The Political Economy of Housing Supply

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Politically Imposed Supply Restrictions

- Green, Malpezzi, and Mayo (2005): regulation explains supply elasticity differences.

- Glaeser, Gyourko, and Saks (2005), Quigley and Raphael (2005): artificial supply restrictions prevent response to soaring prices.

- Barker (2003, 2005): Artificial undersupply in the UK.

Need for a Supply/Demand Model?

- Explain long-term price dynamics.

- Effect of changes in the institutions that govern collective decision-making on housing.

- Welfare analysis.

Goal of this paper: develop tractable model.

Ingredients of a Supply Model

1. Who participates in the decision process? Who chooses to live in a certain city?
   $\Longrightarrow$ A location choice model.

2. What are the stakes of participants? Do they buy or rent?
   $\Longrightarrow$ A housing investment model.

3. How do their preferences map into policy? How do residents affect local housing supply?
   $\Longrightarrow$ A collective choice model.

Ingredients of Our Supply Model

1. Location choice:
   $\Longrightarrow$ Heterogeneous worker productivity: complementarity between productivity and location

2. Housing investment:
   $\Longrightarrow$ Uninsurable productivity shocks: homeownership as a hedge against the risk of being 'left behind'

3. Collective choice:
   $\Longrightarrow$ Majority voting over housing supply: protect housing investment vs ensure access to labor market.

Complete Markets, Except for Housing Permits and Labor Risk

- No externalities, local public goods. No taxes. No local amenities.

- No frictions (re-location costs, housing transaction costs, credit constraints).

- Homogeneous housing supply (no density regulations, price heterogeneity).

- No lobbying.

Results

- Artificial undersupply of housing.
- Persistence of undersupply.
- Policy changes: allocation of building permits, rent/buy subsidies, fractional ownership.
- U-shaped relation between decentralization and undersupply.

Literature

Fischel (2001): The homevoters Hypothesis

Ortalo-Magne-Rady (2002), Sinai-Souleles (2005): Hedging benefits of home-ownership

Glaeser-Gyourko-Saks (2005): determination of housing supply

Model: Population and Geography

Two periods: 1 and 2

A mass 1 of agents, who live for two periods.

CARA utility.

Two locations: city and country

Model: Labor Market

Agent i at time t has potential productivity y_t^i

Complementarity between productivity and location.

If he works in the countryside he produces 0.

If he works in the countryside he produces y_t^i.

Wage $=$ product.

Period 1: $y_1^i \sim U[0,1]$, independent across agents.

Period 2: shock + turbulence

- prob $1-\pi$: no change
- prob π: average productivity goes up by g
  - prob $1-\gamma$: each worker's productivity goes up by g
  - prob γ: reshuffle: $y_2^i \sim U[g, 1+g]$, independent of y_1^i.

Key assumption: $Cov\,(\text{growth} \;,\; \text{turbulence}) > 0$

Model: Housing Market

Identical single-occupancy country homes:

- Perfectly elastic supply, zero price

Identical single-occupancy city homes:

- Mass of houses at t: $N_t \in [0, 1]$

- Rental market determines r_t. Sales market determines p_t.

Working in the city requires use of one house.

- (city) housing consumption: $l_t \in \{0, 1\}$

Agents can buy or shortsell housing

- Housing investment: $h_t^i \in (-\infty, \infty)$

Accounting simplification: agent pays rent on the house he uses (even if he owns it) and receives rent on housing he owns.

There are a large number of international real estate investment trusts (REITs). Hence, at any moment the price of housing is equal to its expected rent return:

$$
\begin{aligned}
p_1 &= r_1 + E[r_2] \\
p_2 &= r_2
\end{aligned}
$$

$\Longrightarrow$ agents are indifferent between buying and renting in period 2.

$\Longrightarrow$ all action is in period 1.

Model: Housing Supply

N_1 initially owned by international REITs

At the end of Period 1, city residents choose $N_2 \in [N_1, 1)$ through a vote.

A mass $N_2 - N_1$ of building permits are issued. Construction cost is zero.

Permits are allocated to:

Lucky/clever developers or cronies: a share $1 - \phi$ of new permits goes to a set of measure zero of the population (opaque system, favoritism).

Residents: A share $\phi\tau$ is equally distributed to current residents (developers pay for services).

Owners: A share $\phi(1 - \tau)$ goes to home-owners (home extension).

Permits can be sold to REITs as soon as they are issued

Timing

1. Period $t = 1$ begins, agents learn y^i.

2. The property market opens, agents choose h^i and l^i.

3. City residents vote on the measure of City houses N_2 to be made available in period 2. Permits can be traded immediately.

