

# Lending by Servicing: How Shadow Banks Dampen Monetary Policy Transmission

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- ▶ Important both in **origination** and **servicing**
  - ▶ Origination and servicing share for FHA and VA loans greater than 70%
- ▶ Need to understand how this affects the effectiveness of various regulatory/macroeconomic stabilization policies
- ▶ Servicing activities of shadow banks not well understood
  - ▶ Interactions between loan servicing and origination?
  - ▶ Implications for transmission of monetary policy?

# This paper

- ▶ This paper proposes and tests a new mortgage servicing channel of monetary transmission through shadow banks
  - ▶ Servicing mortgages generates mortgage servicing rights (MSRs) whose value appreciates during periods of monetary contraction
  - ▶  $\uparrow$  interest rates  $\rightarrow \downarrow$  prepayment risk  $\rightarrow \uparrow$  value of MSRs
  - ▶ Mortgage servicing acts as natural hedge against interest rate shocks

# Overview of results

- ▶ Shadow banks curtail mortgage origination less than traditional banks following contractionary monetary policy shocks
- ▶ **Mortgage servicing channel**: dampened transmission of MP shocks to mortgage lending driven by shadow banks with higher holdings of mortgage servicing rights
- ▶ Mortgage servicing channel is stronger for shadow banks with:
  - ▶ Lower capital ratios
  - ▶ Riskier lending portfolios
- ▶ Shadow banks with greater MSR exposure draw down credit lines more and face lower external funding costs
- ▶ The MSR channel benefits low-income borrowers and minority borrowers relatively more

# Institutional Background on Mortgage Servicing



# Mortgage servicing rights

- ▶ **Mortgage servicing right** is asset created when primary lender originates a mortgage that is sold with servicing retained
- ▶ Servicer (MSR holder) responsible for collecting monthly mortgage payments from borrowers and distributing them to investors
- ▶ Servicers get compensated in the form of servicing fee – monthly payment which is a fixed share of monthly mortgage payment
- ▶ Fair value of MSR = PV of expected revenue from servicing loan
- ▶ Valuation of MSR depends on expected duration of the loan
- ▶  $\uparrow$  interest rates  $\rightarrow \downarrow$  prepayment risk  $\rightarrow \uparrow$  expected duration of loan  $\rightarrow \uparrow$  value of MSR

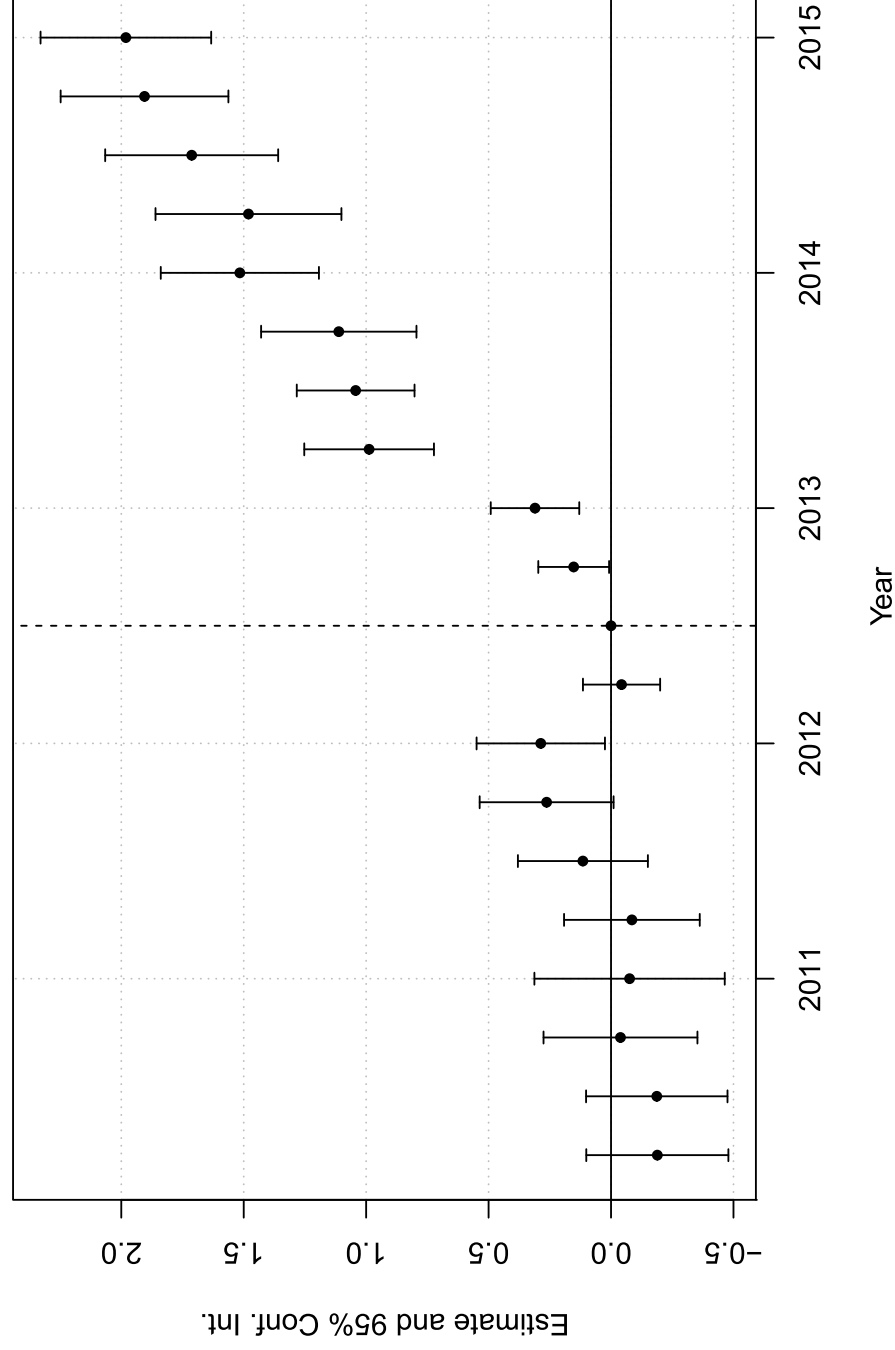
# Rise of shadow banks in servicing market

