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

MEA 2021

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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

STRs in the News

ALL SECTIONS | #LOONESOTA StarTribune

LOCAL

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 pirces

   → 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 propoed 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:

	Income (2016 $)	Density (res. / mi^2)	Parks (ac. / 1k res.)	Dining & lodg. (# / 1k res.)	Rent ($ / mth)
LA (county)	62,978	13,090	3.3	1.9	1,410
LA (city)	58,504	15,637	9.9	2.0	1,473
Beverly Hills	128,985	8,164	1.9	4.7	2,339
Burbank	71,249	8,740	1.1	2.9	1,678
Malibu	125,623	353	9.1	4.0	2,529
Pasadena	79,314	8,549	2.5	3.0	1,604
Pomona	54,328	7,329	1.5	1.3	1,187
San Gabriel	63,644	9,497	0.5	3.1	1,314
Santa Monica	91,098	11,893	1.4	4.7	1,879
Torrance	80,097	9,327	2.4	2.7	1,606
West Hollywood	98,362	13,359	0.6	8.0	2,165

→ **Single most populous county in the US**

→ County is divided into **88 incorporated areas** and 76 unincorporated areas

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, δ is the discount rate, and ϵ is an iid preference shock

$\xi_j : \mathbb{R}^3 \to \mathbb{R}$: 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:

$$\frac{\partial \xi_j}{\partial str_j} = \underbrace{\frac{\partial \xi_j}{\partial f}}_{+} \times \underbrace{f'(str_j)}_{+} + \underbrace{\frac{\partial \xi_j}{\partial g}}_{-} \times \underbrace{g'(str_j)}_{+}$$

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

→ STRs may have positive impacts on residential amenities (added restaurants)

→ STRs also may have negative impacts on residential amenities (more noise)

Eq Price

Assume $\epsilon \sim EV1$ for simplicity and enforcing market clearing, the equilibrium expression for housing prices is:

$$P_j^\star = -\log \frac{(1+\phi_j) \times H_j}{(\exp(\frac{R_j}{1-\delta}) + \exp(\xi_j(k_j, f(str_j^\star), g(str_j^\star))))(N - H_j)}$$

Main insight: Relationship between the equilibrium price, the STR rental rate, and the number of STRs: $\frac{\partial P_j^\star}{\partial R_j}$ and $\frac{\partial P_j^\star}{\partial str_j^\star}$.

$$\frac{\partial P_j^\star}{\partial str_j^\star} = \frac{\exp(\xi_j(\cdot))}{(\exp(\frac{R_j}{1-\delta}) + \exp(\xi_j(\cdot)))} \times \frac{\partial \xi_j}{\partial str_j^\star}$$

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

Partial Derivatives

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

$$\frac{\partial P_j^\star}{\partial str_j^\star} = \frac{\exp(\xi_j(\cdot))}{(\exp(\frac{R_j}{1-\delta}) + \exp(\xi_j(\cdot)))} \times \frac{\partial \xi_j}{\partial str_j^\star}$$

Sign simply depends on $\frac{\partial \xi_j}{\partial str_j^\star}$

$\rightarrow$ If $\frac{\partial \xi_j}{\partial str_j^\star} > 0$ then $\frac{\partial P_j^\star}{\partial str_j^\star} > 0$

$\rightarrow$ If $\frac{\partial \xi_j}{\partial str_j^\star} < 0$ then $\frac{\partial P_j^\star}{\partial str_j^\star} < 0$

Partial Derivatives

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

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

3 (non-trivial cases):

Case 1: $\frac{\partial \xi_j}{\partial str^\star} > 0 \implies \frac{\partial P_j^\star}{\partial R_j} > 0$:

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

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

- **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 $\frac{\partial P_j^\star}{\partial R_j} < 0$ is an edge case but still possible

