

**HOW REGULATIONS AND CONSUMERS' PERCEPTIONS MODERATE THE  
IMPACT OF AIRBNB ON REAL ESTATE PRICES**

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## **ABSTRACT**

The sharing economy facilitates private transactions among individuals and is thought to increase the demand for, and the price of the resources transacted. This study focuses on Airbnb and real estate prices. It explores whether consumers' perceptions, specifically about spanner hosts—firms that shift properties from the long-term rental market onto Airbnb, spanning the two markets—contribute to the increase of real estate prices attributable to the sharing economy. Using longitudinal data of Airbnb hosts in 10 major U.S. cities over seven years, we discover that spanning firms (and not individuals listing only one property) are responsible for the price increase of real estate properties. We also find that this increase can be weakened by changes in consumers' perceptions and the regulation of the sharing economy—that separate the spanner host category from other categories in the industry (e.g., individuals listing only one property). Finally, we find that the moderating effect of regulations is associated with changes in consumers' perceptions of the typical sharing economy host when the regulation change is discussed, not with regulation enforcement. The more consumers become aware of spanners on Airbnb, the less those spanners affect the real estate prices, even before the law is enforced.

**KEYWORDS:** Airbnb, categories, real estate, regulation, platforms.

## INTRODUCTION

The sharing economy is increasingly attracting the interest of policymakers, managers, and management scholars alike (Bucher, Fieseler, Fleck, & Lutz, 2018; Cusumano, 2022; Laamanen, Pfeffer, Rong, & Van de Ven, 2018; Uzunca, Rigtering, & Ozcan, 2018; Vaskelainen & Munzel, 2018). The sharing economy (SE), exemplified by platforms like Airbnb, was initially conceived as a way for private property owners to transact and monetize slack resources, such as extra space in a house (Vaskelainen & Munzel 2018). However, the SE has also attracted firms from other industries (Li, Kim, & Srinivasan, 2022). It has given these resources a new economic value, steeply increasing their sale price (Barron et al., 2021). Prior research examining the causes for this effect has distinguished between spanner hosts and prototypical SE hosts. The former are hosts that manage multiple properties full-time on Airbnb and are probably firms spanning from other industries, while the latter are single-listing hosts who manage on Airbnb only one property, which likely is a slack resource rented part-time (the house they usually live in, with their clothes in the closet and their food in the fridge) (Barron et al., 2021; Chen, Wei, & Xie, 2022; Li et al., 2022).

Within this stream of work, researchers adopting a supply-side view found that spanner hosts contributed most to increasing the price of real estate properties because they allegedly created a shortage of houses by moving multiple real estate properties from other commercial uses (especially the long-term rental market) into the sharing economy (Barron et al., 2021; Chen et al., 2022; Li et al., 2022). In contrast, researchers adopting a demand-side view linked the increase in real estate prices to Airbnb's continuous success and a higher demand from consumers for these properties. The success of Airbnb has led to a change in homeowners' purchasing habits, whereby the opportunity to monetize their home through the short-term rental market is influencing their housing purchasing decisions and willingness to pay (Filippas,

Horton, & Zeckhauser, 2020; Quattrone, Proserpio, Quercia, Capra, & Musolesi, 2016; Valentin, 2021). This apparent tension highlights the need (for scholars and regulators alike) to understand the underlying causes for this effect.

Given the now-recognized effect of Airbnb on real estate prices and the novelty of the marketplace, multiple audiences (e.g., consumers, competitors, neighbors) started pressuring local and national authorities to regulate the operations of Airbnb and similar SE platforms (Edelman & Geradin, 2015; Gottlieb, 2013). While both the supply-side and demand-side views inform regulatory efforts, they lead to an apparent tension: enforcing regulations may reduce the supply on SE platforms and thus the purchasing of properties for this purpose, harnessing their price increase; but regulations might legitimize the emerging market, further augmenting the steady consumer demand for SE products, and thus the purchasing of properties for this purpose, fueling their price increase. To disentangle these potentially opposite effects of these factors, we examine the effect of spanner hosts on real estate prices over time, after regulatory changes, and after consumers become able to distinguish—in other words, to categorize—spanner hosts.