- ▶ Failure of savings and loan institutions led to transfer of distressed assets from banks to shadow banks in early 1990s
- ▶ Banks were dominant players until 2011 with a share of more than 70%
- ▶ Factors responsible for the rise of shadow banks: regulation, technology, expertise
- ▶ **2012Q2: U.S. announcement of Basel III standards**
  - ▶ Cap on MSR contribution to Tier 1 capital from 50% to 10%
  - ▶ Risk weight on MSRs increased from 100% to 250%
- ▶ Massive decline in banks' participation in the servicing market

# Rise of shadow banks in servicing market

$$Y_{M,t} = \beta \text{Treated}_M \times \text{Post}_t + \gamma X_{M,t} + FE_M + FE_t + \epsilon_{M,t}$$

Effect on Nonbank Servicing Share



# Importance of MSRs for shadow banks

- ▶ Unlike traditional banks, which rely on deposits for funding, shadow banks fund mortgages using
  - ▶ secured lines of credit backed by underlying mortgages
  - ▶ secured lines of credit backed by MSRs
  - ▶ cashflow from operations (servicing and origination)
- ▶ Shadow banks with exposure to mortgage servicing will be relatively less negatively affected by rising interest rates
  - ▶ Higher value of MSRs allows shadow banks to get access to secured funding
  - ▶ Lower cashflows from origination business offset by higher cashflows from servicing business → networth relatively less negatively affected

# Data and Methodology

# Data sources

- ▶ Confidential Home Mortgage Disclosure Act (HMDA)
  - ▶ **Quarterly** mortgage application-level data
  - ▶ Loan & borrower characteristics, identity of lender
- ▶ Shadow bank mortgage call reports (MCR)
  - ▶ Obtained from Freedom of Information Act requests to state regulators in Washington and Massachusetts
  - ▶ Covers 80% of mortgages originated by shadow banks
  - ▶ Quarterly variables on balance sheets, mortgage activity, funding
- ▶ Sample construction
  - ▶ Lender classified as shadow bank if “independent mortgage bank” or “independent mortgage bank affiliated with depository institution”
  - ▶ MCR and HMDA merged on name and address of shadow banks
  - ▶ Merged sample: 384 unique shadow banks from 2012–2017

# Top 5 banks and shadow banks

| Institution Type | Name                                     | MSR/Assets (%) |
|------------------|--|----------------|
| Shadow Bank      | Quicken Loans Inc.                       | 15.67          |
| Shadow bank      | LoanDepot.com, LLC                       | 9.01           |
| Shadow bank      | United Shore Financial Services, LLC     | 8.95           |
| Shadow bank      | Caliber Home Loans, Inc.                 | 21.84          |
| Shadow bank      | Fairway Independent Mortgage Corporation | 1.25           |
| Bank             | Wells Fargo Bank, NA                     | 0.83           |
| Bank             | JP Morgan Chase Bank, NA                 | 0.29           |
| Bank             | Bank of America, N.A.                    | 0.21           |
| Bank             | US Bank, N.A.                            | 0.54           |
| Bank             | PNC Bank N.A.                            | 0.44           |