4. Each City resident receives y_1^i and pays the rent r_1. Permit holders can build new houses in the City at zero cost.

5. Period $t = 2$ begins, both aggregate and idiosyncratic shocks are realized, agents learn y_2^i

6. The property market opens, agents choose l_2^i.

7. Each City resident receives y_2^i and pays the rent r_2.

8. Agents consume their accumulated wealth.

Plan

- Step 1: Equilibrium with exogenously given housing supply $N_1 \leq N_2$
- Step 2. Equilibrium with endogenous supply

1 Exogenous Housing Supply

Proposition 1 *Given* $0 < N_1 \leq N_2 < 0$, *there is a unique market equilibrium with the following properties:*

(i) In period t, *agent* i *lives in the City if and only if* $y_t^i \geq 1 - N_t$;

(ii) An agent with first-period income y^i *buys* $\hat{h}^i$ *units of housing, where* $\hat{h}^i$ *is the unique solution of*

$$-U'_{NN}\left(\hat{h}_i^i, y^i\right) + (1-\gamma)\, U'_{SN}\left(\hat{h}^i, y^i\right) + \gamma U'_{SS}\left(\hat{h}^i, y^i\right) = 0.$$

where U_{NN}, U_{SN}, *and* U_{SS} *are utilities in the three possible states.*

Insurance Motive

Suppose a shock is always accompanied by turbulence and $\phi = 0$.

Agent i faces two random variables:

(1) Capital gain on one unit of housing:

$$D = \begin{cases} -\pi g & \text{with no growth} \\ (1-\pi)\, g & \text{with growth} \end{cases}$$

(2) Disposable income after housing cost:

$$\tilde{y}_2^i = \begin{cases} y_1^i - (1 - N_1) & \text{with no growth} \\ y_2^i - (1 - N_1 + g) & \text{with growth} \end{cases}$$

Turbulence $\Longrightarrow$ mean reversion $\Longrightarrow y_2^i - g < y_1^i$ iff y_1^i is high.

$\Longrightarrow$ For an agent with high initial productivity:

	after-rent income	capital gain
no shock	$=$	$-$
shock	$-$	$+$

Housing investment provides insurance against the risk of being overtaken.

Utility in the 3 States

No shock, no reshuffle:

$$U_{NN} = u\left(\text{max}\left(0, y^i - 1 + N_1\right) + \text{max}\left(0, y^i - 1 + N_2\right) - h^i \pi g\right)$$

Shock without reshuffle

$$U_{SN} = u\left(\text{max}\left(0, y^i - 1 + N_1\right) + \text{max}\left(0, y^i - 1 + N_2 - g\right) + h_i \left(1 + \pi\right) g\right)$$