Therefore, we ask: *How can these two types of audiences (consumers and regulators) shape the effect of Airbnb's spanner hosts on real estate prices?*

Because of the novelty and relevance of the phenomenon and our exploratory question, we examine a unique, hand-coded longitudinal dataset of approximately 61,000 hosts on Airbnb, matched with real estate market data from Zillow, legal data, ordinances, and media reports from 10 U.S. cities between 2008 and 2015. The granularity of this new dataset—in terms of geographical detail at the city level, time, and the actors involved (consumers, private hosts versus firms, and regulators)—allows us to examine the effect of consumers' perceptions about the prototypicality of the hosts operating in the SE category, and the impact of regulation. During our observation period, three of the ten cities analyzed new municipal regulations that defined

SE category attributes, i.e., the characteristics that host need to have to operate legitimately on Airbnb.

Our findings confirm that the increase in real estate prices credited to the SE is indeed partially attributable to participation in the SE by firms shifting properties from the long-term rental market to Airbnb (Barron et al., 2021; Chen et al., 2022; Koster, van Ommeren, & Volkhausen, 2021). We also discover that consumers' perceptions and regulations moderate this result. These effects have a sizeable economic significance. An increase of one standard deviation in the proportion of spanners is associated with a \$8,000 increase in real estate prices. In contrast, an increase of one standard deviation in consumer attention interacted with spanner proportion is related to a decrease of the average real estate price by \$800, and the adoption of a short-term rental market regulation interacted with spanner proportion is associated with a reduction of the average real estate price of \$8,500.

To account for these discoveries, we borrow from –and contribute to – ongoing conversations on categories (Lo, Nag, Xu, & Agung, 2020; O'Kane, Mangematin, Geoghegan, & Fitzgerald, 2015; Uzunca et al., 2018). We discover that within a category, regulations can change consumers' preferences (Bucher et al., 2018; Uzunca et al. 2018, 2022) and that a law that legitimates one subset of actors operating on the platform can be consequential even before it is enforced. We thus elucidate the dynamics within and across categories and the consequences of regulatory intervention in the attempt to define them (Funk & Hirschman, 2014; Ozcan & Gurses, 2018). Finally, we discuss this study's implications for managers and policymakers.

## **THE SHARING ECONOMY PHENOMENON AND AIRBNB**

The sharing economy refers to a class of economic arrangements in which asset owners (i.e., complementors) and consumers connect through a digital platform (Sundararajan, 2016) and mutualize access to the products or services associated with these assets (Munger, 2018;

Sundararajan, 2016) “to enable collaborative consumption” (Laamanen et al., 2018: 213).

Among the earliest examples of SE platforms are Couchsurfing, where peers host other members of the platform community without charging any rent; BlaBlaCar, a platform for drivers to share seats in their cars during long trips to share travel costs (e.g., fuel, toll) and make the journey more enjoyable; and others like HomeAway and Carpooling.

Generally, SE platforms accommodate numerous providers and consumers and refrain from exercising firm control over their behavior (McIntyre & Srinivasan, 2017; Reischauer & Mair, 2018). This hands-off approach contributes to the heterogeneity of actors’ interpretations of the SE platforms, a diversity that characterizes all emerging industries (Kennedy, Lo, & Lounsbury, 2010; Pontikes, 2012; Suarez, Grodal, & Gotsopoulos, 2015).

Airbnb is an archetypical example of a SE platform. It offers arrangements for lodging, primarily homestays, but does not own any real estate property. Instead, it acts as a broker and receives commissions from each booking. From the beginning, Airbnb has attracted hosts who share their homes occasionally (Gerwe, Silva, & De Castro, 2020; Lampinen & Cheshire, 2016). Within a few years after its establishment, Airbnb also started attracting firms that shifted houses from other markets and economic uses (especially the long-term rental market) to obtain the higher earnings available in the SE (Barron et al., 2021; Chen et al., 2022; Li et al. 2022). This latter type of Airbnb host allegedly creates housing shortages and other negative externalities (Li et al., 2022; Zervas, Proserpio, & Byers, 2017).