# Empirical strategy and monetary policy shocks

- ▶ Identification challenge in estimating effects of monetary policy
  - ▶ Most changes in federal funds rate (FFR) are central bank's systematic response to macroeconomic variables
  - ▶ Value of MSRs already reflects anticipated changes to FFR through expected loan duration and prepayment probability
- ▶ Measuring unanticipated changes in monetary policy
  - ▶ Use **high-frequency movement** in 3-month fed funds futures around FOMC meetings (Jarociński and Karadi, 2020)
  - ▶ Identifying assumption: monetary policy news dominates other factors in 30-minute window around policy rate announcements
  - ▶ Aggregated to quarterly frequency



# Results

# Shadow banks dampen monetary transmission mechanism

$$Y_{i,l,c,t} = \beta \text{Nonbank}_{l,t} \times \text{FFF3m}_t + \gamma X_{i,l,t} + FE_{c,t} + FE_{c,l} + \epsilon_{i,l,c,t}$$

| Dependent Variables:                        |  | Origination | Log Loan Amount |
|---|--|-------------|-----------------|
|   |  | (1)         | (2)             |
| FFF3m <sub>t</sub> × NonBank <sub>l,t</sub> |  | 0.0956***   | 0.0635***       |
|   |  | (0.0183)    | (0.0137)        |
| NonBank <sub>l,t</sub>                      |  | 0.0007      | −0.0047         |
|   |  | (0.0066)    | (0.0043)        |
| N   |  | 6,992,480   | 5,591,817       |
| R <sup>2</sup>                              |  | 0.1916      | 0.8635          |
| Controls                                    |  | Yes         | Yes             |
| Fixed effects                               |  | Yes         | Yes             |

- Shadow banks contract mortgage lending by less, relative to traditional banks, following unexpected monetary contraction
- 25bp MP shock ⇒ ↑ 2.4% loans originated, ↑ 1.6% loan size

# Mortgage servicing channel of monetary transmission

$$Y_{l,c,t} = \beta \text{FFF3m}_t \times \text{MSREquity}_{l,t-1} + \gamma X_{l,t-1} + FE_{c,t} + FE_{c,l} + \epsilon_{l,c,t}$$

| Dependent Variables:                            |  | Log Loan Count        | Log Loan Amount       |
|---|--|-----------------------|-----------------------|
|   |  | (1)                   | (2)                   |
| FFF3m <sub>t</sub> × MSREquity <sub>l,t-1</sub> |  | 0.0091***<br>(0.0006) | 0.0102***<br>(0.0007) |
| MSREquity <sub>l,t-1</sub>                      |  | 0.0014***<br>(0.0001) | 0.0012***<br>(0.0001) |
| N   |  | 637,481               | 637,481               |
| R <sup>2</sup>                                  |  | 0.8335                | 0.8290                |
| Controls  |  | Yes                   | Yes                   |
| Fixed effects                                   |  | Yes                   | Yes                   |

- Shadow banks with higher *ex ante* MSR holdings relative to equity decrease lending less after monetary contraction
- Shadow bank with median MSR/equity: 25bp MP shock ⇒ ↑ 3.2% loans originated, ↑ 3.6% loan size

# Heterogeneity tests

| Dependent Variables:   | Capital                |                        | Risk                  |                       |
|--|------------------------|------------------------|-----------------------|-----------------------|
|  | Log Count<br>(1)       | Log Amount<br>(2)      | Log Count<br>(3)      | Log Amount<br>(4)     |
| $FFF3m_t \times MSREquity_{l,t-1} \times CapitalRatio_{l,t-1}$ | -0.0004***<br>(0.0001) | -0.0004***<br>(0.0001) |                       |                       |
| $FFF3m_t \times MSREquity_{l,t-1} \times LowFICO\%_{l,t-1}$    |                        |                        | 0.0003***<br>(0.0001) | 0.0003***<br>(0.0001) |
| $FFF3m_t \times MSREquity_{l,t-1}$                             | 0.0153***<br>(0.0012)  | 0.0165***<br>(0.0014)  | 0.0056***<br>(0.0017) | 0.0050***<br>(0.0019) |
| $N$  | 637,481                | 637,481                | 246,841               | 246,841               |
| $R^2$  | 0.83392                | 0.82925                | 0.82360               | 0.82637               |
| Controls   | Yes                    | Yes                    | Yes                   | Yes                   |
| Fixed effects  | Yes                    | Yes                    | Yes                   | Yes                   |

