The Amortization Elasticity of Mortgage Demand

Presentation slides

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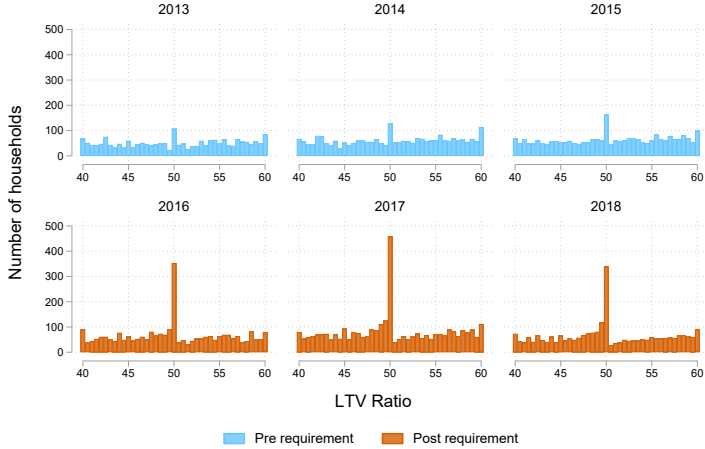


Introduction and research question

Motivation

Mortgage amortization schedules are among the largest savings plans in the world

- $250-300 billion in 2016 in US; pension plans $398 billion (Bernstein & Koudijs, 2021)
- Amortization payments $\approx$ 60 percent of first year mortgage payments

In theory, rational unconstrained borrowers can undo any mandatory amortization payments

- Borrow more (Svensson, 2016), frequent refinancing (Hull, 2017) or save less in other assets (Bernstein & Koudijs, 2021)

Research question:

How do higher required amortization payments affect borrowing decisions?

This paper

Motivation

We study a macroprudential policy introduced in Sweden in 2016, the amortization requirement

- Minimum mandatory mortgage payments have a discontinuous jump at two LTV thresholds

We find considerable bunching at the LTV thresholds for both constrained and unconstrained borrowers

- Borrowers reduce their LTV ratios by $\approx$ 5 percent
- Unconstrained borrowers ($\approx$ 74 %) respond similarly to constrained borrowers ($\approx$ 26 %)

$\rightarrow$ Results consistent with borrowers acting as if amortization payments are costly

Why is (forced) amortization costly?

Motivation

Several reasons:

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

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
- Hull (2017) and Svensson (2016) show it's ineffective in reducing debt

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)

Roadmap

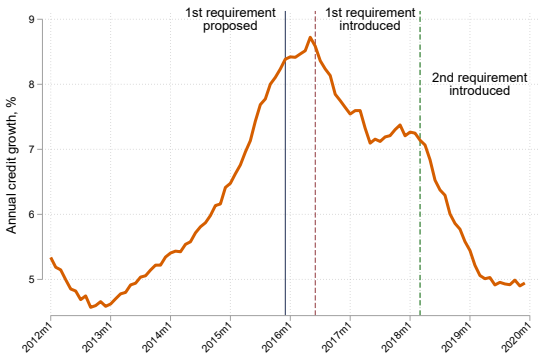
Swedish mortgage contracts prior to 2016

Background

- Adjustable rates or short fixed rate periods
- Linear repayment instead of annuity contracts
- Maturities 40-50 years
- LTV-cap at 85%
- Payment to Income (PTI) constraint
- Full recourse with lifetime garnishing

The amortization requirement

Background

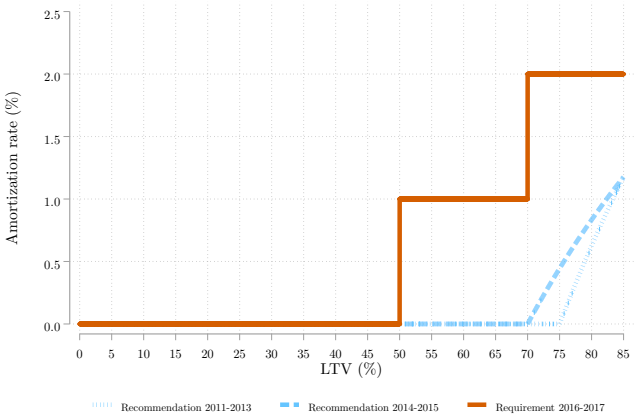


Swedish FSA (Finansinspektionen) introduced the amortization requirement to reduce debt levels over time

