The Amortization Elasticity of Mortgage Demand

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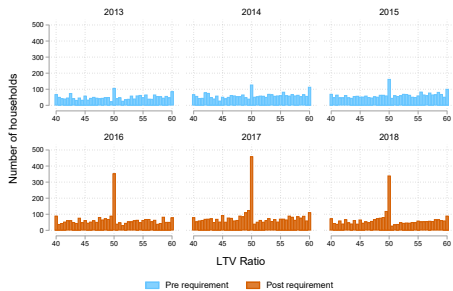


Introduction and research question

Motivation

Signing up for a mortgage commits a borrower to a long stream of mandatory amortization and interest payments

- Amortization payments $\approx$ 60 percent of first year mortgage payments

Several reasons why amortization payments are costly from the literature

- Consumption smoothing, portfolio choice, credit constraints

Research question: Do amortization payments affect borrowing decisions?

- Difficult to estimate due to lack of plausible variation in amortization rate

Why should you care?

Motivation

A new macroprudential tool in Sweden, the Netherlands and Norway

- Campbell *et al.* (2020) show that time-varying amortization payments help stabilize consumption over the business cycle

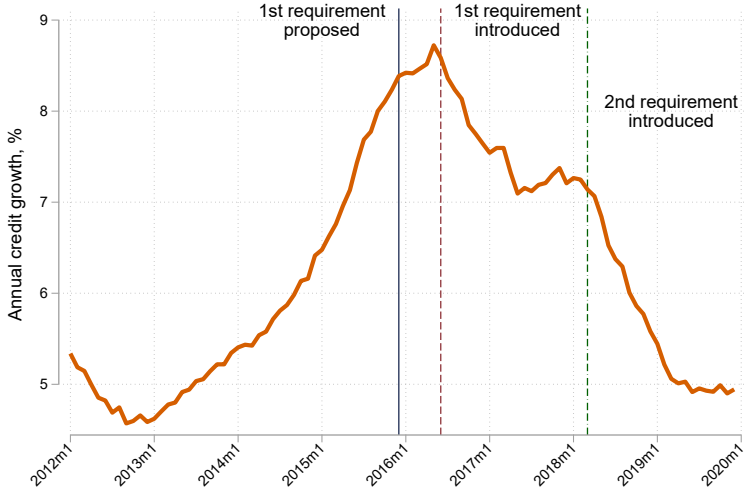
A key part of mortgage innovation

- Mortgages with low(er) amortization payments constituted 52 percent of new origination in US in 2005 (Justiniano *et al.*, 2021)
- "Complex mortgages" used by households with high income (Amromin *et al.*, 2018)

Bernstein & Koudijs (2021) show that amortization payments are key to building wealth

Credit growth in Sweden

Background



Back

This paper

What we do

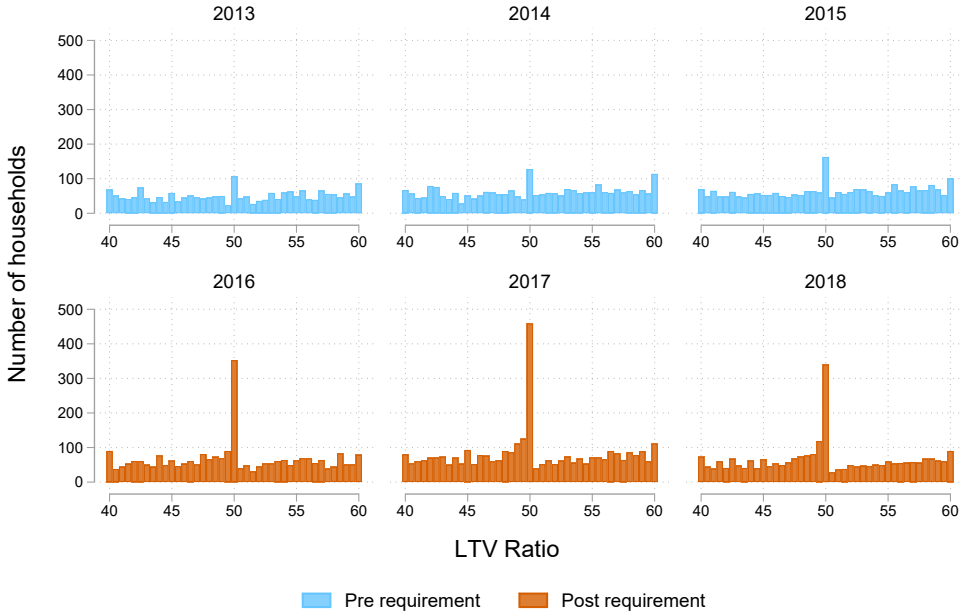
We argue that forced amortization payments are a cost