- ▶ For shadow banks, mortgage servicing rights:
  - ▶ Attenuate adverse selection frictions in raising external finance
- ▶ Strength of mortgage servicing channel is:
  - ▶ Decreasing in capital to asset ratio
  - ▶ Increasing in exposure to risky borrowers

# Heterogeneity tests

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|                      | $\text{FFF3m}_t \times \text{MSREquity}_{l,t-1}$                                    | $0.0153^{***}$<br>(0.0012)  | $0.0165^{***}$<br>(0.0014)  | $0.0056^{***}$<br>(0.0017) | $0.0050^{***}$<br>(0.0019) |
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| Controls             |   | Yes                         | Yes                         | Yes                        | Yes                        |
| Fixed effects        |   | Yes                         | Yes                         | Yes                        | Yes                        |

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- For shadow banks, mortgage servicing rights:
  - Attenuate adverse selection frictions in raising external finance
- Strength of mortgage servicing channel is:
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# Evidence on shadow bank funding

$$Y_{l,t} = \beta \text{FFF3m}_{t-1} \times \text{MSREquity}_{l,t-1} + \gamma X_{l,t-1} + FE_l + FE_t + \epsilon_{l,t}$$

| Dependent Variables:                              | Log Credit Limit<br>(1) | Log Used Credit<br>(2) | Interest Rate<br>(3)   |
|---|-------------------------|------------------------|------------------------|
| FFF3m <sub>t-1</sub> × MSREquity <sub>l,t-1</sub> | 0.0165*<br>(0.0084)     | 0.0312***<br>(0.0088)  | -0.0008***<br>(0.0002) |
| MSREquity <sub>l,t-1</sub>                        | -0.0010<br>(0.0013)     | 0.0008<br>(0.0011)     | 0.0000<br>(0.0000)     |
| N   | 4,603                   | 4,487                  | 4,251                  |
| R <sup>2</sup>                                    | 0.9263                  | 0.8877                 | 0.4291                 |
| Controls  | Yes                     | Yes                    | Yes                    |
| Fixed effects                                     | Yes                     | Yes                    | Yes                    |

- ▶ After monetary contraction, shadow banks with more MSRs:
  - ▶ Experience increase in overall credit limit
  - ▶ Draw down existing credit lines more
  - ▶ Face lower external funding costs

# Distributional Effects

| Dependent Variables:   | Low income                 |                            | Minority                   |                            |
|--|----------------------------|----------------------------|----------------------------|----------------------------|
|  | Log Count<br>(1)           | Log Amount<br>(2)          | Log Count<br>(3)           | Log Amount<br>(4)          |
| $\text{LowIncome}_{l,i} \times \text{FFF3m}_t \times \text{MSREquity}_{l,t-1}$ | $0.0034^{***}$<br>(0.0010) | $0.0023^{***}$<br>(0.0009) |                            |                            |
| $\text{Minority}_{l,i} \times \text{FFF3m}_t \times \text{MSREquity}_{l,t-1}$  |                            |                            | $0.0061^{***}$<br>(0.0012) | $0.0069^{***}$<br>(0.0014) |
| $\text{FFF3m}_t \times \text{MSREquity}_{l,t-1}$                               | $0.0068^{***}$<br>(0.0008) | $0.0063^{***}$<br>(0.0007) | $0.0065^{***}$<br>(0.0006) | $0.0070^{***}$<br>(0.0007) |
| $N$  | 951,964                    | 951,964                    | 835,930                    | 835,930                    |
| $R^2$  | 0.7655                     | 0.7605                     | 0.7309                     | 0.7376                     |
| Controls   | Yes                        | Yes                        | Yes                        | Yes                        |
| Fixed effects  | Yes                        | Yes                        | Yes                        | Yes                        |

► Ease of financing frictions through MSRs during monetary policy tightening period benefits **low income** and **minority** borrowers



# Robustness tests for mortgage servicing channel

- ▶ Alternative measure of MSR exposure [▶ More](#)
- ▶ Alternative measure of monetary policy shocks [▶ More](#)
- ▶ Alternative classification of shadow banks [▶ More](#)

# Conclusion

- ▶ Highlighted importance of shadow banks in mortgage servicing
- ▶ Proposed new mortgage servicing channel of monetary policy transmission operating through shadow banks
- ▶ Mortgage servicing channel attenuates negative effects of higher interest rates on loan origination

