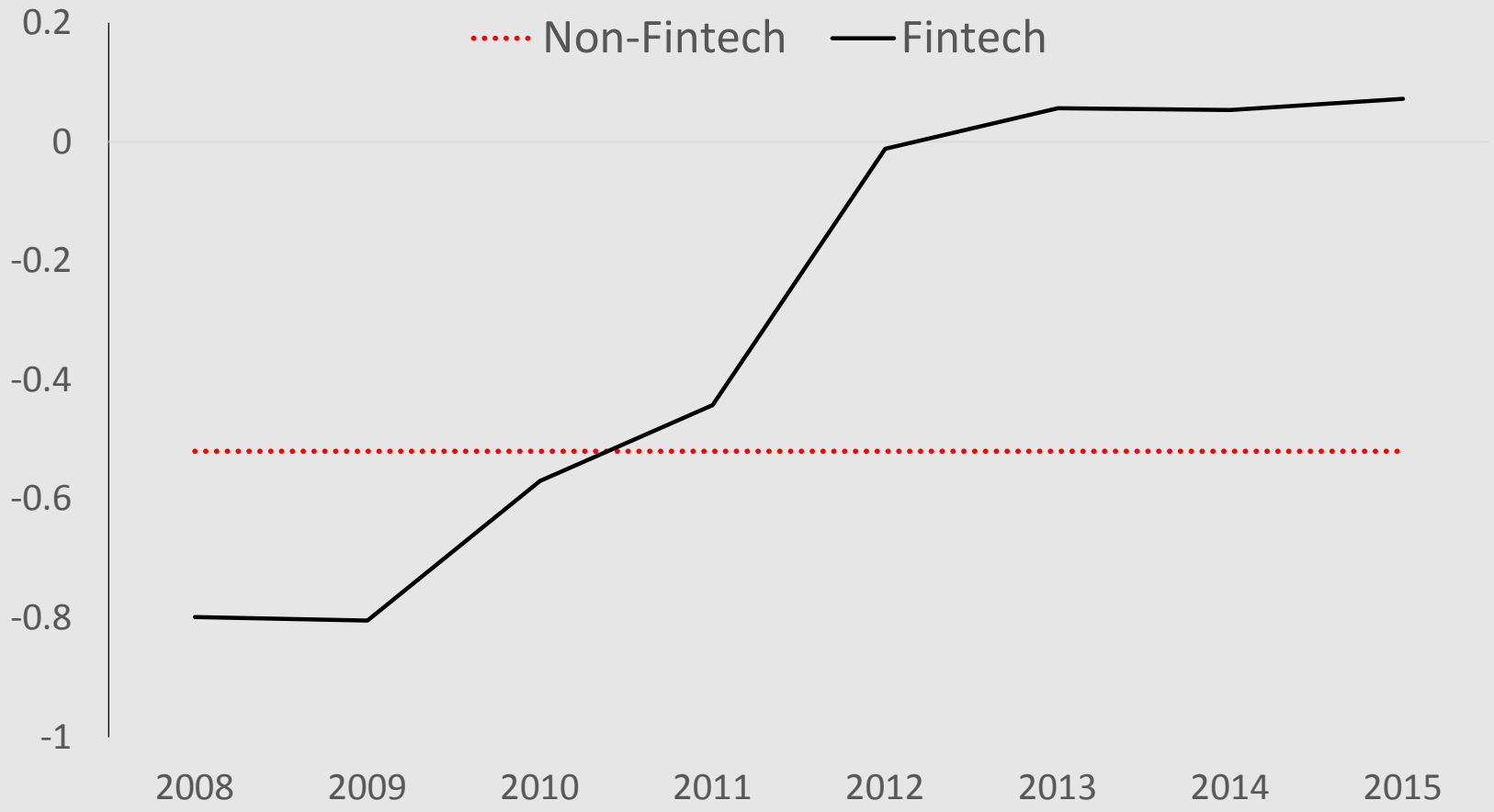
1. **Aggregate HMDA data to year level and calibrate to observed data in average zip**
   - Calibrate **model each year**
   - Market Shares, rates, number of lenders