- E.g. suboptimally high savings rate, portfolio allocation and credit constraints

We use bunching in response to the Swedish amortization requirement to show that:

- Borrowers actively trade off higher amortization payment for lower LTV ratios
- We argue that this is due to lower borrowing
- 1/4 of bunchers face binding credit constraints due to the discretionary income limit

1 percentage point increase in amortization payments leads to a 0.25 percent decline in leverage


2013
2014
2015
2016
2017
2018
Number of households
0
100
200
300
400
500
40
45
50
55
60
LTV Ratio
Pre requirement
Post requirement

Roadmap

Institutional setting

Theory and Methodology

Results

- Bunching
- Elasticity
- Threats to identification

Credit supply mechanism

Institutional setting

Swedish mortgage contracts prior to 2016

Background

Mainly adjustable rate mortgage with a long maturity provided by banks

- Not annuity contracts
- Durations 40-50 years
- LTV-cap at 85%
- Payment to Income (PTI) constraint
- Adjustable rates or short fixed rate periods
- Full recourse with lifetime garnishing

The amortization requirement

Background

Swedish FSA (Finansinspektionen) introduced the amortization requirement to reduce debt levels over time

- House prices grew 31 percent betweeen 2011 and 2015 House price growth
- Credit grew at 8 percent a year in 2015 Credit growth

Amortization requirement went into effect for new mortgages in June, 2016

The amortization requirement

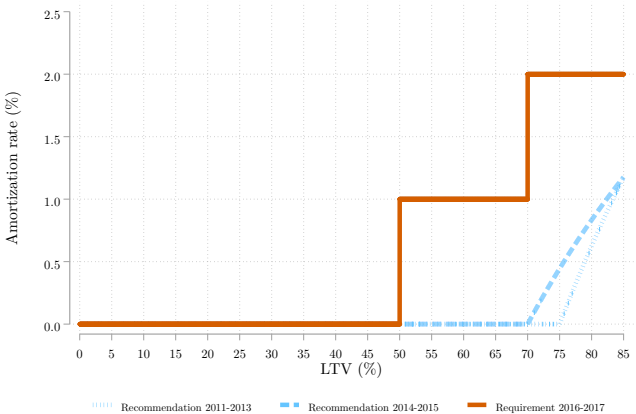
Quote

"If households were to amortise more, both their loans and their interest payments would become smaller. [...] A flexible amortisation requirement contributes in the long run to strengthening household resilience"

Source: Swedish FSA, 2014

The amortization requirement

Design



Mandatory amortization depends on loan-to-value (LTV) ratio:

- 1 percent of entire mortgage if LTV $>$ 50%
- 2 percent of entire mortgage if LTV $>$ 70%
- (From 1st of March 2018: additional 1 percent if debt-to-income $>$ 4.5)

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Why is (forced) amortization costly?