→ **No sharp predictions about ξ**

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:

$$\log(ZHVI_{zjt}) = \beta_{0j} + \beta_{1j} \log(listings_{zjt}) + FX + \epsilon_{zjt}$$

where:

→ $ZHVI_{jct}$ 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

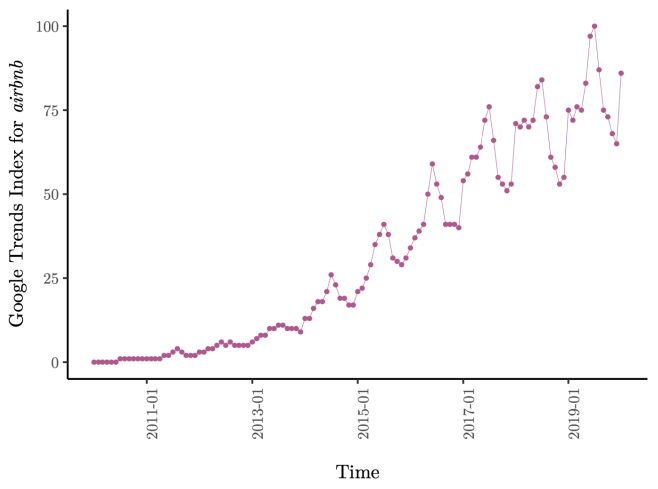
→ FX is a set of fixed effects

→ ϵ_{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}

Instrument idea



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

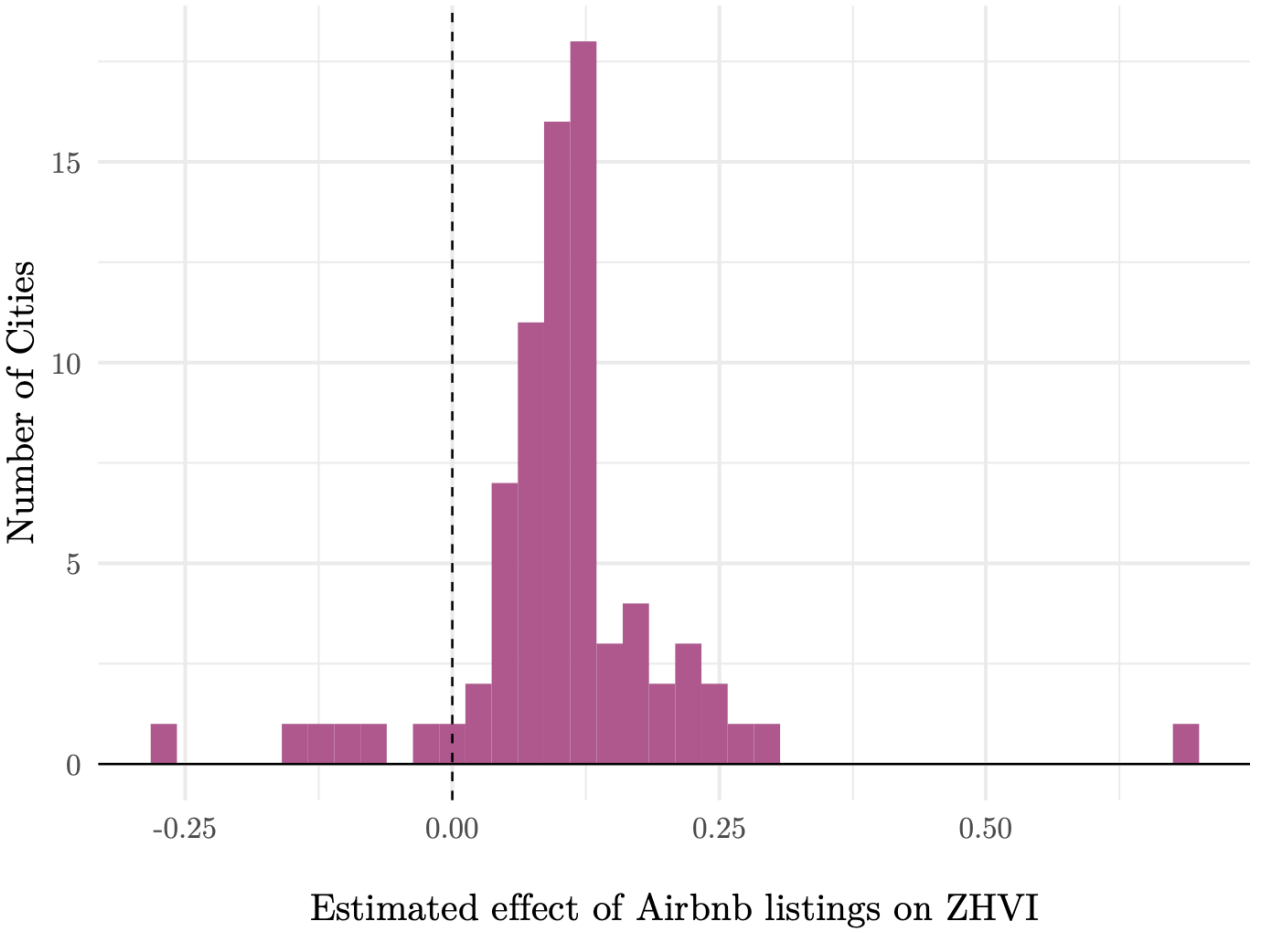
→ $E[z_{zjt} \cdot \epsilon_{zjt}] = 0$

→ If the attractiveness of restaurants to long-term residents is not correlated w/ nationwide Airbnb presence $\implies$ exclusion restriction met

Results

	(1)	(2)	(3)	(4)	(5)	(6)
log(`listings`) for						
LA (entire county)	0.158***	0.129***				
	(0.010)	(0.013)				
LA (city)			0.255***	0.252***	0.236***	0.226***
			(0.016)	(0.018)	(0.015)	(0.016)
