Search to own or search to rent? Housing market churn in the cross section of cities

Boaz Abramson  
Stanford  
Tim Landvoigt  
Wharton  

Monika Piazzesi  
Stanford  
Martin Schneider  
Stanford  

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Motivation: vacancies & inventory across US MSAs
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Months supply = vacancies / turnover = time on market

![Graph showing months supply for rent and sale, with a linear relationship indicated by a diagonal line.](image-url)
This paper

- Widespread housing shortage, but lots of vacancies?
  - distinguish structural from frictional vacancies
  - structural vacancies := excess supply as search frictions \( \rightarrow 0 \)
  - how large are structural vacancies in US cities?

- Search model with tenure choice & financial frictions
  - demand rent/own: flow utility, transaction costs, borrowing constraint
    → poorer or more mobile households rent, low match surplus
  - supply: developers indifferent between selling, renting out
    → low rental surplus compensated by low rental TOM

- Estimate with data on cross section of US MSAs
  - months supply = TOM, turnover rates, rent/price, income, ownership
  - city specific construction cost, mobility rates, growth

⇒ Negative structural vacancies in majority of cities, driven by cost
  - typically much more negative in rental markets
    low vacancies \( \rightarrow \) short TOM, compensates developers
  - x-city differences reflect how tenure choice changes renter pool:
    shorter rental TOMs when more mobile renters (= lower surplus)
Model: agents & houses

- Small open city, continuous time, no aggregate risk
- Infinitely lived households
  - quasilinear utility in housing & numeraire
  - born with exogenous income, choose to enter owner or renter market
  - for buyers, house price $\leq$ multiple of income
  - move out at exogenous Poisson rate $\sigma$, replaced by identical copy
- Indivisible houses
  - flow utility $a$ grows with income; lower by $\rho < 1$ if house rented
  - sold in competitive market to developers $\rightarrow$ become vacant
  - bought or rented in search markets from developers
- Developer firms
  - quadratic construction cost
  - sell or rent out to households found in search markets
Model: housing markets

- Owner and renter search markets
  - potential buyers & renters meet vacant houses
  - random matching: Cobb-Douglas matching function
  - bargaining: equal split of surplus among observable types

- Competitive wholesale housing markets
  - mover households sell s.t. transaction cost
  - developers buy & build, then sell or rent in search markets
  - search frictions for finding dwellings, not getting rid of them

- Balanced growth equilibrium in each city
  - construction cost, # houses grow with population
  - prices & rents grow with income
Identification of structural vacancies: one market

- Intuition with rental market only, fixed supply & population
- Mass one of people meet mass $H$ of houses
  
  \[ \text{vacancies } I + \text{occupied houses } O = H \quad \Rightarrow \quad I - S = H - 1 \]
  \[ \text{searchers } S + \text{house occupiers } O = 1 \quad \Rightarrow \quad \text{structural vacancies} \]
  
  - structural vacancies negative = excess demand for houses in city

- Structural vacancies not observable
  
  - observe vacancies $I$ but not number of searchers
  \[ \Rightarrow \text{use model to infer } H - 1! \]

- Steady state flow of houses
  
  - $\sigma =$ arrival rate of moving shocks, $m(S, I) =$ matching function
  - houses vacated by movers = new matches
  
  \[ \sigma(H - I) = m(S, I) \]
  
  - rearrange to relate vacancy rate $I/H$, turnover rate $m/H$...
Equilibrium vacancies & turnover

Steady state flow of houses: movers = new matches

\[
\sigma \left(1 - \frac{I}{H}\right) = m \left(\frac{I}{H} - \frac{H - 1}{H}, \frac{I}{H}\right)
\]
More mobile city: more turnover & (frictional) vacancies

Steady state flow of houses: movers = new matches

\[
\sigma \left(1 - \frac{I}{H}\right) = m \left(\frac{I}{H} - \frac{H - 1}{H}, \frac{I}{H}\right)
\]

- Higher mobility $\sigma$
  - more renters move out, more supply of rental houses
  - higher vacancy rate $I/H$, turnover rate $m(S,I)/H$
Fewer houses: more turnover, fewer vacancies

Steady state flow of houses: \textit{movers} = \textit{new matches}

\[
\sigma \left( 1 - \frac{l}{H} \right) = m \left( \frac{l}{H} - \frac{H - 1}{H}, \frac{l}{H} \right)
\]

- Lower \(H\)
  - relatively more demand for rental houses
  - lower vacancy rate \(l/H\), higher turnover rate \(m(S, l)/H\)
Structural vacancies from TOM = vacancies / turnover!