Theory

Several reasons:

- Portfolio allocation: Lower rate of return on amortization compared to risky assets and preference for liquid vs illiquid savings (Larsen *et al.*, 2018)
- Life-cycle motive: Current income low relative to permanent income (Cocco, 2013)
- Credit supply: Amortization payments included in payment-to-income calculation (Grodecka, 2020; Greenwald, 2017)
- Illiteracy, mistakes: Borrowers care about total payments

Intuition behind empirical methodology

Methodology

We use the discontinuous jump in average payments at the requirement threshold(s) to identify the trade-off between borrowing and amortizing

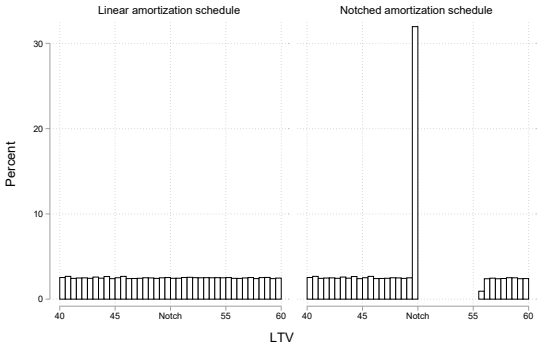
- You can trade lower borrowing for lower payments by placing yourself at the threshold

We use years prior to the requirement to estimate the counter-factual distribution and compare it to the empirical (actual) distribution

- Bunching estimate: The relative increase in percentage of households placing themselves at the threshold
- Maps directly into an estimate of the change in LTV

Notched and linear amortization schedules

Theory



Number of households bunching at the threshold:

$$B = \int_{\overline{LTV}}^{\overline{LTV}+\Delta LTV} g_{linear}(LTV)dLTV$$
$$\approx g_{linear}(\overline{LTV})\Delta LTV$$

With an estimate of $\widehat{B}$ and $\widehat{g_{linear}}$, we can solve for ΔLTV:

$$\widehat{\Delta LTV} = \frac{\widehat{B}}{\widehat{g_{linear}}(\overline{LTV})}$$

Key bunching estimates

Methodology

Counter-factual distribution $\widehat{g_{linear}(\overline{LTV})}$ estimated using pre-requirement years

Bunching $\widehat{B}$ is the difference between the observed and counterfactual bin fractions:

$$\widehat{B} = \sum_{j=L}^{R} (n_j^{post} - \hat{n}_j^{post}).$$

ΔLTV is the change in LTV for the marginal buncher:

$$\widehat{\Delta LTV} = \frac{\overbrace{\widehat{B}}^{\text{Bunched loans}}}{\underbrace{\widehat{g_{linear}(\overline{LTV})}}_{\text{Counter-factual distribution}}}$$

Data

Methodology

- Microdata reported by 8 largest banks in Sweden from Swedish FSA's "Mortgage survey" *(Bolåneundersökningen)*, 2011 - 2018
  - Survey covers all newly issued mortgage loans within a two-week window during the period August - October
  - 15,000 - 30,000 households per year
- Variables:
  - Loan-level: size, interest rate, amortization, collateral
  - Household-level: size, age, income, location, total debt (secured, unsecured)

