

# Household Heterogeneity and Optimal Mortgage Regulation

By Nina Biljanovska and Alexandros P. Vardoulakis

Discussion by Dan Greenwald

MIT Sloan

IMF Macro-Finance Research, September 2021

# Overview

- ▶ Two-type model with many features: default, renovations, collateral constraints, etc.
- ▶ Questions:
  - What externalities does the planner care about and how do they vary across the population?
  - What is the optimal policy and how can it be implemented?
- ▶ Findings:
  - Pecuniary + cost of credit externalities, strength varies with type.
  - Optimal policy can be implemented with individual-specific DSTI (PTI) limit.
- ▶ My take: optimal policy is a nice benchmark, but uses hyperspecific policies.
  - When you customize person-by-person, many limits are isomorphic.
  - Simple policies are more relevant and may have more interesting economics.

# A Very Simple Model

- ▶ Consider borrower who chooses consumption ( $c_i$ ), housing ( $h_i$ ), and mortgage balance ( $m_i$ ) to maximize

$$\max_{c_i, h_i, m_i} \underbrace{c_i}_{\text{consumption}} + \underbrace{\sum_{j=0}^{\infty} \beta^j \zeta_i \log h_i}_{\text{housing services}} - \underbrace{\sum_{j=1}^{\infty} \beta^j r m_i}_{\text{mortgage payments}}$$

subject to

$$\text{Budget Constraint : } c_i \leq \dots + m_i - p h_i$$

$$\text{LTV Constraint : } m_i \leq \theta^{LTV} p h_i$$

$$\text{PTI Constraint : } r \cdot m_i \leq \theta^{PTI} y_i$$

- ▶ Note: debt limits are not individual-specific.

# A Very Simple Model

- ▶ Consider borrower who chooses consumption ( $c_i$ ), housing ( $h_i$ ), and mortgage balance ( $m_i$ ) to maximize

$$\max_{c_i, h_i, m_i} \underbrace{c_i}_{\text{consumption}} + \underbrace{\frac{\zeta_i}{1-\beta} \log h_i}_{\text{housing services}} - \underbrace{\frac{r}{1-\beta} m_i}_{\text{mortgage payments}}$$

subject to

$$\text{Budget Constraint : } c_i \leq \dots + m_i - ph_i$$

$$\text{LTV Constraint : } m_i \leq \theta^{LTV} ph_i$$

$$\text{PTI Constraint : } r \cdot m_i \leq \theta^{PTI} y_i$$

- ▶ Note: debt limits are not individual-specific.

# A Very Simple Model

- ▶ Consider borrower who chooses consumption ( $c_i$ ), housing ( $h_i$ ), and mortgage balance ( $m_i$ ) to maximize

$$\max_{c_i, h_i, m_i} \underbrace{c_i}_{\text{consumption}} + \underbrace{\alpha_i^h \log h_i}_{\text{housing services}} - \underbrace{\alpha_i^m m_i}_{\text{mortgage payments}}$$

subject to

$$\text{Budget Constraint : } c_i \leq \dots + m_i - ph_i$$

$$\text{LTV Constraint : } m_i \leq \theta^{LTV} ph_i$$

$$\text{PTI Constraint : } r \cdot m_i \leq \theta^{PTI} y_i$$

- ▶ Note: debt limits are not individual-specific.

# Equilibrium

- ▶ First order conditions:

$$(h_i) : \quad \alpha_i^h h_i^{-1} = (1 - \theta^{LTV} \mu_i^{LTV}) p_t$$

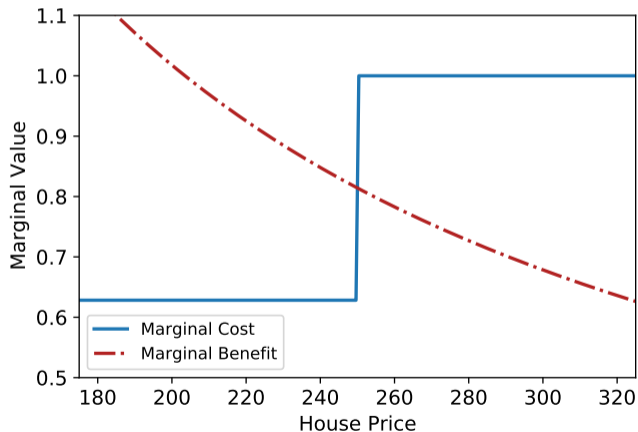
$$(m_i) : \quad (1 - \alpha^m) = \mu_i^{LTV} + \mu_i^{PTI} \equiv \mu$$

- ▶ Three regions depending on value-to-income ratio ( $\alpha_i^h$ ):

1. Low  $\alpha_i^h$ : constrained by LTV only,  $\mu_i^{LTV} = \mu$ .
2. Medium  $\alpha_i^h$ : constrained by **both**. Choose house price equal to max PTI loan plus minimum down payment.  $0 < \mu_i^{LTV} < \mu$ .
3. High  $\alpha_i^h$ : constrained by PTI only.  $\mu_i^{LTV} = 0$ .