Beverly Hills			0.660***	0.653***	0.976***	0.691***
			(0.064)	(0.065)	(0.047)	(0.054)
Burbank			−0.056***	−0.059***	−0.142***	−0.110***
			(0.017)	(0.018)	(0.015)	(0.017)
Pasadena			0.255***	0.246***	0.339***	0.239***
			(0.017)	(0.024)	(0.031)	(0.024)
Pomona			0.110***	0.103***	0.121***	0.091***
			(0.007)	(0.016)	(0.011)	(0.015)
San Gabriel			−0.133***	−0.135***	−0.122***	−0.123***
			(0.012)	(0.012)	(0.008)	(0.009)
Santa Monica			−0.265***	−0.267***	−0.298***	−0.266***
			(0.043)	(0.043)	(0.033)	(0.037)
Torrance			0.202***	0.197***	0.222***	0.188***
			(0.021)	(0.023)	(0.017)	(0.019)
West Hollywood			0.172***	0.163***	0.228***	0.155***
			(0.012)	(0.020)	(0.024)	(0.020)
Year FE	No	Yes	No	Yes	No	Yes
Area code FE	No	Yes	No	No	Yes	Yes
R^2	0.061	0.256	0.659	0.659	0.654	0.648
Num. obs.	6800	6800	6800	6800	6125	6125

Results


Number of Cities
15
10
5
0
-0.25
0.00
0.25
0.50
Estimated effect of Airbnb listings on ZHVI