### **Single-listing Hosts and Spanner Hosts**

Market spaces—particularly new, emerging market spaces—accommodate different interpretations about what attributes are required for membership in a category (Kennedy et al., 2010; Suarez et al., 2015). In the SE, different audiences disagree about who may operate on an SE platform (Bucher et al., 2018; Carnabuci, Operti, & Kovács, 2015; Kennedy et al., 2010;

Montauti, 2019; Vaskelainen & Munzel, 2018). In the case of Airbnb, there is disagreement among both consumers and policymakers on whether Airbnb hosts should rent only their primary residence and offer it only part-time or whether they should be allowed to rent multiple properties full-time.

As a result, spanners from the long-rental market and the more prototypical hosts coexist on the platform (Carnabuci et al. 2015; Pontikes & Barnett, 2015). However, evidence suggests that over time, when audiences (including consumers and regulators) converge towards a shared understanding of the features expected in hosts, they may come to see actors that compete in multiple categories as atypical (Carnabuci et al., 2015; Negro & Leung, 2013). In this process, Airbnb hosts spanning from the long-rental market and thus lacking the features expected in prototypical hosts will lose audiences' attention, will be regarded as less appealing, and consequently will perform below market average (Negro & Leung, 2013; Zuckerman, 1999) and become unable to compete (Kennedy et al., 2010; Navis & Glynn, 2010; Vergne & Wry, 2014).

In an initial investigation of our sample, we find that over our observation period (2008–2015), single-listing actors always represent more than half of the actors on the platform, with an average of 80%, and represent the median host (in line with Chen et al., 2022). Figure 1 plots the number of listings (by host type) and real estate prices over time. This figure shows that the number of listings managed by single-listing hosts and those operated by spanners increased monotonically over our observation period. As of 2012, real estate prices also rose.

Table 1 reports descriptive statistics for the two types of hosts and their listings. The most notable difference is that while a single-listing host manages only one property, a spanner manages 37 properties on average. Spanners charge a higher price per night, rent their units more frequently, and are more likely to renounce their right to select the guest, as they are more likely

to enable the “instant booking” option on their listings—a set of actions coherent with a profit maximization goal and the use of the listing as a full-time rental.

We also hand-collected the profile pictures used to advertise the accommodation, distinguishing between pictures showing people (one individual, a couple, or a family) and logos or photos of the house itself only. In our sample, 94% of properties are managed by single-listing hosts, but only 80% of those operated by spanners have a picture featuring a person. In contrast, spanners more frequently use logos and images of a house (about 13% and 17%, respectively) than do single-listing hosts (fewer than 3% and 5%, respectively) (see Table A1 in the Appendix).

===== INSERT FIGURE 1 AND TABLE 1 ABOUT HERE =====

### **Regulatory Changes and Consumers’ Perceptions**

Reacting to the fear that Airbnb may exacerbate the housing affordability problem in their city (Chen et al., 2022) and to the ensuing pressures from multiple audiences (Edelman & Geradin, 2015), since 2010, policymakers worldwide have tried to define and regulate the activity of the various hosts on SE platforms.<sup>1</sup> This process has often culminated in a change in legislation, for example, in Austin in 2013, Portland in 2014, and Nashville in 2015. These three cities experimented with regulations that maintain the benefits of Airbnb (e.g., flexible housing stock for travelers and the opportunity for homeowners to hold property as an investment) while balancing the stock of properties in the long- and short-term rental markets.<sup>2</sup> All three cities now regulate the rental activity of Airbnb hosts (and competitors like VRBO): they limit the number of rooms hosts can rent within one apartment (e.g., two in Portland, depending on the type of

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<sup>1</sup> See, for example, <https://www.nytimes.com/2016/07/04/technology/a-brooklyn-neighborhood-where-airbnb-is-being-put-to-the-test.html> and <https://archive.nytimes.com/query.nytimes.com/gst/fullpage-9807E5DC153FF93BA3575BC0A9669D8B63.html>.