Shock with reshuffle

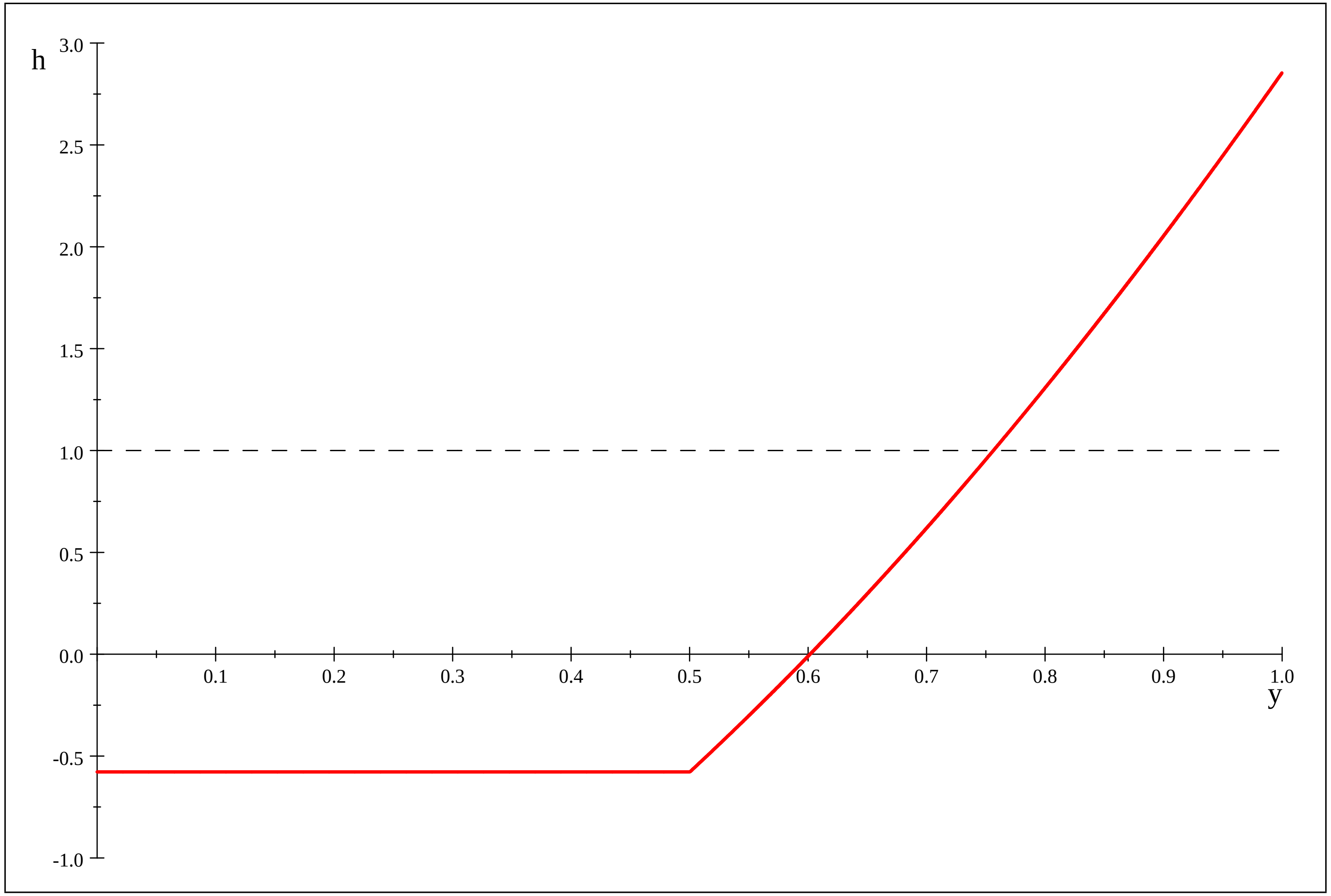
$$U_{SS} = E_{\tilde{y}}\left[u\left(\text{max}\left(0, y^i - 1 + N_1\right) + \text{max}\left(0, \tilde{y}^i - 1 + N_2 - g\right) + h_i \left(1 + \pi\right) g\right)\right]$$

Comparative Statics on Insurance

(1) Housing investment is nondecreasing in y^i;

(2) There exists $y^* > 1 - N_2$ such that agents with $y^i < y^*$ choose $h^i < 0$ and agents with $y^i > y^*$ choose $h^i > 0$;

(3) If γ is sufficiently high with respect to g, $h^i > 1$ for all agents with $y^i > y^* + \varepsilon$, $\varepsilon > 0$;


h
3.0
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1.5
1.0
0.5
0.0
-0.5
-1.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
y

2. Endogenous Housing Supply

N_1 is still exogenous, but the end of Period 1 city residents vote over N_2.

Conjecture that there is an equilibrium in which agents choose housing investment $\hat{h}\left(y^i\right)$ and city residents select N_2.

Two conditions (plus location choice):

- *Market equilibrium*: Given N_1 and N_2, agents do indeed buy $\hat{h}\left(y^i\right)$ in period 1 (same as Proposition 1)

- *Political Equilibrium*: Given N_1 and $\hat{h}\left(y^i\right)$, city residents do not want to deviate to $\hat{N}_2 \neq N_2$.

Permit revenues do *not* wash out off the equilibrium path.

Median Voter

Home ownership is a strictly increasing function of productivity, among city residents.

The median city voter has first period productivity:

$$y^m = \frac{1 + N_1}{2}$$

Given N_2, this determines his housing wealth h^m.

Agent m chooses N_2.

Marginal Permit Revenue due to a Political Deviation

Extra permit revenue in case of deviation

$$\Omega \equiv \frac{\hat{N}_2 - N_1}{N_1}\left(1 - \hat{N}_2 + \pi g\right) - \frac{N_2 - N_1}{N_1}\left(1 - N_2 + \pi g\right).$$

Marginal:

$$\left.\frac{\partial \Omega}{\partial \hat{N}_2}\right|_{\hat{N}_2 = N_2} = \frac{1}{N_1}\left(1 + N_1 - 2N_2 + \pi g\right)$$

...higher if initial city size is small, for two reasons.