- House prices grew 31 percent between 2011 and 2015 House price growth
- Credit grew at 8 percent a year in 2015
- Amortization requirement went into effect for new mortgages in June, 2016

The amortization requirement

Background

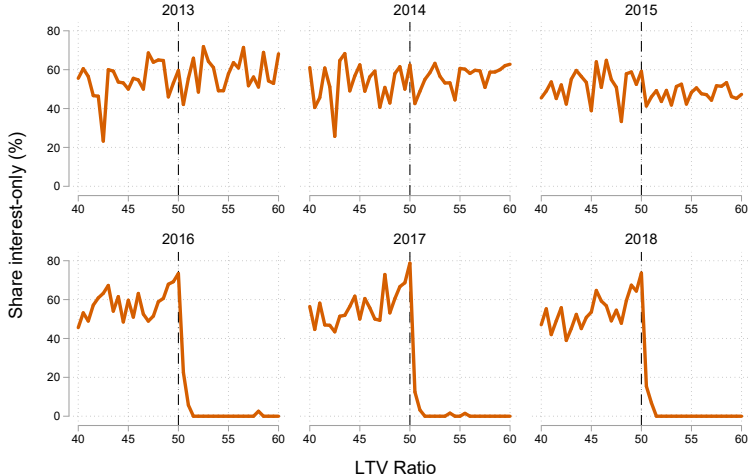


Mandatory amortization depends on loan-to-value (LTV) ratio:

- 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)

Sharp reduction in share of interest-only mortgages

Background



Roadmap

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

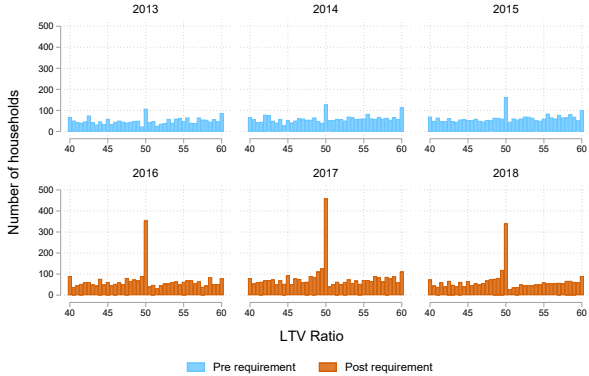
- You can trade lower borrowing for lower payments by placing yourself at the threshold
- Example: House 500,000; mortgage 350,000: LTV $= 70\% \rightarrow$ Amortization (1%) $\approx$ 300/month
- Borrow 10,000 more: LTV $= 72\% \rightarrow$ Amortization (2%) $= 600$/month
- Unconstrained borrower might well choose the lower loan to free up 300 per month

Bunching estimate

Methodology

We use years prior to the requirement to estimate the counter-factual LTV distribution (g_{pre}) and compare it to the empirical (post-requirement) distribution

- Bunching estimate: The relative increase in percentage of households placing themselves at the threshold



From bunching to LTV response

Methodology

Number of households bunching at the threshold $\overline{LTV}$:

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

Marginal buncher would have borrowed $\overline{LTV} + \Delta LTV$ had there been no notch

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

Estimated borrowing response: $\widehat{\Delta LTV} = \frac{\overbrace{\widehat{B} = \sum_{j=L}^{R}(n_j^{post} - n_j^{pre})}^{\text{Bunched loans}}}{\underbrace{\widehat{g_{pre}(\overline{LTV})}}_{\text{Counter-factual distribution}}}$

From LTV response to semi-elasticity

Methodology

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

We convert the average amortization rate (1 or 2 percent) to the marginal amortization rate ($\approx$ 20 percent)