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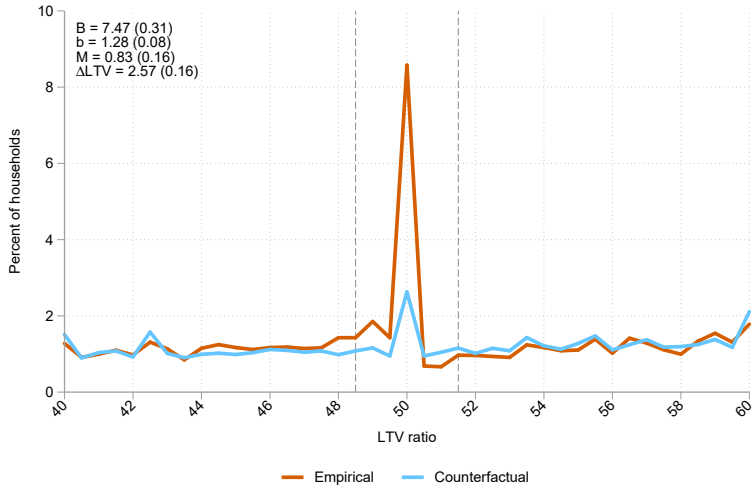
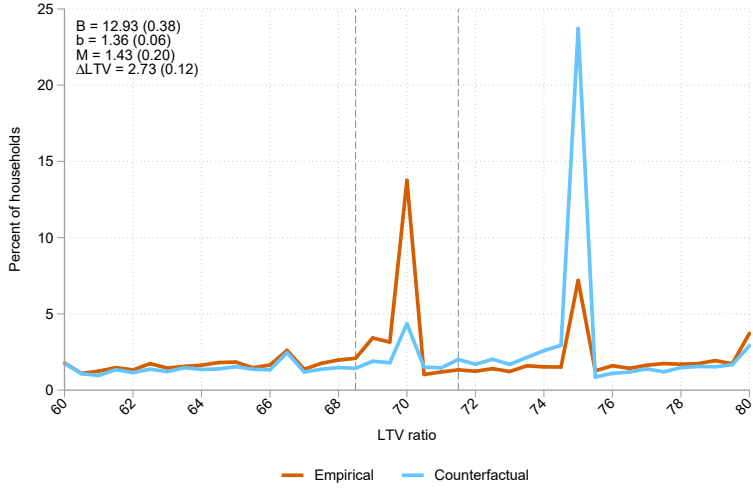
Bunching at lower threshold

Results



Bunching at upper threshold

Results



Elasticity for the marginal buncher

Elasticity

$$e^{\alpha} = \frac{\overbrace{\Delta LTV}^{\text{From bunching}}}{\underbrace{\alpha^*(\overline{LTV} + \Delta LTV) - \alpha}_{\text{Change in marginal amortization rate}}}$$

We convert the average amortization rate to the marginal amortization rate

$$\gamma^* = \gamma + \Delta\gamma + \Delta\gamma \cdot \frac{\overline{LTV}}{(LTV - \overline{LTV})}$$

Intuition: the change in amortization rate from moving just below the threshold $\overline{LTV}$ to the LTV for marginal buncher

Resulting elasticity

Elasticity

Resulting elasticity:

- Lower threshold: Reduction in LTV per unit of amortization of 0.25
- Upper threshold: Reduction in LTV per unit of amortization of 0.14

Implication: Moving from an interest-only mortgage to annuity schedule with a 3 percent interest rate reduces borrowing by between 5.6 and 10 percent

Estimation of counter-factual distribution

Threats to identification

Placebo test: estimate bunching using only pre-requirement data Placebo tests

Standard approach of fitting a flexible polynomial gives very similar results Polynomial approach

- But find it difficult to capture round-number bunching

Other reasons to bunch

Threats to identification

Maybe borrowers bunch for other reasons, not the amortization requirement?

- Interest rates around the thresholds are flat Interest rates
- Amortization rates higher above notch only after requirement is in effect Amortization rates
- Borrowing more in response to requirement (Svensson, 2016) would not lead to bunching from above
- We also argue against bank incentives, potential manipulation of collateral assessments, and salience

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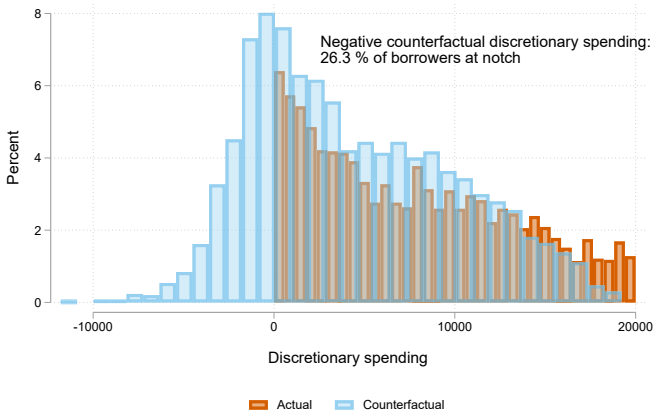
Effect of payment-to-income constraint