Proposition 2 *The necessary and sufficient conditions for the existence of an interior equilibrium* ($N_1 < N_2 < 1$) *are:*

(i) The conditions for a market equilibrium

(ii) The no-political-deviation condition:

$$\left(h^m - \phi\left(\tau + h^m\left(1-\tau\right)\right) \left.\frac{\partial \Omega}{\partial \hat{N}_2}\right|_{\hat{N}_2 = N_2} \right) U' = U'_{\mathit{city}}$$

where

$$U' = \text{ } m\text{'s expected marginal utility of wealth increase}$$

and

$$U'_{\mathit{city}} = \text{ } m\text{'s expected marginal utility of rent reduction}$$

Proposition 3 *Let* $a > 1$ *be the risk-aversion coefficient. The first-order condition for a housing market equilibrium is:*

$$
\begin{aligned}
& (1-\gamma)\exp\left[-ah^m g\right] + \gamma \exp\left[-a\left(\frac{N_1}{2} - N_2 + h^m g\right)\right]\left(\frac{3}{2} - N_2 - \frac{1}{2}\exp\left[-aN_2\right]\right) \\
= \ & 1
\end{aligned}
$$

and the first-order condition for a political equilibrium is

$$
\begin{aligned}
& 1 - h^m + \phi\left(\tau + h^m (1-\tau)\right)\left(\frac{1}{N_1}\left(1 + N_1 - 2N_2 + \pi g\right)\right) \\
= \ & \pi\gamma \exp\left[-a\left(\frac{N_1}{2} - N_2 + h^m g\right)\right](1 - N_2)
\end{aligned}
$$

Extreme Case

If $\phi = 0$ (cronies get all) and the median voter owns at least a house ($h^m \geq 1$), no new construction occurs ($N_2 = N_1$).

Moreover, $h^m \geq 1$ if γ (turbulence) is large enough with respect to g (growth rate).

For the median voter, a pound of rent reduction is never as valuable as a pound of price increase.

Strong case of supply persistence.

Extreme?

Persistence

True even if $N_2 > N_1$.

Suppose still that $\phi = 0$ but it may now be that $h^m < 1$.

Proposition 4 *The equilibrium number of houses in the second period N_2 is a strictly increasing function of the number of houses in the first period N_1.*

Small $N_1 \rightarrow$ high-income median city resident $\rightarrow$ high $h^m \rightarrow$ vote for low N_2

Initial exogenous undersupply causes long-term endogenous undersupply. No price convergence.

Solution #1: Revenues from Building Permits

Proposition 5 *Start from an equilibrium where the sale of housing permit does not benefit citizens directly ($\phi = 0$) and new housing supply is restricted ($N_2 < \frac{1+N_1}{2}$). Then, a marginal increase in ϕ causes an increase in housing supply.*

Now, compare the effect of an increase in ϕ when owners get all the benefit ($\tau = 0$) or residents get all the benefit ($\tau = 1$). Start from an equilibrium where $\phi = 0$, $N_2 < \frac{1+N_1}{2}$ and the median voter owns $\hat{h}^m$ units of housing. A marginal increase in ϕ causes an increase in housing supply that is greater when $\tau = 0$ rather than $\tau = 1$ if and only if $\hat{h}^m > 1$.

Solution #2: Encourage Renting

For every dollar of housing purchased the state offers a subsidy of s cents (or a tax if s is negative).

Proposition 6 *A purchase subsidy (tax) depresses (boosts) housing supply.*

Solution #3: Centralize Urban Planning

Suppose that all citizens vote on housing supply. By proposition 2, the amount of housing is an increasing function of productivity. The median citizen owns less housing than the median city residents. Hence

Proposition 7 *If planning decisions are made at a less local level, housing supply in the city increases*

Solution #4: Decentralize Urban Planning

U-shaped relation between centralization and housing supply: the worst case is when city = labor market.

Break up city into m municipalities.

Majority voting in each municipality.

Proposition 8 *Supply is increasing in the number of municipalities* m*.*

Solution #5: Encourage Fractional Ownership

In practice, you either own a home (you keep 100% of the capital gain) or you don't (you keep 0% of the capital gain). See Caplin et al. Suppose $h^i \in \{0, 1\}$.

Proposition 9 *If allowing for fractional ownership reduces (increases) the amount of housing that the median voter owns, housing supply increases (decreases).*

This is true if $h^m = 1$ when $h^i \in \{0, 1\}$, but the median voter would like a home equity sharing scheme.

Future Research?

Externalities: Congestion; Local public good provision and local taxes; Transportation.

Planning instruments: density regulation.

Political mechanisms: Indirect democracy; lobbying.

Insurance: Housing futures.