Empirics: Policy Evaluation

Overview

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

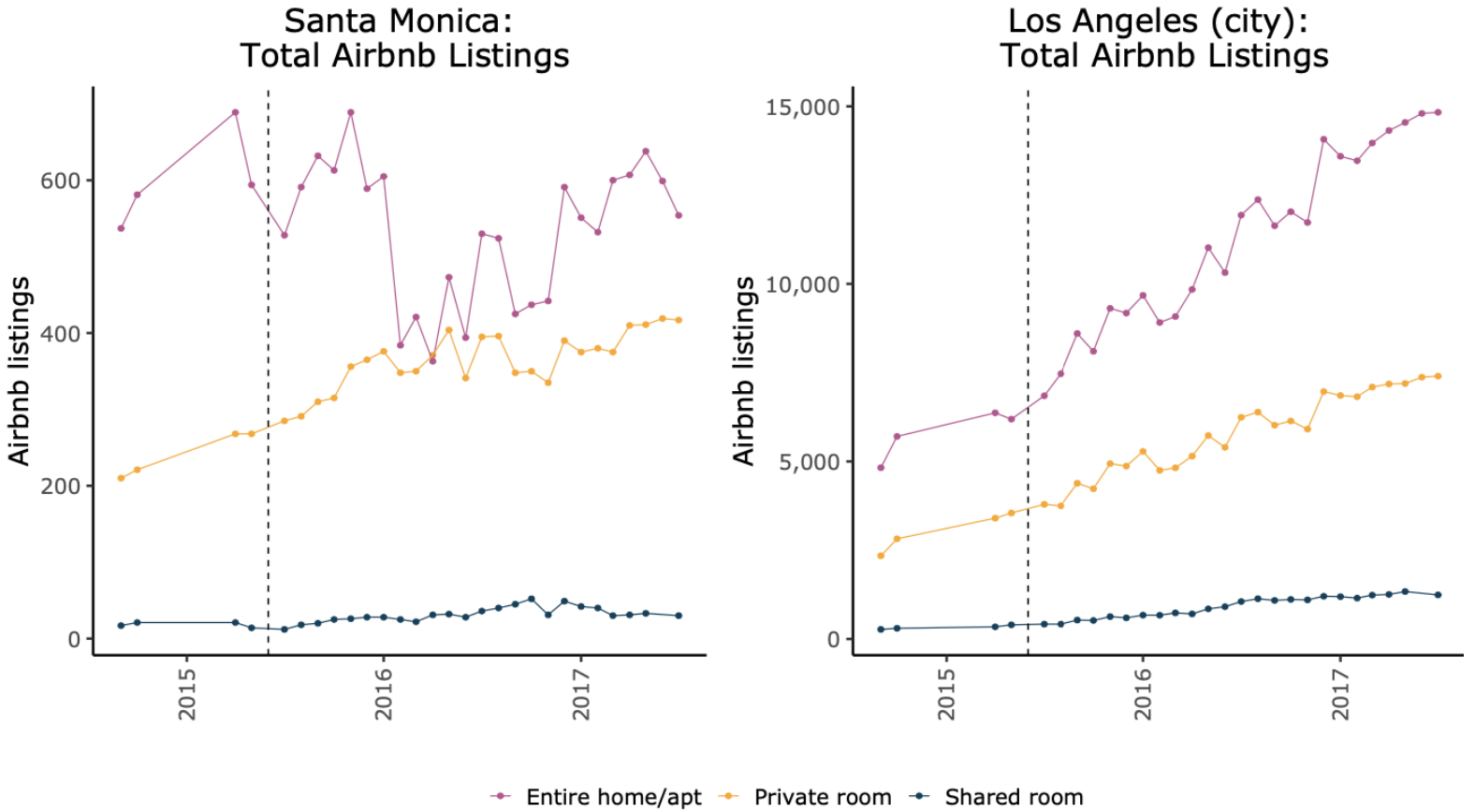
→ SM's **Ordinance 2484CCS**, which was adopted by its City Council on May 12, 2015. Went into effect in June