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

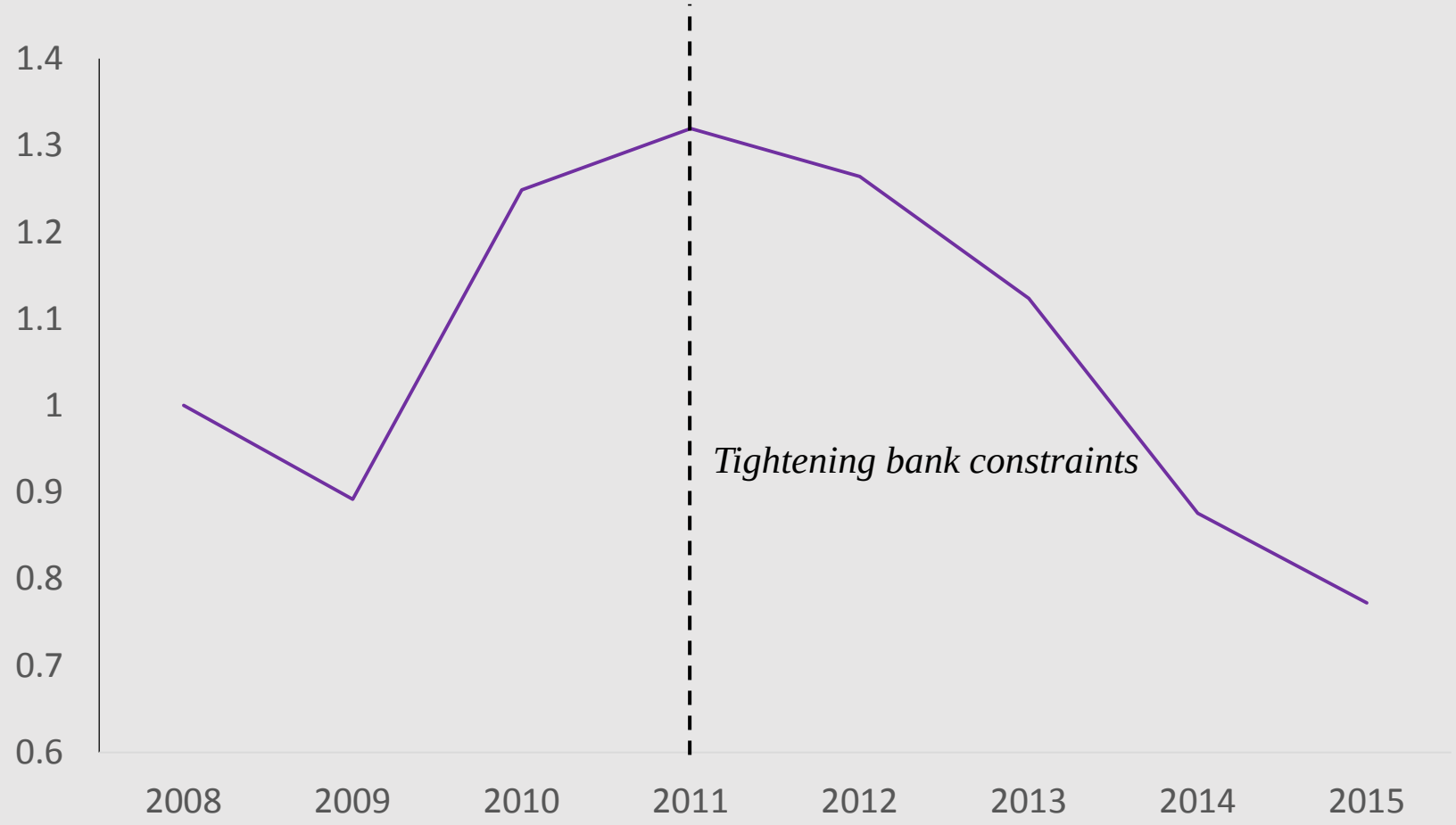
Calibration: Funding Costs



Calibration: Lender Quality



Calibration: Bank Regulatory Burden



Validation with Actual Data