# Intuition

- ▶ Both constraints binding not a knife edge case.
- ▶ Marginal cost of financing jumps discontinuously as borrower switches from credit to cash.



# Equilibrium

- ▶ First order conditions:

$$(h_i) : \quad \alpha_i^h h_i^{-1} = (1 - \theta^{LTV} \mu_i^{LTV}) p_t$$

$$(m_i) : \quad (1 - \alpha^m) = \mu_i^{LTV} + \mu_i^{PTI} \equiv \mu$$

- ▶ Three regions depending on value-to-income ratio ( $\alpha_i^h$ ):

$\alpha_i^h$	Binding Constraint	$h_i$	$m_i$
Low	LTV	$\alpha_i^h / \left[ (1 - \theta^{LTV} \mu) p \right]$	$\theta^{LTV} p h_i$
Medium	Both	$\theta^{PTI} y_i / (r \cdot \theta^{LTV} \cdot p)$	$\theta^{PTI} y_i / r$
High	PTI	$\alpha_i^h / p$	$\theta^{PTI} y_i / r$



# Policy Experiments

- ▶ **Policy #1:** tax on borrowing. Equivalent to reduction in  $\mu$ .
- ▶ Compute “first-round” effects on housing and mortgage demand (GE would adjust  $p$ ).
- ▶ Result: only LTV-constrained affected, proportional reduction in housing and debt.
- ▶ Intuition: only LTV-constrained can use collateral at the margin.

$\alpha_i^h$	Binding Constraint	$-\partial \log h_i / \partial \mu$	$-\partial \log m_i / \partial \mu$
Low	LTV	$-\theta^{LTV} / (1 - \theta^{LTV} \mu)$	$-\theta^{LTV} / (1 - \theta^{LTV} \mu)$
Medium	Both	0	0
High	PTI	0	0

# Policy Experiments

- ▶ **Policy #2:** reduction in  $\theta^{LTV}$ .
- ▶ LTV-constrained borrowers reduce housing demand, reduce debt even more.
  - $\theta^{LTV}$  affects both “LTV” and “V”
- ▶ Jointly constrained borrowers **increase** housing demand, do not adjust debt.
- ▶ Ambiguous effect on total housing demand (prices), decrease in debt.

$\alpha_i^h$	Binding Constraint	$-\partial \log h_i / \partial \theta^{LTV}$	$-\partial \log m_i / \partial \theta^{LTV}$
Low	LTV	$-\mu / (1 - \theta^{LTV} \mu)$	$-1 - \mu / (1 - \theta^{LTV} \mu)$
Medium	Both	1	0
High	PTI	0	0

# Policy Experiments

- ▶ **Policy #3:** reduction in  $\theta^{PTI}$ .
- ▶ Jointly constrained borrowers decrease housing demand and debt.
- ▶ PTI-constrained borrowers decrease debt but not house size.
  - Housing financed with cash at the margin, not affected by credit.
- ▶ Decline in housing demand, (slightly) larger decrease in debt.

$\alpha_i^h$	Binding Constraint	$-\partial \log h_i / \partial \theta^{PTI}$	$-\partial \log m_i / \partial \theta^{PTI}$
Low	LTV	0	0
Medium	Both	-1	-1
High	PTI	0	-1

# Takeaways and Suggestions

- ▶ Tax on borrowing **not equivalent** to change in PTI (or LTV) limit when policies are not individual-specific.
  - Differences in cross-sectional effects, could be important if externalities vary with type.
  - Differences in aggregate consequences for housing and credit demand.
- ▶ Constant policies map much more clearly into real-world macroprudential frameworks.
- ▶ Tractable in Ramsey economy?
- ▶ Important consideration: what characteristics are associated with constraints.
  - Work in progress: binding PTI appears to be combination of lower income and higher VTI ratios.

# Conclusion

- ▶ Paper working toward important question: optimal policies for macroprudential housing instruments.
  - Planner would like to influence pecuniary and cost of debt externalities.
- ▶ Optimal tax on debt can be implemented using individual-specific PTI (DSTI) limits.
- ▶ May be substantial value added in moving away from individual-specific policies.
  - Breaks equivalence of policies.
  - Influences different parts of the population differently.
  - Changes link between house prices and debt.
- ▶ Very promising research area with room for many papers.