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

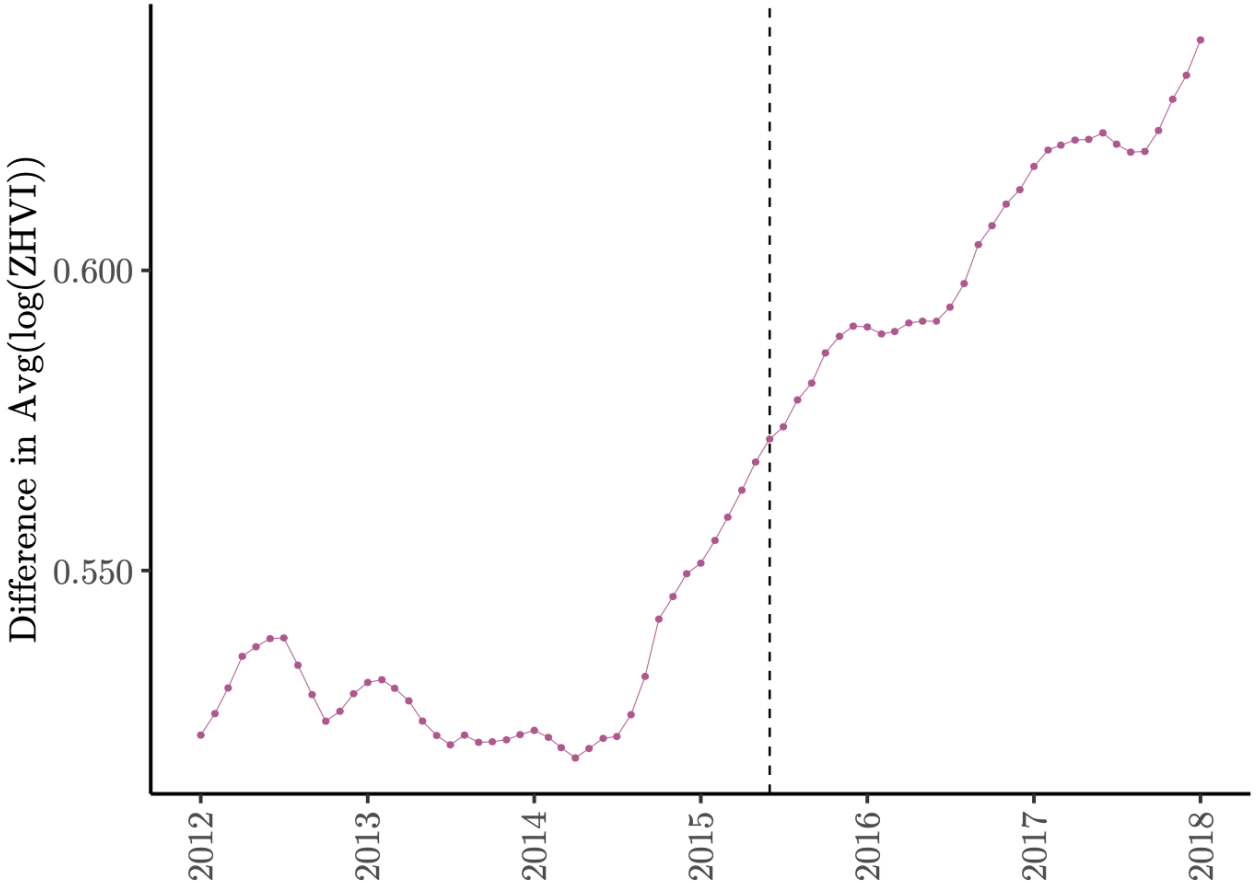
→ We estimated a **negative coefficient** for SM. **Hypothesis"** STR ban in SM may have *increased* housing prices