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

Data

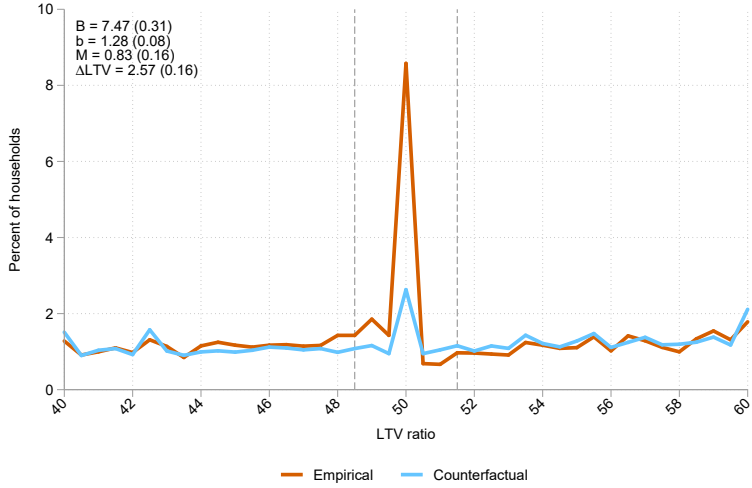
Methodology

- 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: amount, interest rate, amortization, collateral
  - Household-level: size, age, income, location, total debt (secured, unsecured)

Roadmap

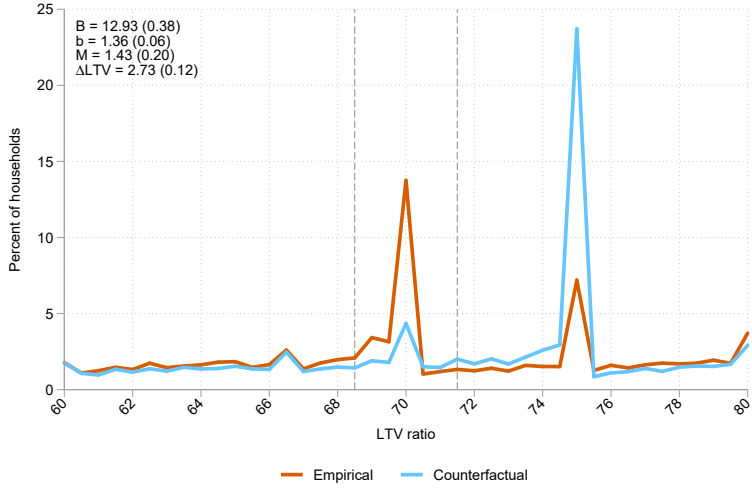
Bunching at lower threshold

Results



Bunching at upper threshold

Results



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

Bunching by constrained and unconstrained borrowers

Constrained and unconstrained borrowers

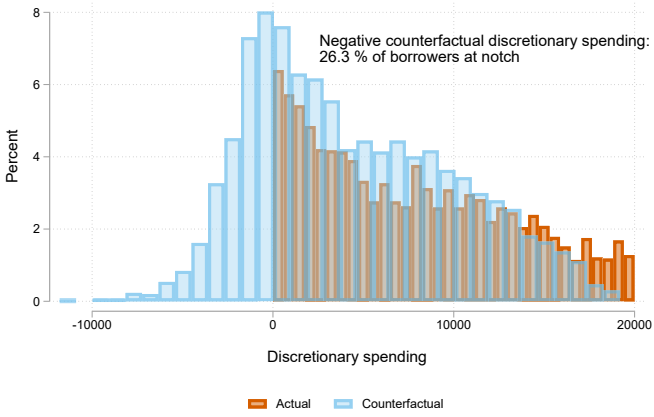
Counter-factual discretionary income = the discretionary income given your chosen LTV, minus the extra payments if you borrowed 1%-point more in LTV.

