The Amortization Elasticity of Mortgage Demand

Young Scholars Nordic Finance Workshop

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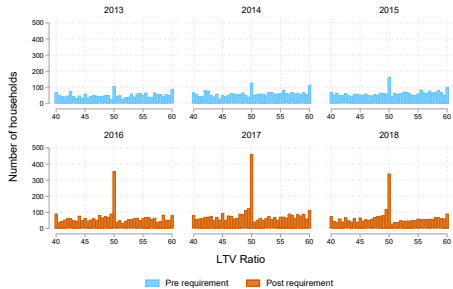
November 26, 2021



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

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

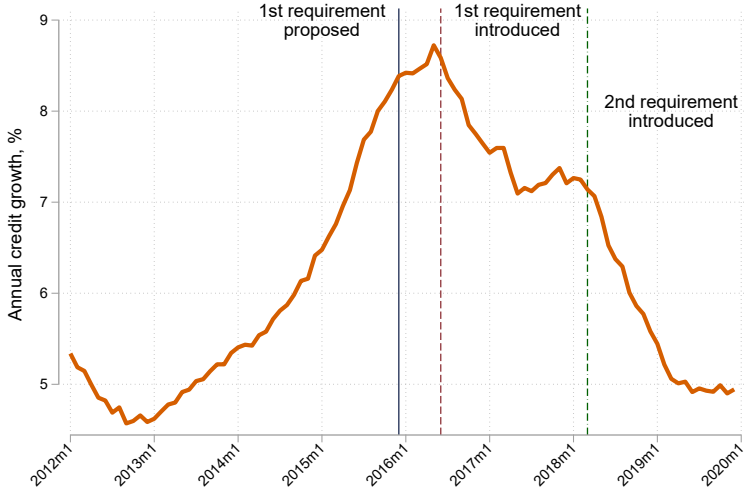
- Campbell *et al.* (2020) show that time-varying amortization payments help stabilize consumption over the business cycle

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)

Credit growth in Sweden

Background



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Roadmap

Institutional setting

Theory and Methodology

Results

- Bunching
- Elasticity

Credit supply mechanism

- Threats to identification

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

Swedish mortgage contracts prior to 2016

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The amortization requirement

Background

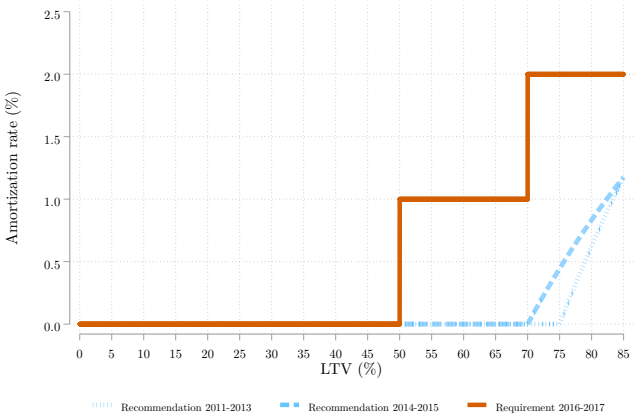
Swedish FSA (Finansinspektionen) introduced the amortization requirement to reduce debt levels over time

- 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

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

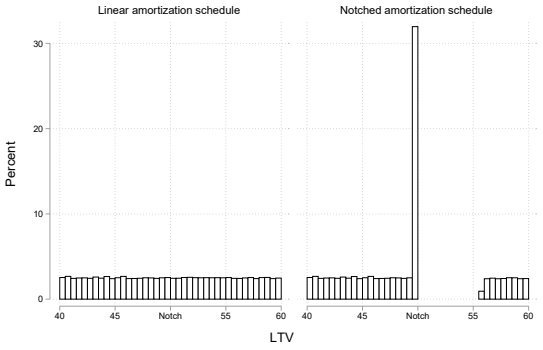
- You can trade lower borrowing for lower payments by placing yourself at the threshold

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:

