In Search of Peace and Quiet: The Heterogeneous Impacts of Short-Term Rentals on Housing Prices

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Research Overview

**Research Q:** How do short-term rentals (STRs) impact housing prices?

- *A lot of papers:* more STRS $\implies$ higher prices! (why?)
- Option value of owning a home increases $\implies$ higher demand $\implies$ higher prices. QED

**Is that it?**

- Could STRs lower housing values under any circumstances? We think so
- **Key idea:** The effect of STRs on residential amenities is ambiguous (more later)
STRs in the News

The Future of Airbnb

Home-sharing’s challenges aren’t only about social distancing and hygiene. Overtourism, racial bias, fee transparency and controlling the party crowd are also in the mix.

Airbnb’s IPO Warning: Unhappy Neighbors Are Fighting Back

The company, scheduled to list its shares Thursday, has warned its success depends on managing unfavorable local laws in the face of angry neighbors.
Roseville restricts short-term rentals after problem party houses

The City Council voted to license short-term rentals and require minimum stays when the property owner does not live onsite.

By Shannon Prather Star Tribune | FEBRUARY 9, 2021 — 9:16AM
Plan

**Goal:** Demonstrate theoretically that the effect of STRs on housing prices is ambiguous. Empirically substantiate this claim.

1. **Background and Literature**

2. **Highly stylized model**
   - Illustrate a potential mechanism for ambiguity

3. **Panel Regression:** demonstrate heterogeneous effects of Airbnb listings on housing prices
   - use a (not novel) instrument for Airbnb listings

4. **Policy Evaluation:** Examine a 2015 STR regulation in Santa Monica, CA
   - Evidence that impact on housing prices was non-negative

5. **Event Study:**
   - Hilarious descriptive evidence for proposed mechanism

**What we won't do:** provide *causal* evidence for our mechanism
Background
LA County

We focus on LA county as our geographic area of study. Some quick facts:

- **Single most populous county in the US**
- County is divided into 88 incorporated areas and 76 unincorporated areas

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STRs: A brief history

→ **1950s** Short term rentals became popular via *vacation rentals*

→ **1995**: Vacation Rentals by Owner (VRBO) provided the first online platform for vacation or STR bookings; Booking.com entered a year later

→ **2008**: Airbnb launches

→ **2020**: Airbnb's IPO!

**Today**: Airbnb's peer-to-peer market offers both owner-absent and owner-present options and lists more rooms than the largest six hotel groups combined
Regulating STRs

→ Neither California nor the U.S. federal government explicitly regulates STRs
  
  • STRs are regulated through local ordinances

→ We focus on Santa Monica's Ordinance 2484CCS, which was adopted by its City Council on May 12, 2015. Went into effect in June

  • According to staff reports and the text of the measure STRs removed "needed permanent housing from the market" and transient visitors could "disrupt the quietude... of the neighborhoods and adversely impact the community"

  • Nominally banned owner-absent STRs, while allowing owner-present STRs to continue with additional costs (taxes, reporting, etc)

→ Airbnb (and other platforms) quickly sued the city, which made enforcement difficult.

  • Ultimately, the city prevailed

→ Other regulatory challenges are often driven by section 230 of the Communications Decency Act -- which protects online platforms from content
Model
Overview

**Goal**: Demonstrate that the effects of STRs on housing prices is ambiguous in *as parsimonious* of a framework as possible

→ Intentionally abstract from anything except our **main mechanism**: the interplay between STRs and residential amenities

**Main Ingredients:**

→ Static, discrete choice over nbhd, $j$, and owner-status $k \in \{o, a\}$.

→ Fixed quantity of housing in each nbhd, $H_j$ and an exogenous number of rep. agents in market $N$
Model: Utility

Utility for owning in nbhd $j$:

$$u_{i,j,o} = \xi_j(k_j, f(str_j), g(str_j)) - P_j + \epsilon_{i,j,o}$$

$$u_{i,j,a} = \frac{R_j}{1 - \delta} - P_j + \epsilon_{i,j,a}$$

Where: $P_j$ is the housing price, $R_j$ is the rental price, $\delta$ is the discount rate, and $\epsilon$ is an iid preference shock.

$\xi_j : \mathbb{R}^3 \rightarrow \mathbb{R}$: maps three local features to a scalar amenity value.