We sort borrowers in three groups according to their counter-factual discretionary income

- Constrained = counter-factual discretionary income less than 5,000 SEK,
- Intermediate counter-factual discretionary income of 5,000-15,000 SEK
- Unconstrained = counter-factual discretionary income greater than 15,000 SEK

Effect of payment-to-income constraint

Constrained and unconstrained borrowers



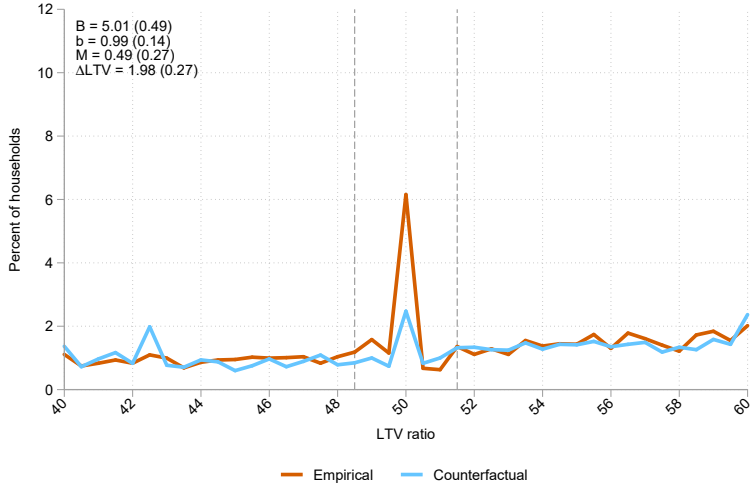
Borrowers lower amortization payments to comply with PTI constraints

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

Importantly, this still leaves three quarters of borrowers who do not face binding constraints

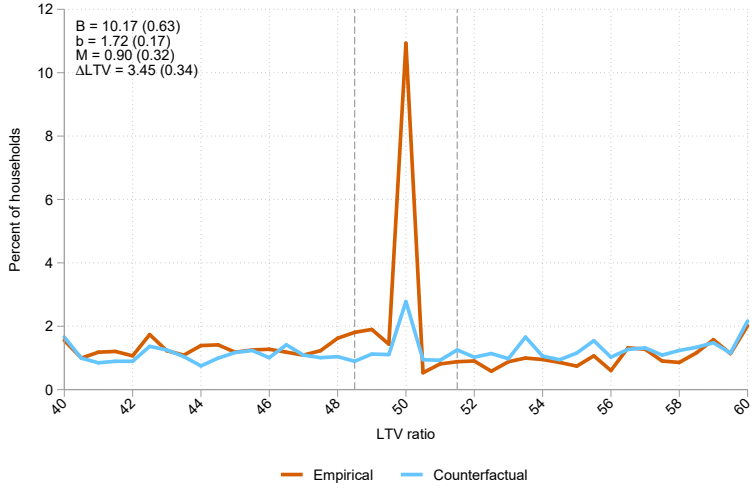
Bunching at lower threshold for Constrained group

Constrained and unconstrained borrowers



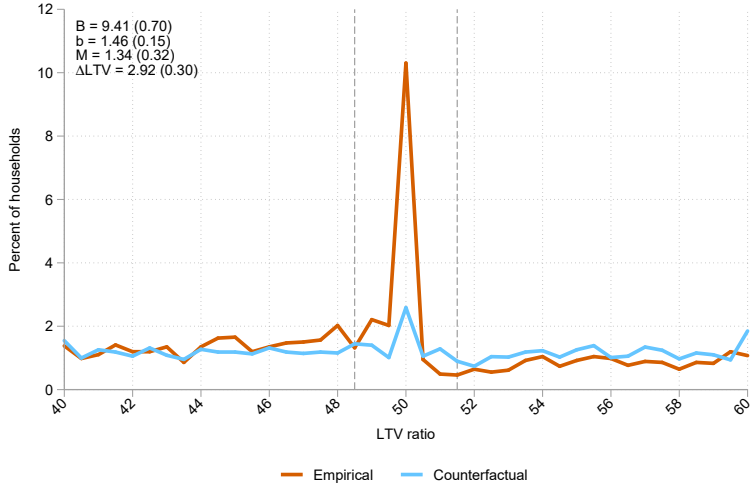
Bunching at lower threshold for Intermediate group