<sup>2</sup> See, for example, Nashville’s ordinance no. BL2014-951 to amend Chapter 6.28 of the Metropolitan Code pertaining to Short Term Rental Property.

license, and four in Nashville), or stipulate that hosts can rent rooms but not the entire apartment or house (e.g., Portland), or restrict the licensing of properties that are not owner occupied. In Nashville, the 2015 law caps licenses for non-owner-occupied properties. In contrast, Austin's new legislation allows a single host to manage an indefinite number of listings. But in commercial areas in Austin, only non-owner-occupied properties can get a license, thus limiting the number of properties that hosts can legally rent in the city through an SE platform, and in Portland, only the host's primary residence can be lawfully advertised on Airbnb.

To examine whether and how consumers' perceptions may change as cities implement these new regulations, we analyzed consumers' reviews (i.e., their descriptions of how much they liked their stay) through a sentiment analysis algorithm. Using a dictionary of positive and negative words to measure the sentiment of each review, we coded the reviews' sentiment. We averaged it by month and type of host (spanner or single-listing host). In the three cities that regulated the rental market created by SE platforms, consumers' sentiment towards spanners is higher than for single-listing hosts. Still, when a new regulation is about to be introduced, in their reviews, consumers start describing spanners more negatively (see Figure 1A in the Appendix).

## **EXPLORING THE EFFECT OF SPANNERS, CONSUMERS' PERCEPTIONS, AND REGULATIONS ON REAL ESTATE PRICES**

By enabling the transaction of private resources among strangers, the SE has increased the value of the resources transacted (Barron et al., 2021; Guo et al., 2019; Koster et al., 2021). For example, Airbnb has increased the value of houses (Barron et al., 2021), and Uber has increased the value of cars (Guo et al., 2019). This effect is because products originally intended for private uses are now exploitable both for personal consumption and for creating income (Munger, 2018; Sundararajan, 2016), and this potential double use increases their value and their market price (Barron et al., 2021; Chen et al., 2022; Li et al., 2022). Homeowners can now rent

their excess capacity on digital platforms like Airbnb and VRBO; this raises the value of owning, which is then capitalized into house prices. Studies of the short-term rental market have found that the entry of Airbnb is responsible for an increase in the sale price of houses ranging from 1% (Barron et al., 2021; Chen et al., 2022) up to about 15% in tourist areas (Koster et al., 2021).

### **Spanners**

In general, established firms can contribute to the growth of new market spaces by moving part of their resources to the emerging industry (Adams, Fontana, & Malerba, 2015; Carroll, Bigelow, Seidel, & Tsai, 1996; Carroll & Swaminathan, 2000; Grodal, Gotsopoulos, & Suarez, 2015; Klepper & Simons, 2000). The displacement of resources from other industries into SE platforms (Barron et al., 2021; Chen et al., 2022; Li et al., 2022) allows the fast growth of these platforms (Hagiu, Jullien, & Wright, 2020).

In the case of Airbnb, by moving resources from the long-term rental industry to the platform, spanners can fuel the platform's indirect network effects: the more properties are offered for rent on Airbnb, the more travelers will rely upon Airbnb to find a place to stay (Afuah, 2013; Rochet & Tirole, 2006). Meanwhile, the spanning firms are shrinking the supply of houses in their original industry, hence contributing to an increase in their prices (Barron et al., 2021; Chen et al., 2022; Li et al., 2022). But there have been few direct tests of this effect and, most importantly, of the underlying mechanisms. We explore the specific influence of consumers and regulators in shaping the dynamics of Airbnb and, hence, the impact on real estate prices.

### **Consumers' Perceptions**

Typically, at the early stages of a category's development, heterogeneous interpretations of the category coexist (Suarez et al., 2015). However, over time, audiences converge on a single understanding of what constitutes a prototypical actor in that category (Kennedy et al., 2010;

Navis & Glynn, 2010; Vergne & Wry, 2014; Zuckerman, 1999). In Airbnb, the convergence happens partly through reviews that guests leave on the platform about their experience in an Airbnb property and with a host. Reviews not only disclose the intrinsic quality of Airbnb hosts but also differentiate between types of hosts. Through the features reviewed, one can identify those that are considered the most critical factual attributes of the category, and through the sentiment of reviews, one can understand the host's degree of prototypicality and its appeal to consumers (Alexy & George, 2013; Hsu, Hannan, & Kocak, 2009; Kennedy et al., 2010).