- $k_j$: fixed, time-invariant amenity level unrelated to STRs
- $f(str_j)$: the "good" amenities that come with STRs (e.g., extra restaurants). **Assume**: $f' > 0$
- $g(str_j)$: the "bad" amenities that come with STRs (more partying?). **Assume**: $g' < 0$
A note

Under the assumption that STRs impact local amenities positively and negatively, it follows that:

\[
\frac{\partial \xi_j}{\partial str_j} = \frac{\partial \xi_j}{\partial f} \times f'(str_j) + \frac{\partial \xi_j}{\partial g} \times g'(str_j)
\]

Key Idea: The net impact of STRs on residential amenities is ambiguous

→ STRs may have positive impacts on residential amenities (added restaurants)
→ STRs also may have negative impacts on residential amenities (more noise)
Assume $\epsilon \sim EV1$ for simplicity and enforcing market clearing, the equilibrium expression for housing prices is:

$$P^*_j = -\log \frac{(1 + \phi_j) \times H_j}{(\exp(\frac{R_j}{1-\delta}) + \exp(\xi_j(k_j, f(str^*_j), g(str^*_j))))(N - H_j)}$$

**Main insight:** Relationship between the equilibrium price, the STR rental rate, and the number of STRs: $\frac{\partial P^*_j}{\partial R_j}$ and $\frac{\partial P^*_j}{\partial str^*_j}$.

$$\frac{\partial P^*_j}{\partial str^*_j} = \frac{\exp(\xi_j(\cdot))}{(\exp(\frac{R_j}{1-\delta}) + \exp(\xi_j(\cdot)))} \times \frac{\partial \xi_j}{\partial str^*_j}$$

$$\frac{\partial P^*_j}{\partial R_j} = \frac{1}{\exp(\frac{R_j}{1-\delta}) + \exp(\xi_j(\cdot))} \left( \frac{\exp(\frac{R_j}{1-\delta})}{1 - \delta} + \exp(\xi_j(\cdot)) \times \frac{\partial \xi_j}{\partial str^*_j} \times \frac{\partial str^*_j}{\partial R_j} \right)$$
Partial Derivatives

Consider a regulation directly restricting the number of STRs. We examine:

\[ \frac{\partial P_j^*}{\partial \text{str}_j^*} = \frac{\exp(\xi_j(\cdot))}{(\exp\left(\frac{R_j}{1-\delta}\right) + \exp(\xi_j(\cdot)))} \times \frac{\partial \xi_j}{\partial \text{str}_j^*} \]

Sign simply depends on \( \frac{\partial \xi_j}{\partial \text{str}_j^*} \)

→ If \( \frac{\partial \xi_j}{\partial \text{str}_j^*} > 0 \) then \( \frac{\partial P_j^*}{\partial \text{str}_j^*} > 0 \)

→ If \( \frac{\partial \xi_j}{\partial \text{str}_j^*} < 0 \) then \( \frac{\partial P_j^*}{\partial \text{str}_j^*} < 0 \)
Partial Derivatives

What about a regulation that changes the return on holding a STR? What happens to equilibrium housing prices?

$$ \frac{\partial P_j^*}{\partial R_j} = \frac{1}{\exp\left(\frac{R_j}{1-\delta}\right) + \exp\left(\xi_j(\cdot)\right)} \left( \frac{\exp\left(\frac{R_j}{1-\delta}\right)}{1-\delta} + \exp(\xi_j(\cdot)) \times \frac{\partial \xi_j}{\partial \text{str}^*} \times \frac{\partial \text{str}^*}{\partial R_j} \right) $$

3 (non-trivial cases):

Case 1: \( \frac{\partial \xi_j}{\partial \text{str}^*} > 0 \implies \frac{\partial P_j^*}{\partial R_j} > 0 \):

Case 2: \( \frac{\partial \xi_j}{\partial \text{str}^*} < 0 \) and \( \frac{\exp\left(\frac{R_j}{1-\delta}\right)}{1-\delta} > \left| \exp(\xi_j(\cdot)) \times \frac{\partial \xi_j}{\partial \text{str}^*} \times \frac{\partial \text{str}^*}{\partial R_j} \right| \implies \frac{\partial P_j^*}{\partial R_j} > 0 \):

Case 3: \( \frac{\partial \xi_j}{\partial \text{str}^*} < 0 \) and \( \frac{\exp\left(\frac{R_j}{1-\delta}\right)}{1-\delta} < \left| \exp(\xi_j(\cdot)) \times \frac{\partial \xi_j}{\partial \text{str}^*} \times \frac{\partial \text{str}^*}{\partial R_j} \right| \implies \frac{\partial P_j^*}{\partial R_j} < 0 \):

• STRs create net-negative amenities and the decrease in the marginal benefit to owner-occupiers exceeds the decrease in the marginal benefit to absentee landlords.
Recap