Steady state flow of houses: movers = new matches

\[
\sigma \left( 1 - \frac{l}{H} \right) = m \left( \frac{l}{H} - \frac{H - 1}{H}, \frac{l}{H} \right)
\]

Observe vacancy rate
- solid eq: turnover low
- dotted eq: turnover hi
- slope from origin to equilibrium = 1/TOM
- flat slope, long TOM
- identifies hi \( H - 1/H \) structural vacancies
The role of tenure choice

- **Structural vacancies in owner & rental markets**
  - households choose tenure based on
    1. mobility: moving shocks \(\rightarrow\) transaction costs of ownership
    2. income: must be rich enough to afford ownership
  - firms buy houses at wholesale price \(P\), divide housing stock

- **Firms indifferent between renting out & selling**

\[
\frac{1}{TOM\text{\_own}} (E[\text{sales price}] - P) = \frac{1}{TOM\text{\_rent}} (E[\text{PV rents}] - P)
\]

  - TOMs decrease with queue = \# searchers / vacancies
  - sales price - \(P\), \(PV(\text{rent})\) - \(P\) = firm’s share of surplus
  - vacancies adjust to achieve indifference

- **Surplus vs time on market**

  - surplus lower in rental market: lower flow utility + more mobile types
  - shorter TOM in rental market to compensate firms
  - if short TOMs, queues respond more to differences in surplus
  - more mobile renters \(\rightarrow\) shorter TOM rent, longer TOM own
Quantitative exercise

- MSA level data, mostly from Census
  - housing stock, tenure, vacancies for rent, median rent, median price
  - share of recent (1yr) movers by tenure to measure turnover rate
  - distribution of income, population growth
  - inventory for sale from Zillow

- Parametrization
  - two household types: high vs low mobility
  → equilibrium owners = rich & low mobility households

- Preliminary steps
  - document strong common variation in TOMs
  → project own and rent TOMs on 1st principal component (explains 75% of variation)
  - income distribution & flow value matter only via borrowing constraint
  → compute share of households "rich enough" for ownership
    := households with 10*income > median house price in city
    (strongly positively correlated with rental turnover, ownership rate)
Months supply = vacancies / turnover = time on market

months supply for rent
months supply for sale
Turnover rent & share of "rich enough" households
Estimation

- Pre-set common parameters
  - lower flow utility $\rho = .9$ from renting, interest rate $r = .02$
  - transaction cost 6%, matching functions $\tilde{m}\sqrt{SI}$, with $\tilde{m}$ s.t.
    \[\text{TOM} = \text{time to find a house in average city renter/owner markets}\]

- Exactly identified estimation of city-specific parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>x-city median</th>
<th>Most relevant moment</th>
<th>x-city median</th>
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</thead>
<tbody>
<tr>
<td>low mobility rate</td>
<td>.04</td>
<td>turnover own</td>
<td>.06</td>
</tr>
<tr>
<td>high mobility rate</td>
<td>.41</td>
<td>turnover rent</td>
<td>.31</td>
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<tr>
<td>share of high mob type</td>
<td>.29</td>
<td>ownership rate</td>
<td>.57</td>
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<td>marginal constr. cost</td>
<td>4.1mn</td>
<td>TOM own (1st PC)</td>
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<tr>
<td>growth rate of income</td>
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<td>rent/price</td>
<td>.048</td>
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</tbody>
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- Intuition for identification
  - growth rate determines rent/price because search discounts small
  - ownership rate driven by share of rich or immobile people
  - mobility rates track turnover closely, since vacancies small
Structural vacancies and TOM own

Northeast
Midwest
South
West
Structural vacancies in rental and owner markets

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  - distinguish structural from frictional vacancies
  - structural vacancies := excess supply as search frictions $\rightarrow 0$
  - how large are structural vacancies in US cities?

- Search model with tenure choice & financial frictions
  - estimated with data on cross section of US MSAs
  - accounts for comovement in vacancies, TOM
  - key mechanism: short TOM compensates for low surplus

⇒ Negative structural vacancies in majority of cities
  - driven by construction cost, especially high in West

⇒ More negative in rental markets, even if positive in owner markets
  - few vacancies $\rightarrow$ short TOM, compensates firms for low surplus

⇒ X-city differences reflect how tenure choice changes renter pool
  - more mobile renters $\rightarrow$ more structural vacancies rent
  - more constrained, less mobile renters $\rightarrow$ fewer struct. vacancies rent