According to the categories literature, spanners are eventually recognized as less prototypical actors in the SE (Carnabuci et al., 2015; Zuckerman, 1999). For example, the many properties that spanners rent full-time are likely to be perceived as vacation rentals because they do not live full-time. They are substantially different from other properties on Airbnb, where the host lives most of the year. If spanners are perceived as atypical, the sentiment of their reviews decreases (Alexy & George, 2013; Hsu, 2006; Hsu et al., 2009). Consequently, the demand for their properties also declines (Kennedy et al., 2010). We explore whether this process is affected by consumers' attention to policymakers' discussions about Airbnb, eventually increasing the opportunity costs of switching properties from other industries into Airbnb and thus affecting the price of those properties.

## **Regulation**

Regulation can also contribute to consumers' convergence towards a preferred category schema. Policymakers are experimenting with regulations limiting the supply of houses on the platform, especially those transferred from the long-term rental market (Li et al., 2022). These regulatory "experiments" aim to dissipate ambiguity (Funk & Hirschman, 2014) about the specific organizational form and attributes of firms and actors operating in the SE (Bucher et al., 2018; Carnabuci et al., 2015; Hsu et al., 2009; Vergne & Wry, 2014) and thus allow a crisper

differentiation between spanners and prototypical hosts in Airbnb. Schemata of necessary attributes can be built over time by the actors in a product category (Suarez et al., 2015) and then formalized by regulators (Ozcan & Gurses, 2018).

There are two ways in which these regulations may discourage spanners from operating in the SE. First, regulations may push spanners out of the market by imposing requirements they cannot meet. For example, regulations may limit the number of rooms or apartments that a host can manage on the platform, require the host to be present in the apartment for the entire stay of the guest, or allow hosts to rent only their primary residence on the platform<sup>3</sup> (for a review of short-term rental regulations, see Gottlieb, 2013). To explore this first mechanism, we examine whether the spanners operating on Airbnb after a regulatory change differ from those on Airbnb before.

Second, regulations may have an indirect effect by shaping consumers' perceptions about atypical hosts. Policymakers, as authoritative third parties in the industry, can impose legal requirements on actors in the emerging product category (Lee, Hiatt, & Lounsbury, 2017; Ozcan & Gurses, 2018) and thus facilitate differentiation between prototypical hosts and atypical hosts. The crisper definition of the product category can cause consumers to identify spanners as atypical and less appealing (Bucher et al., 2018). To explore this second mechanism, we examine the effect of regulations on consumers' appreciation of SE's spanners and the price of real estate properties.

## DATA AND METHOD

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<sup>3</sup> See, for example, the ordinance no. 20120802-122 in Austin (<https://www.austintexas.gov/edims/document.cfm?id=174697>), ordinance no. BL2014-951 in Nashville ([https://legisarchive.nashville.gov/mc/ordinances/term\\_2011\\_2015/bl2014\\_951.htm](https://legisarchive.nashville.gov/mc/ordinances/term_2011_2015/bl2014_951.htm)), and Chapter 33.207 of Title 33 in Portland ([https://www.portland.gov/sites/default/files/code/207-accessory-short-term-rentals\\_0.pdf](https://www.portland.gov/sites/default/files/code/207-accessory-short-term-rentals_0.pdf)) (retrieved April 15, 2022).

To explore how consumers and regulators can shape the effect of Airbnb spanner hosts on real estate prices, we analyzed the population of Airbnb hosts since Airbnb's establishment in August 2008 in 10 major U.S. cities: Austin, Boston, Chicago, Los Angeles, Nashville, New York, Portland, San Francisco, Santa Cruz, and Washington D.C. This collection of data from multiple geographical areas increases the institutional variability of our sample. To limit noise in the data, we stopped data collection in 2015, before micro-entrepreneurs began to use SE platforms (Tae, Luo, & Lin, 2020). In October 2015, we collected data on Airbnb hosts and their listings' features from 2008 from insideairbnb.com (Barron et al., 2021), which contains detailed data about 60,747 hosts managing 80,878 properties. We combined these data with data from Zillow Research to obtain time series trends in the real estate market (Barron et al., 2021; Chen et al., 2022; Li et al., 2022).