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

Counterfactuals

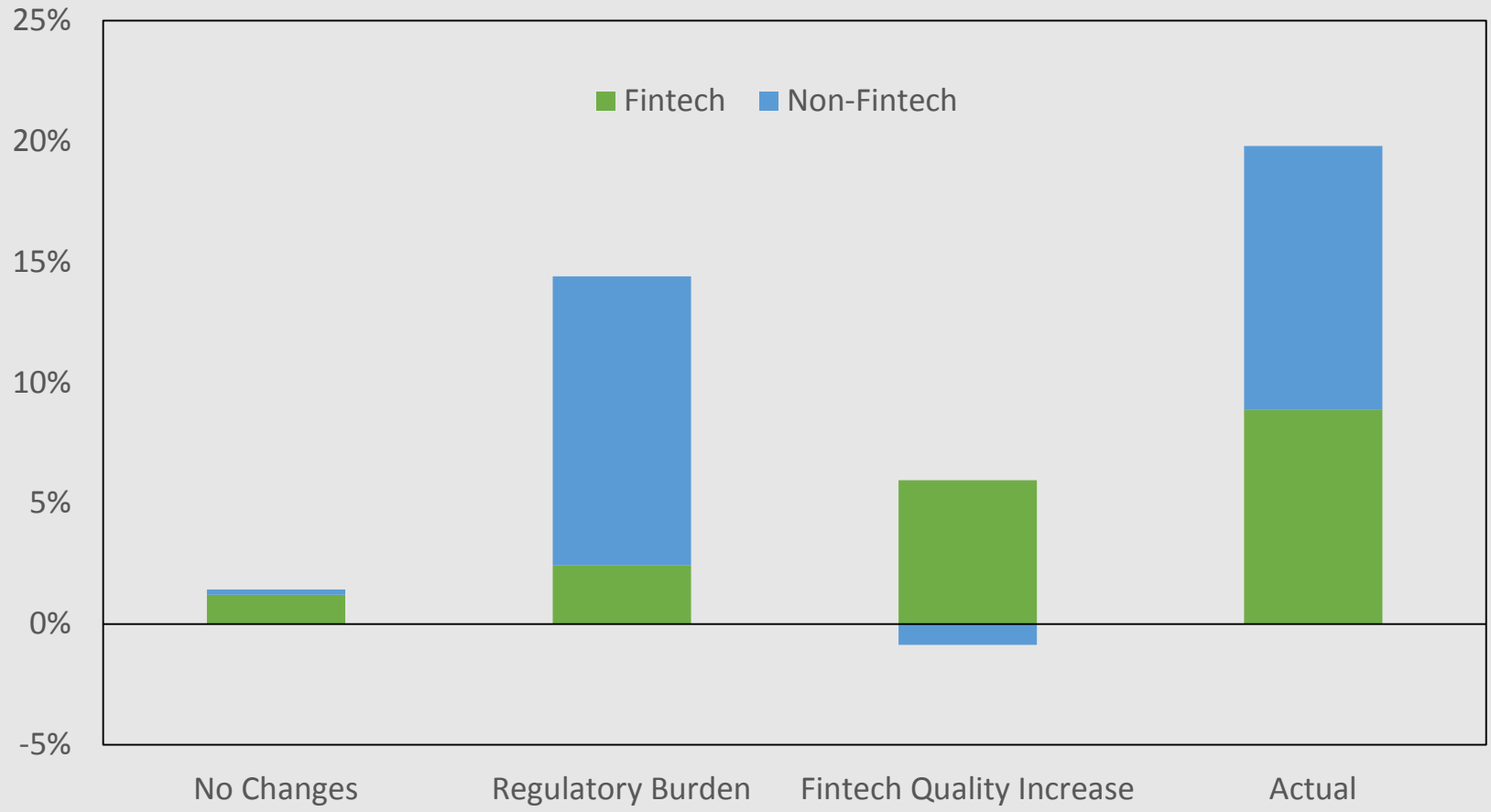
1. No fintech, no changes in regulations

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: 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**