Constrained and unconstrained borrowers



Bunching at lower threshold for Unconstrained group

Constrained and unconstrained borrowers



Bunching estimates by type of payment constraints

Constrained and unconstrained borrowers

PTI Constraint	Constrained	Intermediate	Unconstrained
Panel A: Notch at LTV=50			
Bunching	5.01	10.17	9.41
	(0.49)	(0.63)	(0.70)
Excess mass	0.99	1.72	1.46
	(0.14)	(0.17)	(0.15)
Missing mass	-0.49	-0.90	-1.34
	(0.27)	(0.32)	(0.32)
Δ LTV	1.98	3.45	2.92
	(0.27)	(0.34)	(0.30)
Elasticity	0.15	0.45	0.32
	(0.04)	(0.09)	(0.06)
Number of borrowers	13,350	10,471	10,182

Bunching estimates for LTV=70

Reduction in LTV vs reduction in borrowing?

Endogenous housing demand response

Results are for LTV ratios, but theory is for borrowing

- There is a potentially endogenous housing demand response

We estimate bunching for existing homeowners and homebuyers

- Existing homeowners cannot adjust collateral values
- All the effect would come through the loan size
- Identify types through the valuation method used by banks

Results by valuation method

Endogenous housing demand response

Valuation	Internal	External	Purchase price
Panel A: Notch at LTV=50			
Bunching	7.10	7.38	9.30
	(0.34)	(0.88)	(1.46)
Excess mass	1.22	1.44	1.09
	(0.08)	(0.23)	(0.28)
Missing mass	-0.81	-0.81	-1.25
	(0.19)	(0.48)	(0.76)
Δ LTV	2.44	2.89	2.18
	(0.17)	(0.47)	(0.56)
Elasticity	0.23	0.32	0.18
	(0.03)	(0.10)	(0.09)

Bunching estimates for LTV=70

Roadmap

Why do unconstrained borrowers bunch?

Mechanisms

Theory suggests that:

- Higher required amortization payments make unconstrained borrowers should borrow more (Svensson, 2016)
- Borrowers can undo higher required amortization payments by refinancing → little impact on borrowing
- Borrowers can substitute other savings for amortization payments (Bernstein & Koudijs, 2021)

Why do we find that unconstrained borrowers reduce their LTV ratios?

Financial literacy?

Mechanisms

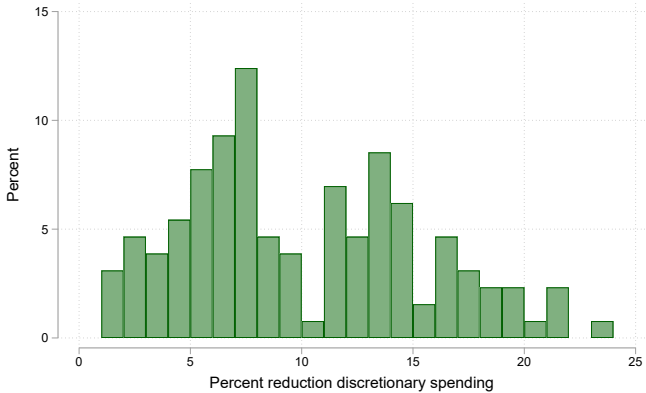
Borrowers mistake amortization payments for interest payments

- Linked to levels of financial literacy in Sweden (Almenberg & Säve-Söderbergh, 2011)
- 38% of survey respondents state that amortization payments are a cost (SBAB, 2018)

But: unconstrained households have higher income, lower debt-to-income, and lower debt-service-to-income

Liquidity?

Mechanisms



Summary statistics: Mean (std. dev): 10.05 (5.30) Min: 1.61, Max: 23.18

Higher amortization payments associated with a substantial reduction in liquidity.

Reduction in discretionary income for a one percent increase in leverage:

- Constrained: 80 percent
- Intermediate: 24 percent
- Unconstrained: 10 percent

Fixed refinancing costs?