Credit supply



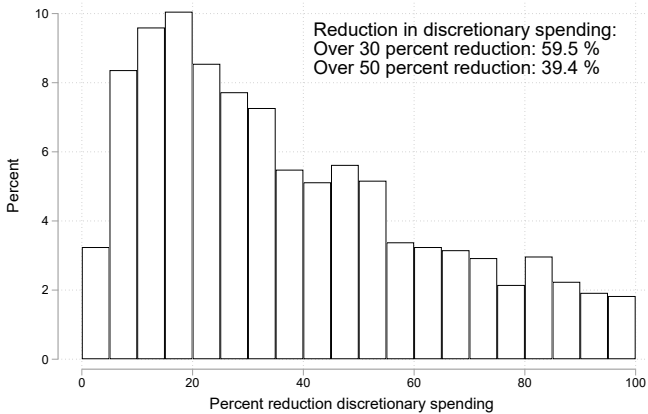
26.3% of borrowers close to the threshold are unable to borrow more due to credit constraints

Borrowers lower amortization payments to comply with PTI constraints

- Potential implication for wealth accumulation (Bernstein & Koudijs, 2021)

Reduction in discretionary income

Credit supply



Higher amortization would entail a large reduction in discretionary income for many households

39.4 percent of borrowers would have a reduction of more than 50 percent

- Anecdotally, this also seems to explain reluctance to amortize

Conclusion

Summary: We provide evidence that borrowers avoid making amortization payments

- Borrowing reduced even for households with low leverage

Contribution: We contribute to a growing literature that studies amortization payments:

- A perhaps under-appreciated part of the financial crisis? (Justiniano *et al.*, 2021; Amromin *et al.*, 2018; Ganong & Noel, 2020)
- A potential tool to stabilize the business cycle (Campbell *et al.*, 2020)
- A key part to building wealth (Bernstein & Koudijs, 2021)

Thank you!

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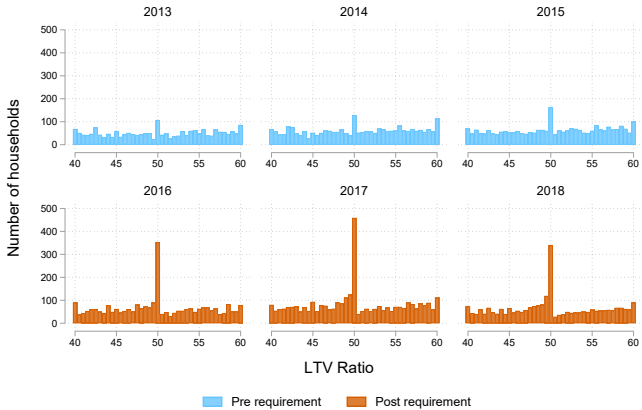
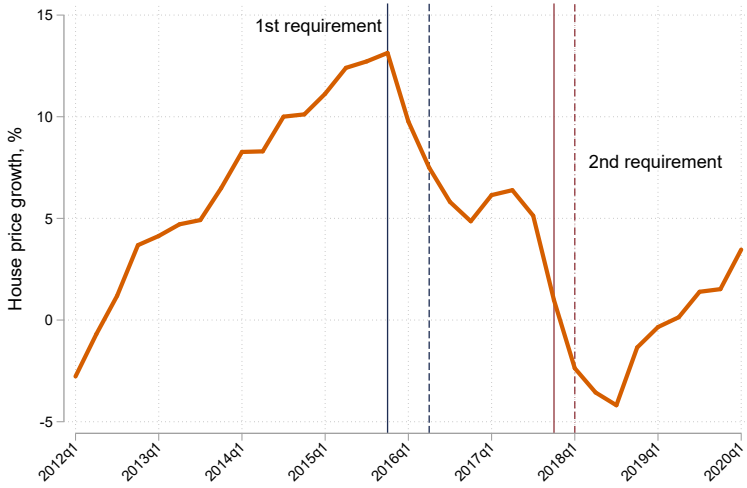