Built a parsimonious model that suggests the effects of STRs on housing prices is ambiguous

→ Intentionally made it as simple as possible. Minimal assumption: STR impact on amenities is ambiguous

→ Model makes it clear that that $\frac{\partial P_j^*}{\partial R_j} < 0$ is an edge case but still possible

→ No sharp predictions about $\xi$

Question

→ Is this just a theoretical curiosity? We turn to test our theory empirically.
Empirics: Panel Regressions
Data overview

We combine data from multiple sources:

- **Zillow**: Monthly housing price indices (ZHVI) at zip code level
- **Inside Airbnb + Tomslee**: Publicly available, scraped Airbnb listings
  
  → Scraped at irregular intervals -- combine them to get largest possible sample

  → Characteristics of listings, location accurate to within 500m

**Focus Area**: Los Angeles County. Estimation window: July 2015–June 2017
Specification

Using our model to guide the empirics, we estimate:

$$\log(ZHV I_{zjt}) = \beta_0 + \beta_1 \log(listings_{zjt}) + FX + \epsilon_{zjt}$$

where:

→ $ZHV I_{jct}$ is the Zillow Home Value Index for zip code $z$ in jurisdiction $j$ at year-month time $t$

→ $listings_{zjt}$ is the number of Airbnb listings

→ $FX$ is a set of fixed effects

→ $\epsilon_{zjt}$ is an unobservable

We use an instrument from Barron et. al (2020) for listings:

- Interact google search hits for Airbnb, $g_t^{air}$, with num. of restaurants and accomodations estab (NAICS 72) in 2010, $b_{zj}^{2010}$
**Intuition:** $b_{zj}^{2010}$ proxy for degree a given neighborhood attracts tourists over the long term

→ Likely correlated with housing prices

→ $g_{t}^{air}$ scales tourist measure by overall market size for Airbnb

**Exclusion Restriction**

→ $E[z_{jt} \cdot \epsilon_{zjt}] = 0$

→ If the attractiveness of restaurants to long-term residents is not correlated w/ nationwide Airbnb presence ⟷ exclusion restriction met
## Results

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Results

Estimated effect of Airbnb listings on ZHVI
Empirics: Policy Evaluation
Overview

Next, we zoom in on Santa Monica (SM). Recall:

- SM's **Ordinance 2484CCS**, which was adopted by its City Council on May 12, 2015. Went into effect in June

- Nominally banned owner-absent STRs, while allowing owner-present STRs to continue with additional costs (taxes, reporting, etc)

- We estimated a **negative coefficient** for SM. **Hypothesis**: STR ban in SM may have *increased* housing prices

Extra benefit to focusing on SM: **very detailed data on calls to police** (more on this later)
Listings over time

Santa Monica:
Total Airbnb Listings

Los Angeles (city):
Total Airbnb Listings

Airbnb listings

Entire home/apt  Private room  Shared room
Not so parallel pre-trends

![Graph showing differences in \( \log(\text{ZHVI}) \) values from 2012 to 2018.](image)
Diff in Diff: Alternative Bandwidths

Difference-in-Difference Estimates

Parameter estimate

Bandwidth Selection Method

CCT

CV

IK
Diff in Diff: Discussion

→ Not super well identified

→ In no specification do we find evidence that housing prices decreased from regulation

→ Consistent with Fonseca (2018) -- different research design -- detects no effect on housing prices
Empirics: Event Study Evidence
Finally, we provide *descriptive* evidence of our proposed mechanism, using calls to police.

→ **Hypothesis:** Nuisance calls to police decline after STRs are regulated in SM (may in part negative estimated coefficient)

→ **Data:** Santa Monica Open Data Project for 2013--2019
  
  → Geolocated calls with reason for the call

  → Define a call *k* as being party related if it was for loud music, public intoxication or noise complaint

  → Event study with pre-post as policy date STR regulation went into place
Event Study

Santa Monica: Party Related Complaints

Log(Total Party Related Incidents)

Months Since Airbnb Regulation
Public Intoxication

Public Intoxication Incidents

Log(Public Intoxication Incidents)

Months Since Airbnb Regulation
Conclusion

Main takeaways

→ Literature has exclusively focused on STRs and rising housing prices

→ We point out that this is probably right on average

  • Averages mask heterogeneity!

  • Less important if this heterogeneity means $\frac{\partial P_j^*}{\partial str_j^*}$ still always positive

→ Policy implication: regulating STRs in the name of housing affordability may backfire.

→ Much more work to be done here, though
Thank you!!

Questions? Comments? Concerns?

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