Mechanisms

Once a borrower hits the threshold, they can lower their amortization payments

- The increase in amortization payments is potentially short-lived

Communication with banks reveal that barriers to lowering amortization rate are likely low:

- Lowering rate is free of charge for all except one bank
- Can be done online or with a phone-call
- No credit check or new contract required
- Is very rarely denied

Takeaway on mechanisms

Three (more or less) plausible mechanisms:

1. Mistaken beliefs about nature of amortization payments
2. Liquidity needs
3. Refinancing costs

We can summarize these as: **Borrowers act as if amortization payments are costly**

Roadmap

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 threshold 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

Roadmap

Conclusion

We provide evidence that constrained and unconstrained borrowers avoid higher required amortization payments

- Similar behavior has been documented in the car loan market (Argyle *et al.*, 2020)
- Ganong & Noel (2020) find that maturity extensions that increase only liquidity have large effects.

Next version of the paper will include a life-cycle model with realistic mortgage contracts to better understand the mechanisms

Thank you!

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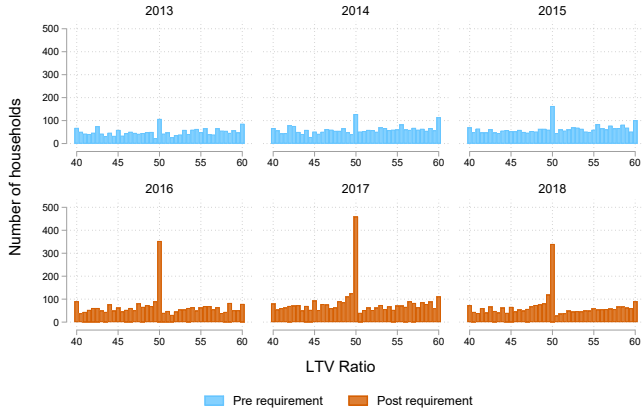
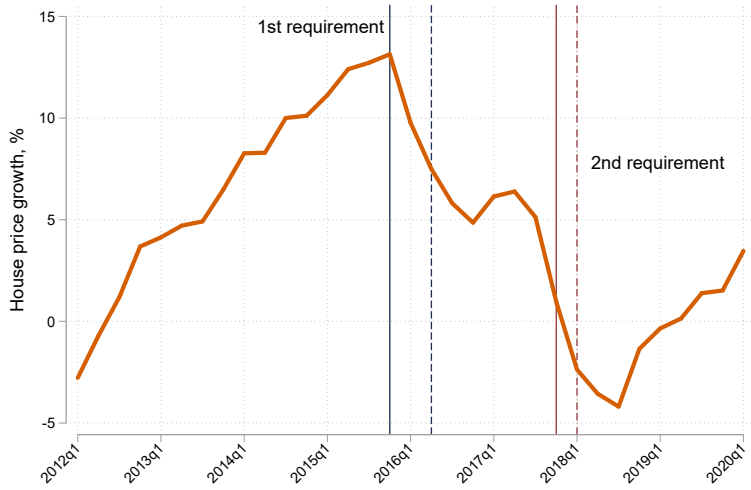


House price growth in Sweden

Background



Back

Bunching estimates by type of payment constraints

Results

PTI Constraint	Constrained	Intermediate	Unconstrained
Panel B: Notch at LTV=70			
Bunching	13.16	13.29	13.10
	(0.58)	(0.71)	(0.96)
Excess mass	1.42	1.46	1.29
	(0.10)	(0.11)	(0.12)
Missing mass	-1.28	-0.94	-2.15
	(0.32)	(0.40)	(0.42)
Δ LTV	2.84	2.92	2.57
	(0.20)	(0.22)	(0.24)
Elasticity	0.16	0.17	0.13
	(0.02)	(0.02)	(0.02)
Number of households	15,949	12,127	10,242