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

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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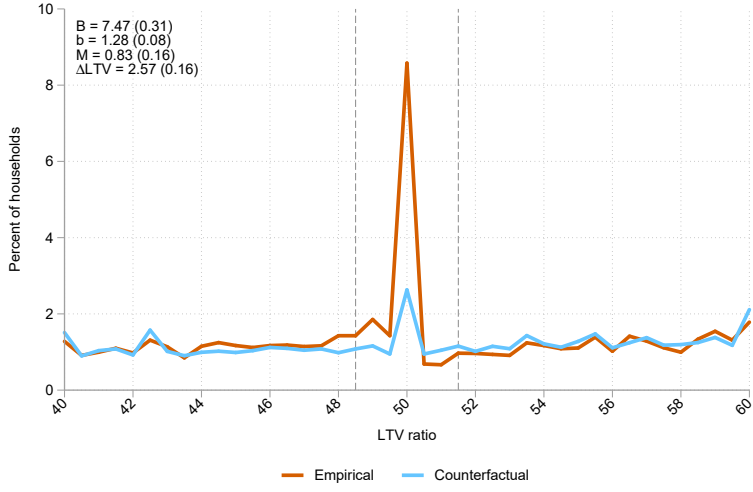
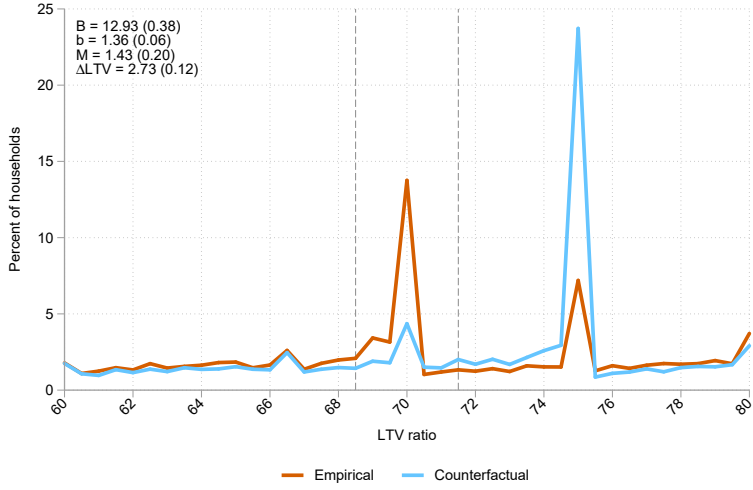
Bunching at lower threshold

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

- 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

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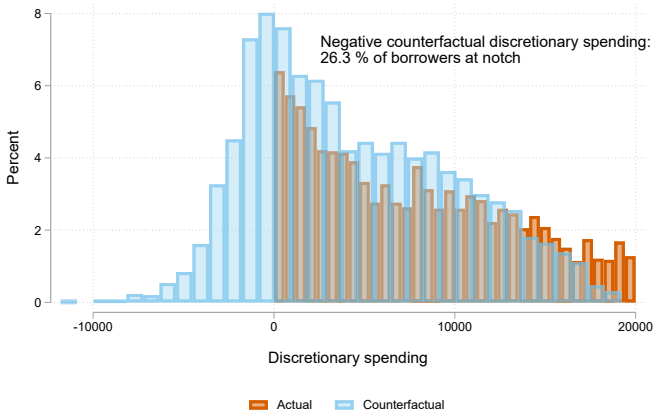
Effect of payment-to-income constraint

Credit supply



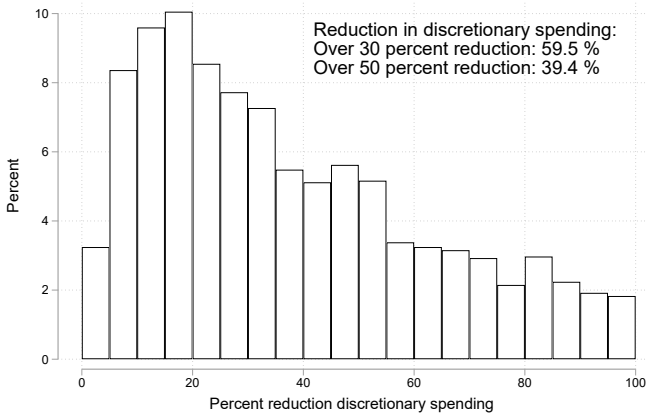
26.3% of borrowers close to the threshold are unable to borrow more due to credit constraints

