Unlocking Mortgage Lock-In: Evidence From a Spatial Housing Ladder Model

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Summary

- **Question:** how has mortgage lock-in (unwillingness to move because existing mortgage rates are below current rates) affected house prices?
- **Approach:** rich heterogeneous-agents GE model + detailed micro data
  - Two regions, two types of housing to own + rental
- **Main findings:** lock-in increases house prices overall, particularly at the lower-price end of the geographic/quality spectrum
  - Starter homes in low-price areas increase ~7% due to lock-in
  - Prices in high-price areas much less affected
  - Many other interesting results (see paper)
- **This discussion:** what drives the quantitative results, and how can we make sure the model is calibrated to get them right?

Intuition: supply and demand

- Let's build intuition with a simple supply + demand framework
  - Define demand $D_i(p)$ as housing agent i would buy at price p
  - Similarly, supply $S_i(p)$ is housing agent i would sell at price p
  - $D_i(p) = S_i(p) = 0$ if not participating
  - Excess demand: $X_i(p) = D_i(p) - S_i(p)$.

- Market clearing requires: $\sum_i D_i(p^*) = \sum_i S_i(p^*)$

- Expressed as excess demand: $X(p^*) \equiv \sum_i X_i(p^*) = 0$

Intuition: supply and demand

- Lock in effectively removes households from this system
- Assume households in Group A (never locked in) or B (become locked in).
  - Define $X_j(p)$ to be excess demand for Group j
- Before Group B is locked in:

$$X_A(p^*) + X_B(p^*) = \sum_{i \in A} X_i(p^*) + \sum_{i \in B} X_i(p^*) = 0$$

- After Group B is locked in, $X_B = 0$, so new price satisfies:

$$X_A(p') = 0$$

Intuition: supply and demand

- First-order approximation

$$X_A(p') \simeq X_A(p^*) + \nabla X_A(p^*)(p' - p^*)$$

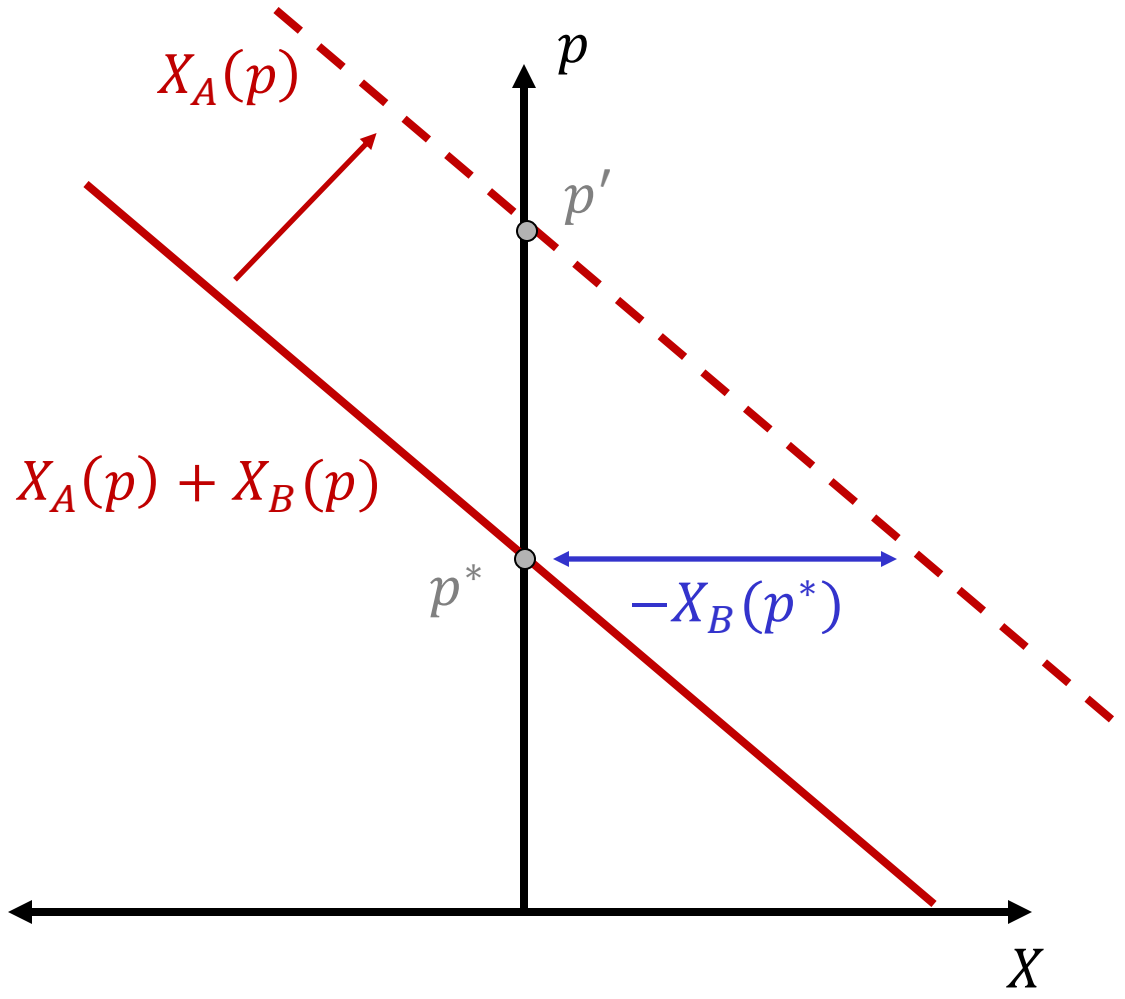
- Apply $X_A(p^*) = -X_B(p^*)$ and $X_A(p') = 0$ and solve:

$$\Delta p \equiv p' - p^* = \frac{X_B(p^*)}{\nabla X_A(p^*)}$$

- Effect on prices depends on two components:
  1. Excess demand of Group B: $X_B(p^*)$
  2. Excess demand elasticity of Group A: $\nabla X_A(p^*)$