Back

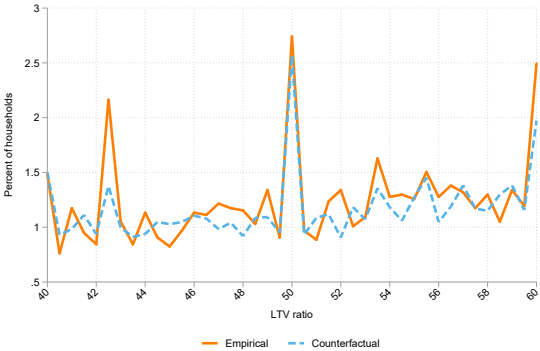
Bunching estimates by valuation

Results

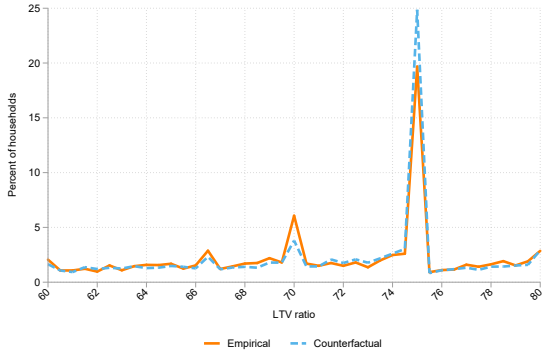
Valuation	Internal	External	Purchase price
Panel B: Notch at LTV=70			
Bunching	12.88	6.40	19.13
	(0.43)	(1.05)	(1.01)
Excess mass	1.36	0.58	2.68
	(0.07)	(0.11)	(0.32)
Missing mass	-1.38	-0.53	-1.68
	(0.24)	(0.66)	(0.54)
Δ LTV	2.72	1.17	5.36
	(0.13)	(0.23)	(0.63)
Elasticity	0.15	0.03	0.54
	(0.01)	(0.01)	(0.12)