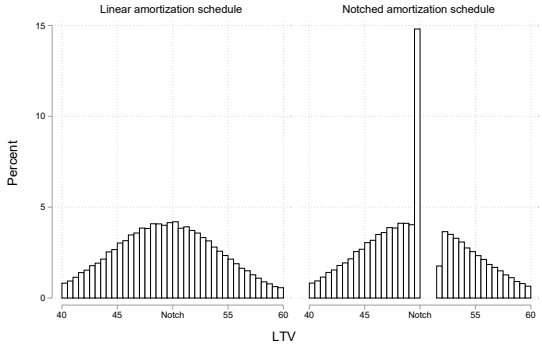
House price growth in Sweden

Background



Back

Simulated densities with and without a requirement in a simple model

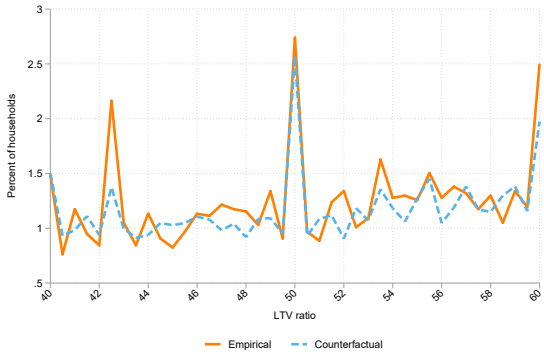


Linear schedule: $\alpha = \alpha_0$

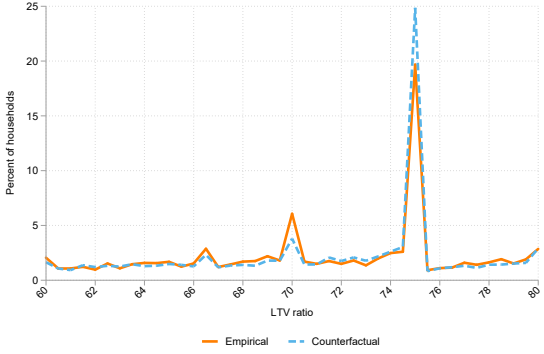
Notched schedule: $\alpha = \alpha_0 + \mathbb{1}(LTV > \overline{LTV})\Delta\alpha$