We coded all variables at the zip code level to account for differences within cities that may affect real estate prices (e.g., distance from tourist attractions, proximity to public transportation, predominantly residential areas). This choice has two additional advantages. First, it provides good variability across time and space that can be exploited to estimate the coefficients of interest. Second, it allows for the integration of data from different sources. Our final dataset has 259 zip codes, observed for 85 months from 2008 to 2015.

### **Dependent Variable**

The dependent variable is the *Real estate price* for each zip code in our sample. In line with previous studies (Barron et al., 2021; Chen et al., 2022; Koster et al., 2021), we derived real estate prices from Zillow, whose index reflects the market values of the actual stock of houses available each month, seasonally adjusted and smoothed using a Henderson filter. We used the natural logarithm of this index.

### **Independent Variables**

We use three variables for how Airbnb may affect real estate prices: *Spanner proportion*, *Consumer attention*, and *Regulated market*. To build the *Spanner proportion* variable, we coded any host managing six or more properties (i.e., an above-average number) as a spanner. We excluded from our measure actors that work between two and five properties—a choice that reflects a conservative measure of economic motivations (see Gerwe et al., 2020; Lampinen & Cheshire, 2016) and may reduce the size effect of our findings, but it allows us to avoid overlaps in the operationalization of our constructs. (We ran robustness checks with different cut-offs to define spanners vs. single-listing hosts.) Next, for every month and every zip code, we calculated the ratio between the number of listings managed by spanners (numerator) and the sum of listings managed by spanners and single-listing hosts (denominator). Thus, the *Spanner proportion* ranges from 0 to 1, with 1 representing a zip code populated only by spanners.

We measured *Consumer attention* using the index of Google searches for news about Airbnb and Airbnb's legal challenges, following prior research on categories that used press coverage as a proxy for the attention (Bermiss, Zajac, & King, 2014; Navis & Glynn, 2010). We computed the ratio over time of Google searches for news about Airbnb's legal challenges over the trend of Google searches for news about Airbnb in general (i.e., including but not limited to legal challenges). This measure captures consumers' attention to the ongoing conversation about Airbnb and the hosts expected to operate on the platform. Because news about Airbnb's legal challenges in the period of analysis focuses on the undesirability of multi-listing hosts on the Airbnb platform, this measure reflects whether spanner hosts are recognized as atypical and, therefore, lose appeal among consumers (Navis & Glynn, 2010).

Finally, to explore regulatory changes and their consequences, we examined cities experimenting with stricter regulations for real-estate actors operating in the SE. We built a variable, *Regulated market*, that refers to a change in legislation to regulate the operations of the

sharing economy. Almost all the cities in our sample have implemented rules for the SE rental market, and three did so within our data collection period: Austin in October 2013, Portland in August 2014, and Nashville in March 2015.<sup>4</sup> We coded *Regulated market* at the city level as a dummy variable with a value of 0 before the change in legislation and 1 after approving a regulatory change of the short-term rental market. The regulated market variable captures an increased differentiation between the SE category and other product categories in the real estate industry.

### **Control Variables**

Our first preoccupation was to control for possible changes in the supply and demand of properties in the cities analyzed. Given that the increase in real estate prices may be driven by independent or seasonal changes in the availability of housing stock, we controlled for changes in the supply and demand of houses monthly at the zip code level using a measure for *Change in number of houses sold* (Chen et al., 2022) and a measure of *Change in number of new building permits* (McDonald & McMillen, 2000). We also add a control for the demand for Airbnb properties by calculating the zip code average number of reviews left monthly by consumers, as most Airbnb rentals result in a review by the guest (Fradkin, Grewal, & Holtz, 2021).

Any increase in real estate prices may reflect a general economic trend or a change in demand for reasons independent of Airbnb. Thus, to account for macroeconomic trends, we included *Population* (Chen et al., 2022) recorded by the U.S. Census at the metropolitan statistical area (MSA) level and *Income*, also at the MSA level, as reported in the St. Louis Fed's

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<sup>4</sup> Austin: Ordinance no. 20130926-144 amended City Code Chapters 25-2 and 25-12, which provides for the regulation, monitoring, and licensing of short-term rentals (STRs). Nashville: Ordinance no. BL2014-951 will amend Chapter 6.28 of the Metropolitan Code of Short-Term Rental Property. Portland: regulations that define what is allowed as an Accessory Short-Term Rental (ASTR) in the Portland Zoning Code Section 33.207. We do not analyse New York City here because instead of defining the SE category attributes through new municipal regulations, it decided to ban the platform entirely, eliminating SE from the hospitality industry.