▶ Distributional effects

# Appendix

# Basel III treatment of mortgage servicing rights

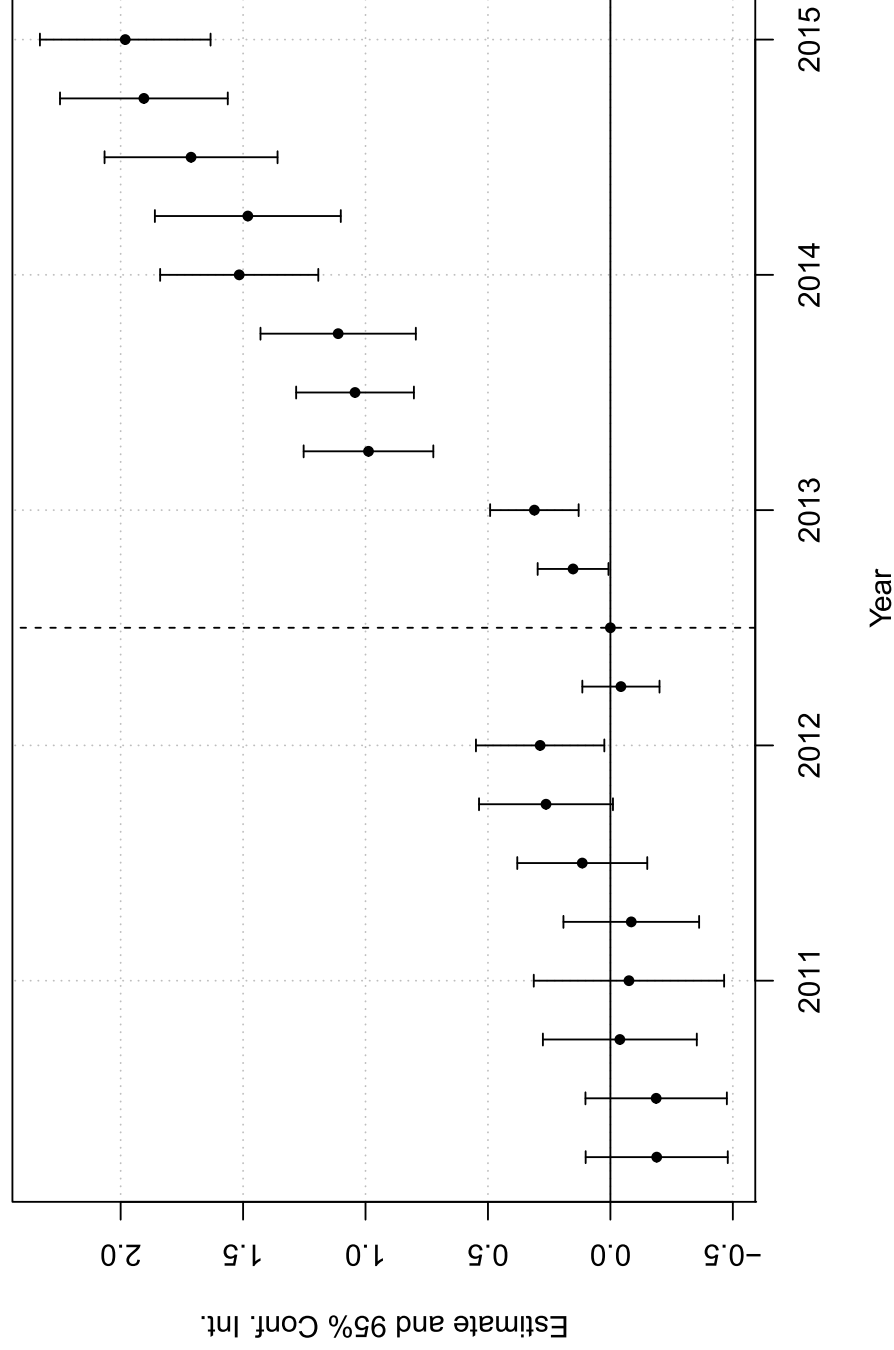
- ▶ 2012Q2: U.S. announcement of Basel III standards
  - ▶ Cap on MSR contribution to Tier 1 capital from 50% to 10%
  - ▶ Risk weight on MSRs from 100% to 250%
- ▶ *Ex ante* variation in banks' capital ratios generates plausibly exogenous variation in shadow banks' servicing share
  - ▶ U.S. treatment of MSRs differed from international standards and were largely unanticipated (Irani et al, 2021)
  - ▶ Hypothesis: more reallocation of servicing and lending to shadow banks where banks had higher regulatory capital shortfalls
- ▶ Measure of *ex ante* exposure to Basel III: servicing-weighted MSRs as percent of tier 1 capital at MSA level