Back

Empirical and Counter-factual distribution in 2014



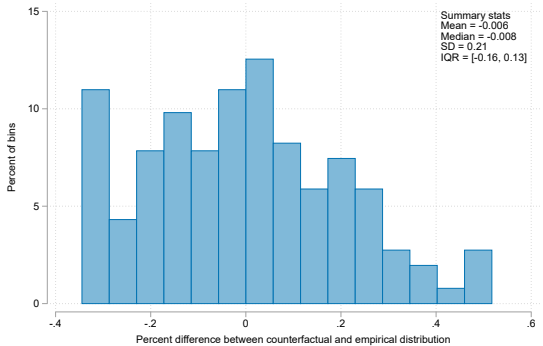
Lower threshold



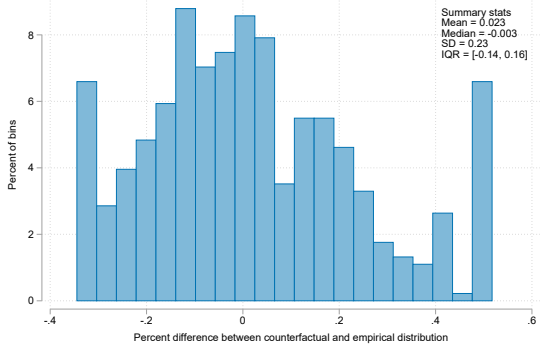
Upper threshold

Back

Ratio between counter-factual and empirical distribution in placebo years



Lower threshold

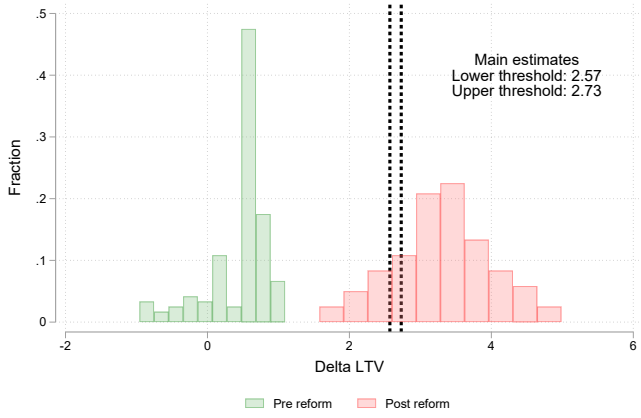


Upper threshold

Back

Estimates of ΔLTV using polynomial approach

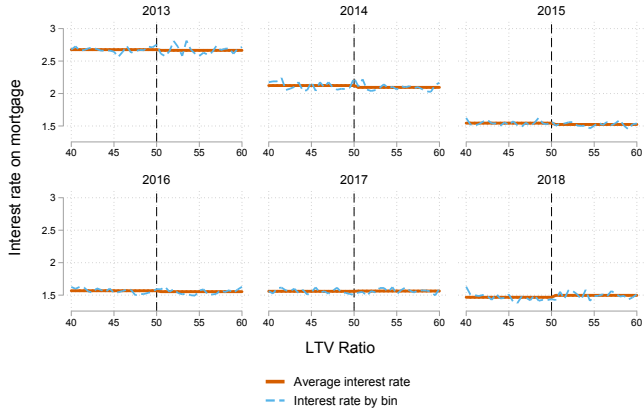
Threats to identification



Back

Interest rates by LTV ratio over time

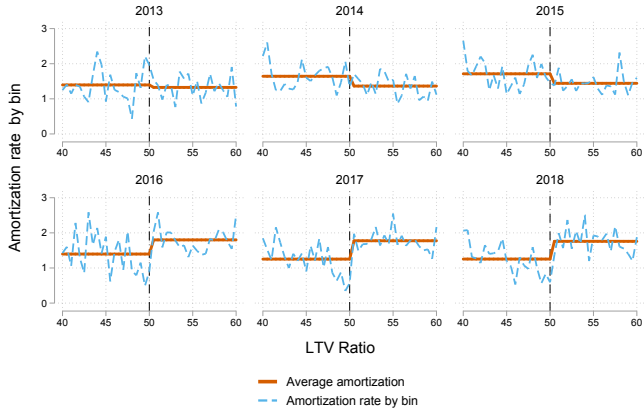
Lower threshold



Back

Amortization rates by LTV ratio over time

Lower threshold



Back

References

Amromin, Gene, Huang, Jennifer, Sialm, Clemens, & Zhong, Edward. 2018. Complex mortgages. *Review of Finance*, **22**(6), 1975–2007.

Bernstein, Asaf, & Koudijs, Peter. 2021. The Mortgage Piggy Bank: Wealth Building through Amortization. *Available at SSRN 3569252*.

Campbell, John Y, Clara, Nuno, & Cocco, Joao F. 2020. Structuring mortgages for macroeconomic stability. *The Journal of Finance, forthcoming*.

Cocco, Joao F. 2013. Evidence on the benefits of alternative mortgage products. *The Journal of Finance*, **68**(4), 1663–1690.

Ganong, Peter, & Noel, Pascal. 2020. Liquidity versus wealth in household debt obligations: Evidence from housing policy in the Great Recession. *American Economic Review*, **110**(10), 3100–3138.

Greenwald, Daniel L. 2017. *The Mortgage Credit Channel of Macroeconomic Transmission*. Working Paper, MIT Sloan.

Grodecka, Anna. 2020. On the Effectiveness of Loan-to-Value Regulation in a Multiconstraint