Intuition: supply and demand

- Graphical version of intuition
- Excess demand is initially at green line, then shifts due to lock-in
- Assuming $X_B(p^*) < 0$ (locked-in would have downsized) this expands excess demand
- Price must now rise to restore equilibrium
- Amount depends on slope of dashed line (∇X_A)



Adding segmented markets

- We can also incorporate segmented markets
  - Let $X_j^k(p)$ be the excess demand for group j in market k, where p is now a vector of prices across markets
  - Stack excess demands to form vector: $\boldsymbol{X}_j(p) = \left(X_j^1(p), \ldots, X_j^K(p)\right)'$
- First order approximation becomes:

$$\Delta p = \nabla \boldsymbol{X}_A(p^*)^{-1} \boldsymbol{X}_B(p^*), \qquad \nabla \boldsymbol{X}_A(p) = \begin{bmatrix} \frac{\partial X_A^1(p)}{\partial p_1} & \cdots & \frac{\partial X_A^1(p)}{\partial p_K} \\ \vdots & \ddots & \vdots \\ \frac{\partial X_A^K(p)}{\partial p_1} & \cdots & \frac{\partial X_A^1(p)}{\partial p_K} \end{bmatrix}$$

- Now $\boldsymbol{X}_B(p^*)$ is market specific, $\nabla \boldsymbol{X}_A(p^*)$ depends on cross-elasticities

Excess demand of Group B

- Recall: $\Delta p = \nabla \boldsymbol{X}_A(p^*)^{-1} \boldsymbol{X}_B(p^*)$
- First consider excess demand of Group B ($\boldsymbol{X}_B(p^*)$)
- House prices are only affected if this is nonzero! No effect if locked-in sellers would purchase same-sized home on average.
- House prices rise when locked-in sellers would have otherwise had negative excess demand (downsized or exited the market) in that segment
- Depends quantitatively on two factors:
  - Extensive margin: exact population that is locked in (Group B)
  - Intensive margin: excess demand of this group

Demand elasticity of Group A

- Recall: $\Delta p = \nabla \boldsymbol{X}_A(p^*)^{-1} \boldsymbol{X}_B(p^*)$
- Now consider demand elasticity term ($\nabla \boldsymbol{X}_A(p^*)^{-1}$)
- Intuition: effect on prices is smaller when demand is more elastic
  - Takes smaller price incentive for Group A to absorb excess demand of Group B
  - Note: only the demand elasticity of the non-locked-in matters at the margin
- Depends quantitatively on two factors:
  - Demand elasticities of households (both within and across markets)
  - Contributions from non-households: construction and trade with landlords

Back to the paper

- Summing up, the model will be quantitatively accurate if it provides a good representation of the following:
  1. Who exactly is locked in
  2. What their counterfactual excess demand would be absent lock-in
  3. The excess demand elasticities (incl. cross) of the remaining households
  4. The excess demand (supply) elasticity of builders and landlords
- Calibration seems like a work in progress, to my reading only item #4 is rigorously calibrated in the current draft
  - I would recommend trying to match/validate all of them (suggestions next)
  - Authors are world experts in items #1 and #2 so should be feasible!

Calibration suggestions

- **Who is locked in** likely depends on **dispersion of moving/taste shocks**
  - Low dispersion: variation is determined by fundamentals, rates are central
  - High dispersion: variation is basically random, rates are unimportant
  - Currently calibrated arbitrarily, but could target lock-in propensity by rate gap
- **Counterfactual excess demand** likely depends on a number of factors
  - Should make sure to match empirical housing ladder in the data
  - Important to target flows (moves) rather than stock of housing by type
  - Could require more **preference shifters** (inputs to mean of Ξ_i) if not
  - Need to account for selected lock-in sample (e.g., older households)

Calibration suggestions

- **Household demand elasticity** likely depends on **cost (level and dispersion) of moving** between house sizes
  - Currently zero cost to move between quality (or in/out of renting) within area
  - Dispersion also important, prices matter more when dispersion is low
  - Ideally, would calibrate to match empirical demand elasticities if we have them
  - Non-locked-in are also a selected sample (e.g., first-time buyers)
- **Construction/landlord elasticity** determines new supply
  - Landlord properties likely segmented (Greenwald + Guren, 2024), can ignore
  - Paper takes reduced form approach with **construction elasticities** from Baum-Snow + Han (2024), seems reasonable to me

Conclusion

- Nice paper taking on highly salient and much-discussed topic
- Effect of lock-in on house prices should depend on:
  - Who is locked in and their counterfactual excess demand
  - The price elasticity of demand for the non-locked-in
- The paper has a great model, my suggestion would be to make sure it is able to precisely match these features
  - Level and dispersion of moving and taste shocks seem key
  - May require some (feasible) empirical work to create targets
  - I am curious what role selection into lock-in status plays