$$\text{MSR}\%_M = 100 \times \sum_{b \in M} \frac{\text{MSR}_{b_{2012Q2}}}{\text{Tier1Capital}_{b_{2012Q2}}} \times \frac{\text{Servicing}_{b_{2012Q2}}}{\sum_{d \in M} \text{Servicing}_{d_{2012Q2}}}$$

# Effect of Basel III standards on shadow bank servicing share

$$Y_{M,t} = \beta \text{MSR}\%_M \times \text{Post}_t + \gamma X_{M,t} + FE_M + FE_t + \epsilon_{M,t}$$

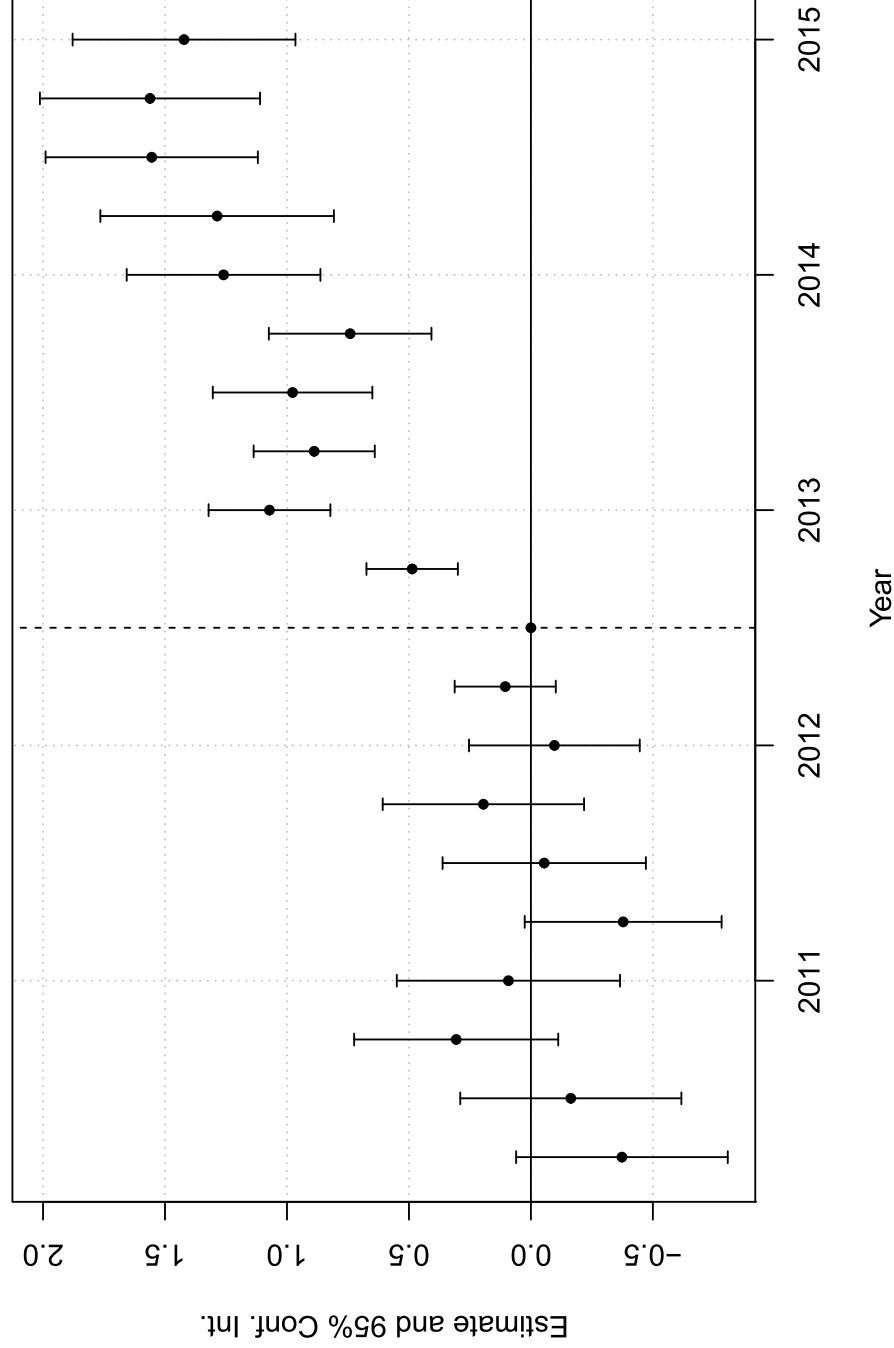
Effect on Nonbank Servicing Share



# Effect of Basel III standards on shadow bank lending share

$$Y_{M,t} = \beta \text{MSR}\%_M \times \text{Post}_t + \gamma X_{M,t} + FE_M + FE_t + \epsilon_{M,t}$$