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

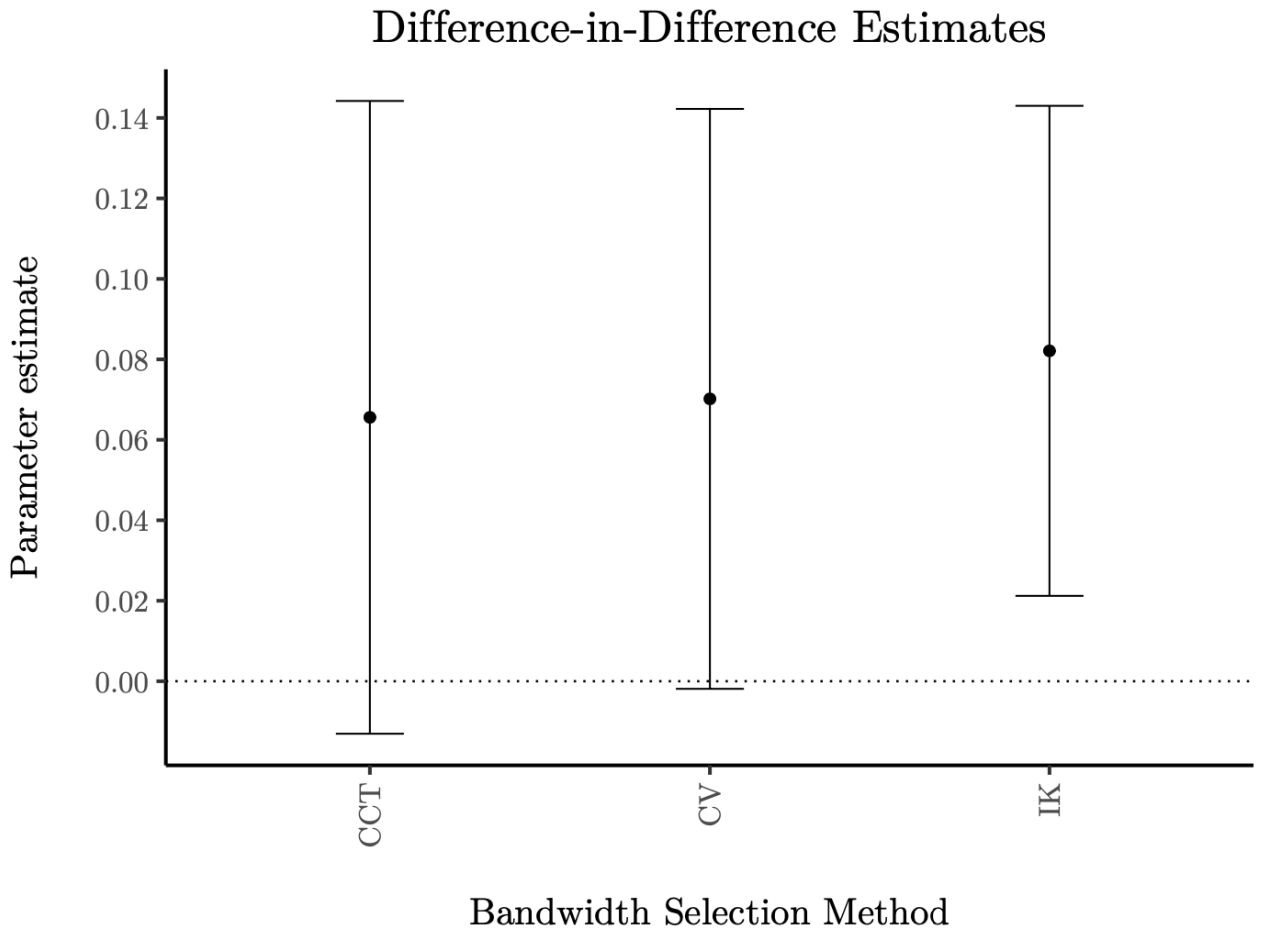
Listings over time



Not so parallel pre-trends



Diff in Diff: Alternative Bandwidths



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

Idea and Data

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

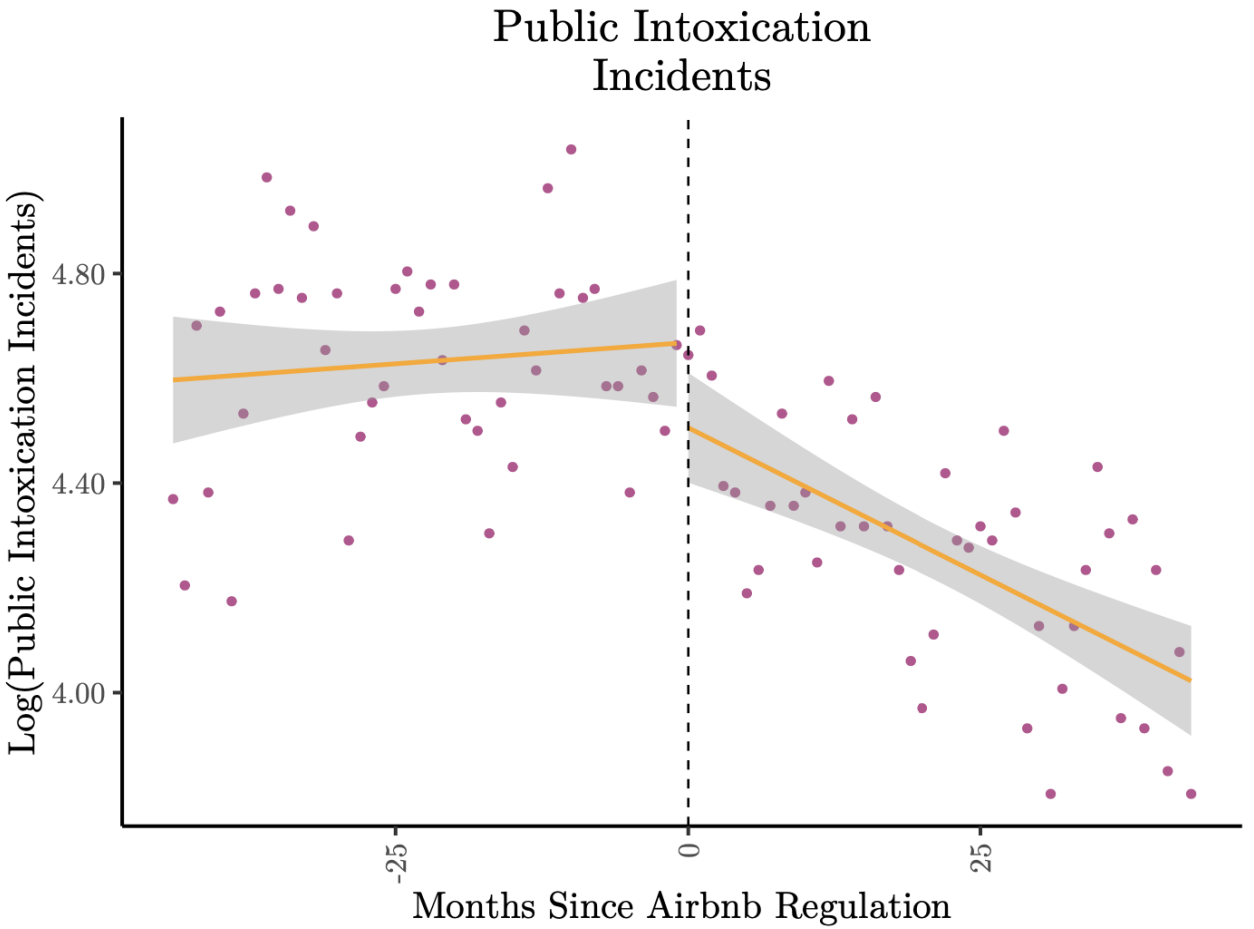
→ Define a call k as being party related if it was for loud music, public intoxication or noise complaint

→ 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)
6.00
5.80
5.60
5.40
-25
0
25
Months Since Airbnb Regulation

Public Intoxication



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 $\frac{\partial P_j^\star}{\partial str_j^\star}$ 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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