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

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

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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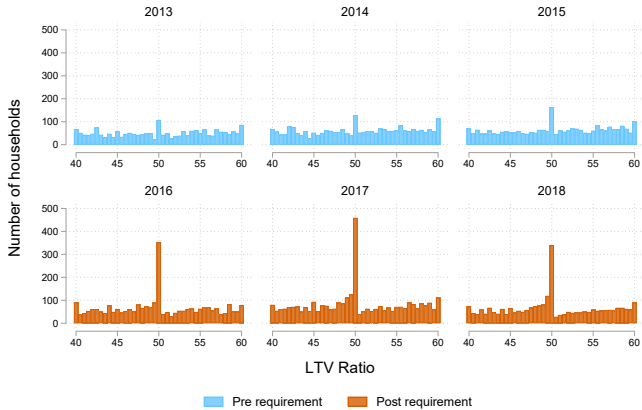
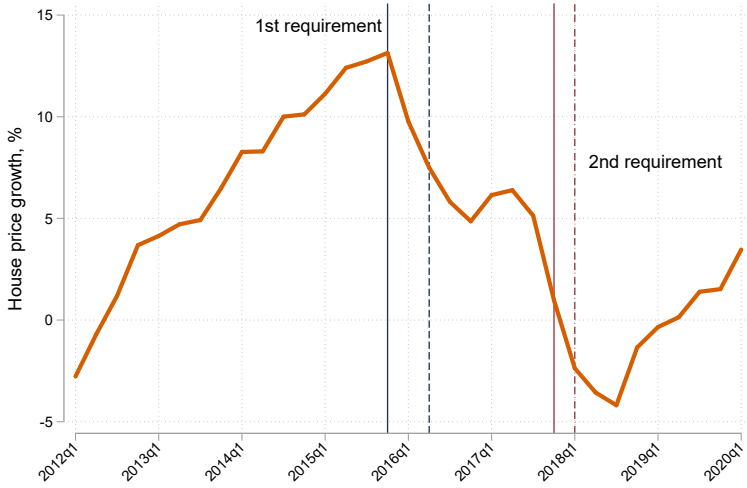


House price growth in Sweden

Background



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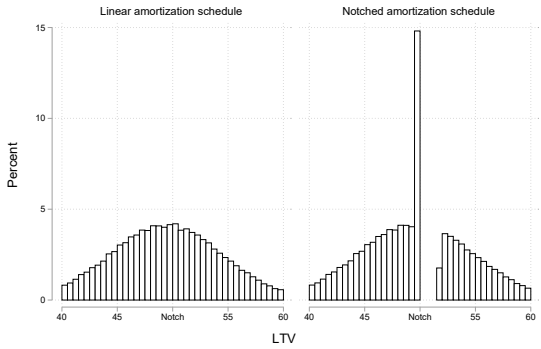
Simulated densities with and without a requirement in a simple model



Linear schedule: $\alpha = \alpha_0$

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

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Key bunching estimates

Methodology

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

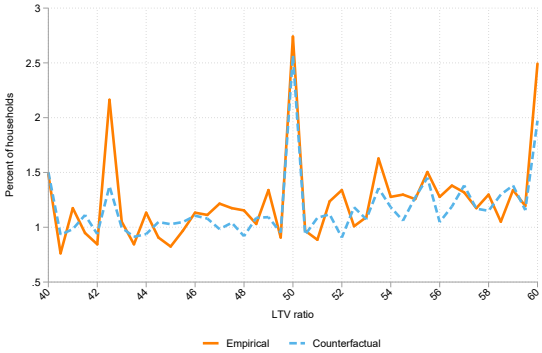
Bunching $\widehat{B}$ is the difference between the observed and counterfactual bin fractions:

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

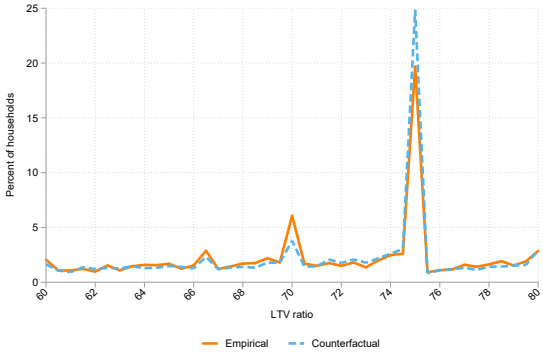
ΔLTV is the change in LTV for the marginal buncher:

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

Empirical and Counter-factual distribution in 2014



Lower threshold



Upper threshold

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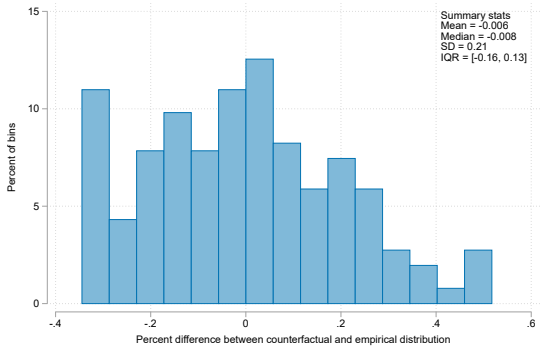
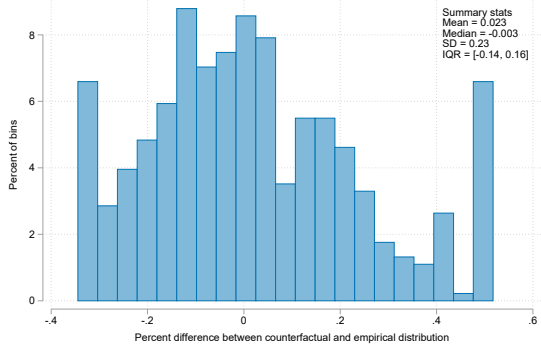
Ratio between counter-factual and empirical distribution in placebo years



Lower threshold



Upper threshold

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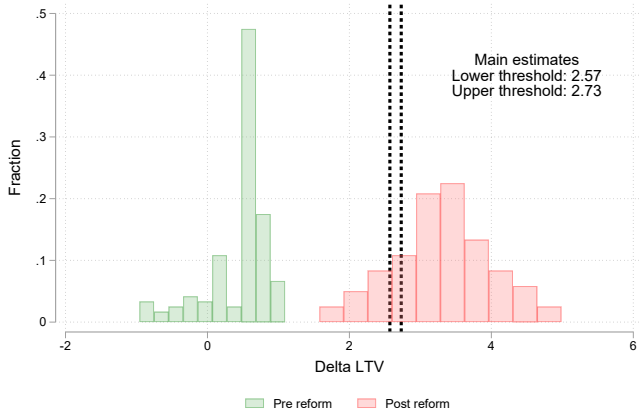
Estimates of ΔLTV using polynomial approach

Threats to identification



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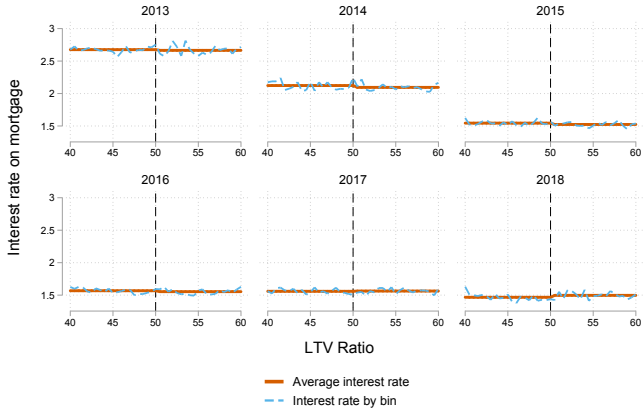
Interest rates by LTV ratio over time

Lower threshold



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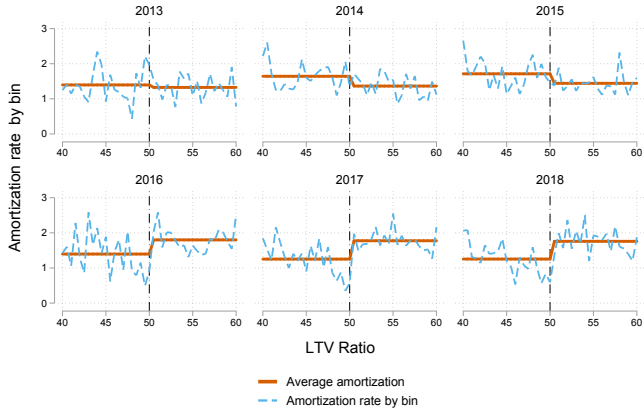
Amortization rates by LTV ratio over time

Lower threshold



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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