Effect on Nonbank Origination Share



# Summary statistics

| Panel A: Shadow bank balance sheets     |       |       |       |       |       |       |
|---|-------|-------|-------|-------|-------|-------|
|   | N     | Mean  | SD    | p25   | p50   | p75   |
| Assets (in billions)                    | 6,502 | 0.491 | 1.494 | 0.038 | 0.085 | 0.246 |
| Equity (in billions)                    | 6,502 | 0.082 | 0.260 | 0.007 | 0.017 | 0.047 |
| Mortgage UPB to asset ratio             | 6,502 | 0.647 | 0.282 | 0.560 | 0.740 | 0.826 |
| Liquidity to asset ratio                | 6,502 | 0.098 | 0.136 | 0.033 | 0.061 | 0.115 |
| MSR to asset ratio                      | 6,502 | 0.077 | 0.101 | 0.000 | 0.021 | 0.104 |
| MSR to equity ratio                     | 6,498 | 0.381 | 0.382 | 0.003 | 0.142 | 0.492 |
| Capital ratio                           | 6,502 | 0.236 | 0.312 | 0.128 | 0.189 | 0.295 |
| Share of mortgages with FICO $\leq$ 650 | 1,463 | 0.189 | 0.221 | 0.054 | 0.110 | 0.226 |
| Panel B: Shadow bank funding            |       |       |       |       |       |       |
|   | N     | Mean  | SD    | p25   | p50   | p75   |
| Credit limit (in billions)              | 5,676 | 0.839 | 6.509 | 0.052 | 0.112 | 0.310 |
| Used credit (in billions)               | 5,676 | 0.395 | 2.422 | 0.026 | 0.063 | 0.183 |
| Utilization rate                        | 5,676 | 0.522 | 0.210 | 0.376 | 0.522 | 0.675 |
| Interest rate (annualized)              | 4,648 | 0.027 | 0.021 | 0.016 | 0.024 | 0.035 |

[◀ Return](#)

# Evidence on shadow bank funding: robustness

$$Y_{l,b,t} = \beta \text{FFF3m}_{t-1} \times \text{MSREquity}_{l,t-1} + \gamma X_{l,t-1} + FE_l + FE_t + FE_{b,t} + \epsilon_{l,b,t}$$

| Dependent Variables:       |   | Log Credit Limit      | Log Used Credit       | Interest Rate          |
|----------------------------|---|-----------------------|-----------------------|------------------------|
|                            |   | (1)                   | (2)                   | (3)                    |
| MSREquity <sub>l,t-1</sub> | FFF3m <sub>t-1</sub> × MSREquity <sub>l,t-1</sub> | 0.0173***<br>(0.0062) | 0.0290***<br>(0.0079) | -0.0007***<br>(0.0002) |
|                            |   | -0.0003<br>(0.0010)   | 0.0000<br>(0.0011)    | 0.0000<br>(0.0000)     |
|                            | N   | 4,603                 | 4,487                 | 4,251                  |
|                            | R <sup>2</sup>                                    | 0.9263                | 0.8877                | 0.4291                 |
| Controls                   |   | Yes                   | Yes                   | Yes                    |
| Fixed effects              |   | Yes                   | Yes                   | Yes                    |

- ▶ Endogeneity concerns with shadow bank-level analysis
  - ▶ Matching between shadow banks and their lenders is non-random
  - ▶ Those with high MSR exposure may borrow from lenders experiencing positive credit supply shocks
- ▶ To address this, exploit within-shadow bank-lender pair variation