Back

Empirical and Counter-factual distribution in 2014



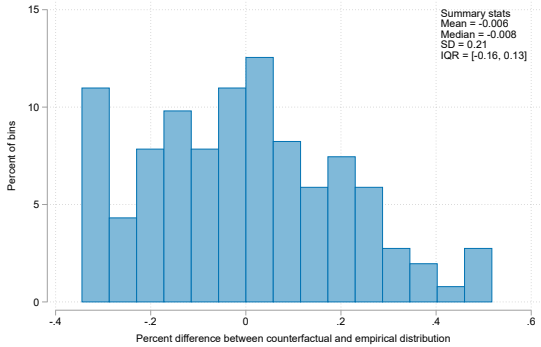
Lower threshold



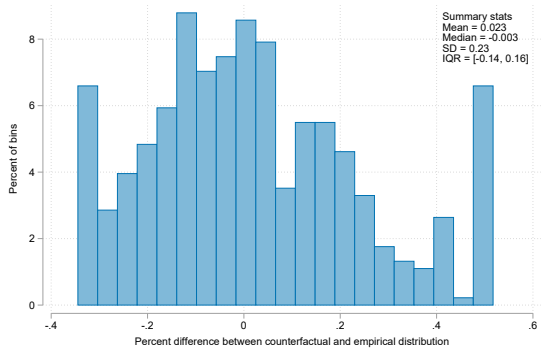
Upper threshold

Back

Ratio between counter-factual and empirical distribution in placebo years



Lower threshold

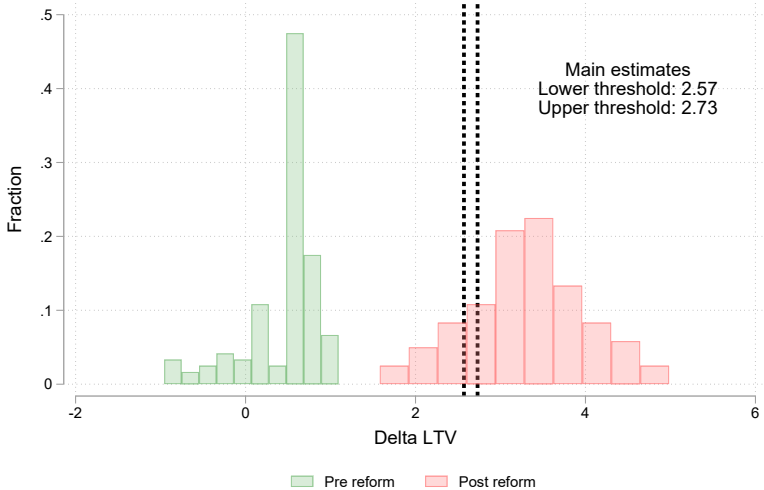


Upper threshold

Back

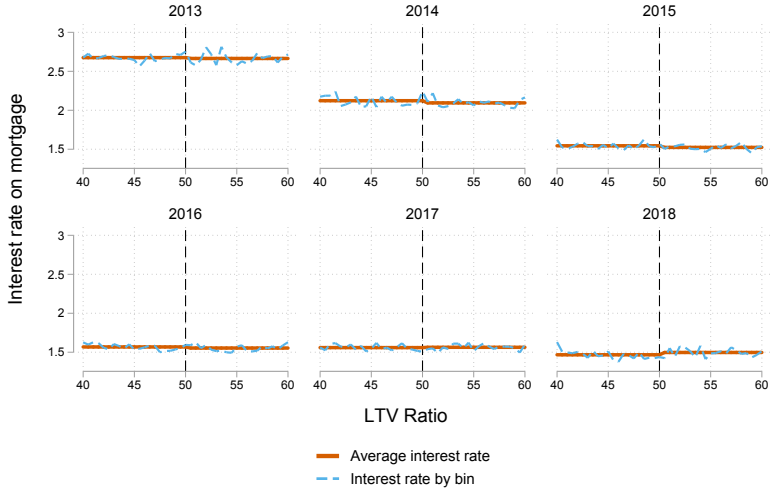
Estimates of ΔLTV using polynomial approach

Threats to identification Back



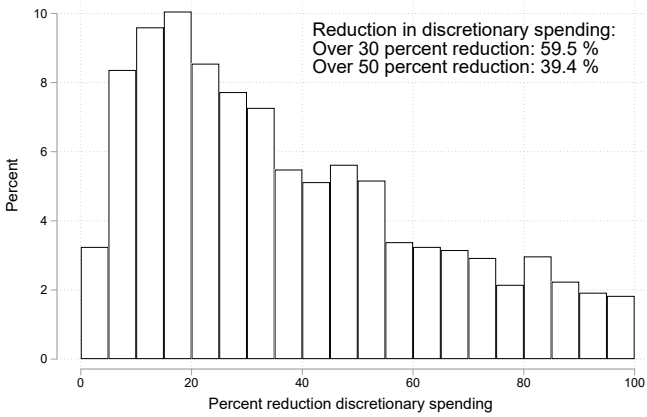
Interest rates by LTV ratio over time

Lower threshold Back



Reduction in discretionary income

Credit demand



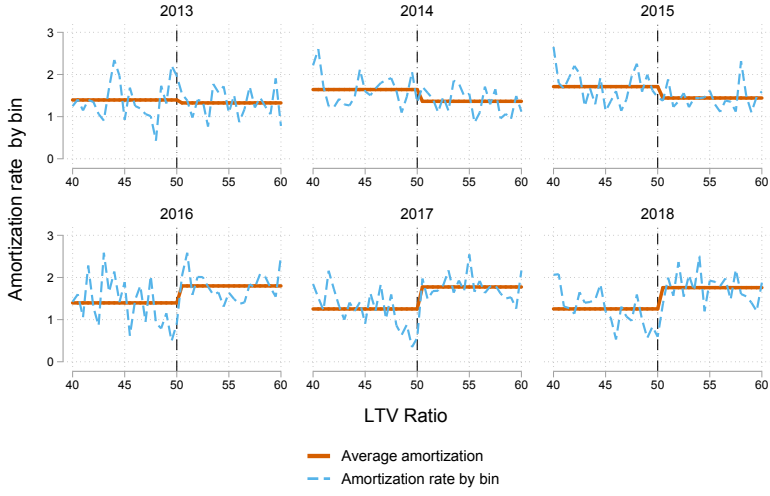
Higher amortization would entail a large reduction in discretionary income for many households

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

- Anecdotally, this also seems to explain reluctance to amortize

Amortization rates by LTV ratio over time

Lower threshold Back



References

Almenberg, Johan, & Säve-Söderbergh, Jenny. 2011. Financial literacy and retirement planning in Sweden. *Journal of Pension Economics & Finance*, **10**(4), 585–598.

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

Argyle, Bronson S, Nadauld, Taylor D, & Palmer, Christopher J. 2020. Monthly payment targeting and the demand for maturity. *The Review of Financial Studies*, **33**(11), 5416–5462.

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.