# Distributional Effects

| Dependent Variables: |  | Low income                 |                            | Minority                   |                            |
|----------------------|--|----------------------------|----------------------------|----------------------------|----------------------------|
|                      |  | Log Count<br>(1)           | Log Amount<br>(2)          | Log Count<br>(3)           | Log Amount<br>(4)          |
|                      | $\text{LowIncome}_{l,i} \times \text{FFF3m}_t \times \text{MSREquity}_{l,t-1}$ | $0.0034^{***}$<br>(0.0010) | $0.0023^{***}$<br>(0.0009) |                            |                            |
|                      | $\text{Minority}_{l,i} \times \text{FFF3m}_t \times \text{MSREquity}_{l,t-1}$  |                            |                            | $0.0061^{***}$<br>(0.0012) | $0.0069^{***}$<br>(0.0014) |
|                      | $\text{FFF3m}_t \times \text{MSREquity}_{l,t-1}$                               | $0.0068^{***}$<br>(0.0008) | $0.0063^{***}$<br>(0.0007) | $0.0065^{***}$<br>(0.0006) | $0.0070^{***}$<br>(0.0007) |
| $N$                  |  | 951,964                    | 951,964                    | 835,930                    | 835,930                    |
| $R^2$                |  | 0.7655                     | 0.7605                     | 0.7309                     | 0.7376                     |
| Controls             |  | Yes                        | Yes                        | Yes                        | Yes                        |
| Fixed effects        |  | Yes                        | Yes                        | Yes                        | Yes                        |

► Ease of financing frictions through MSRs during monetary policy tightening period benefits **low income** and **minority** borrowers

# Alternative measure of MSR exposure

| Dependent Variables:                           | Log Count       |                 | Log Amount      |                 |
|--|-----------------|-----------------|-----------------|-----------------|
|  | (1)             | (2)             | (3)             | (4)             |
| $\text{FF3m}_t \times \text{MSRAsset}_{l,t-1}$ | $0.0238^{***}$  | $0.0347^{***}$  | $0.0285^{***}$  | $0.0397^{***}$  |
|  | (0.0032)        | (0.0028)        | (0.0036)        | (0.0032)        |
| $\text{MSRAsset}_{l,t-1}$                      | $-0.0015^{***}$ | $-0.0021^{***}$ | $-0.0016^{***}$ | $-0.0022^{***}$ |
|  | (0.0004)        | (0.0004)        | (0.0005)        | (0.0005)        |
| $N$  | 661,960         | 637,481         | 661,960         | 637,481         |
| $R^2$  | 0.4049          | 0.8334          | 0.4740          | 0.8289          |

- Lending by shadow banks with higher *ex ante* MSR holdings relative to assets decreases less after monetary tightening
- Mortgage servicing channel robust to shadow bank size

# Alternative measure of monetary policy shocks

| Dependent Variables:            | Log Count                  |                            | Log Amount                 |                            |
|---------------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
|                                 | (1)                        | (2)                        | (3)                        | (4)                        |
| $NS_t \times MSREquity_{l,t-1}$ | $0.0050^{***}$<br>(0.0006) | $0.0066^{***}$<br>(0.0005) | $0.0056^{***}$<br>(0.0006) | $0.0073^{***}$<br>(0.0006) |
| $MSREquity_{l,t-1}$             | $0.0011^{***}$<br>(0.0001) | $0.0013^{***}$<br>(0.0001) | $0.0009^{***}$<br>(0.0001) | $0.0011^{***}$<br>(0.0001) |
| $N$                             | 692,404                    | 667,613                    | 692,404                    | 667,613                    |
| $R^2$                           | 0.4119                     | 0.8336                     | 0.4790                     | 0.8290                     |

- Nakamura and Steinsson (2018) shock: high-frequency change in first principal component of different interest rates
- Mortgage servicing channel robust to using NS (2018) shock

# Alternative classification of shadow banks

| Dependent Variables:                             | Log Count      |                | Log Amount     |                |
|--|----------------|----------------|----------------|----------------|
|  | (1)            | (2)            | (3)            | (4)            |
| $\text{FFF3m}_t \times \text{MSREquity}_{l,t-1}$ | $0.0072^{***}$ | $0.0110^{***}$ | $0.0080^{***}$ | $0.0119^{***}$ |
|  | (0.0008)       | (0.0007)       | (0.0009)       | (0.0008)       |
| $\text{MSREquity}_{l,t-1}$                       | $0.0013^{***}$ | $0.0016^{***}$ | $0.0011^{***}$ | $0.0014^{***}$ |
|  | (0.0001)       | (0.0001)       | (0.0001)       | (0.0001)       |
| $N$  | 494,540        | 480,186        | 494,540        | 480,186        |
| $R^2$  | 0.4291         | 0.8406         | 0.4913         | 0.8364         |

► Mortgage servicing channel robust to using classification of shadow banks from Buchak et al (2018)