FRED database (Bork & Møller, 2015; Chen et al., 2022). In cities where the regulatory change took place, it is possible that the crisper definition of the emerging category boundaries increased the category's legitimacy (Vergne & Wry, 2014) and, consequently, the demand for it. Thus, we controlled for the direct effect of *Regulated market* in the full model.

We controlled for the *Number of nonspanning actors* (i.e., single-listing hosts and hosts who manage between 2 and 5 listings) to confirm that the effect of *Spanner proportion* on the dependent variable is due to an increase in the number of spanner hosts (numerator) and not to a decrease in the total number of hosts on Airbnb.<sup>5</sup>

It is also possible that features of specific zip codes or time periods affect our results. Thus, in addition to all these controls, we used *zip code fixed effects* and *month fixed effects* to control for unobserved differences across time and units of analysis.

## **Models**

We used a dynamic panel data model for our main analyses, with variables measured at the zip code and month level. For every model, we measured the dependent variable one lead (i.e., one month) ahead of all the independent variables. We examined the effect of the proportion of spanners and the impact of consumer attention to spanners' presence in the market for the entire sample of 10 cities (259 zip codes) and the role of the regulator for only the three cities (73 zip codes) that underwent a regulatory change. We used the Arellano-Bond (1991) estimator to address the bias due to the correlation between the lagged dependent variable and the error term in dynamic panel models.

## **EMPIRICAL ANALYSES**

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<sup>5</sup> Without this control, a positive correlation between Spanner proportion and the dependent variable could be explained by an increase in the number of single-listing hosts too. Thus, with this control variable, we are more confident that our results are driven by a change in the number of spanners.

An initial analysis of our data suggests that (after we exclude actors that manage between two and five properties) spanners (single-listing hosts) represent 2% (98%) of all the hosts in the sample. Their listings represent 14.1% (85.9%) of all the listings on Airbnb. The average number of properties managed by the same host in the sample is 5.1. Single-listing hosts represent the median host on Airbnb. The average real estate price across zip codes and months is \$473,066.

Tables 2 and 3 report the correlations and descriptive statistics among our variables. In our study, the number of single-listing hosts and the number of spanners are moderately correlated ( $\beta = .71$ ), and the robustness checks show evidence of biased estimates in models where both variables are present (Appendix Table A2). To address concerns about multicollinearity, which may lead to biased estimates (Kalnins, 2018), we used “spanner proportion” instead of the absolute number of spanners. To double-check the robustness of our results to multicollinearity, we entered the control variables into the model one by one (Mata & Alves, 2018) (Appendix Table A3). Spanner proportion remained stable when we introduced other controls. We observe that, unsurprisingly, the measures of population and income correlate positively with real estate prices. None of our three explanatory variables strongly correlates with the control variables. Spanner's proportion is, on average, 0.17 and negatively correlates with real estate prices and a regulated market. Of course, these correlation values must be interpreted cautiously and reinforced by a full-fledged regression, the results of which we present below.

===== INSERT TABLES 2 AND 3 ABOUT HERE =====

## **Main Findings**

Table 4 reports the main findings of our analyses. The dependent variable of every model, i.e., real estate price (log), is one month ahead of the independent variables. When we look at our control variables, we see that the increase in the number of houses sold has a positive but insignificant effect on real estate prices. In contrast, the change in the number of new building

permits has a negative but not significant effect. Income and population significantly affect real estate prices: while population has a positive impact, income has a negative effect. The number of reviews has a positive but not significant impact on the real estate price. Finally, real estate price at  $t_0$  has a positive and significant effect on and strongly predicts real estate price at  $t_1$  (Model 1 in Table 4).

**Spanner proportion.** Model 2 in Table 4 measures the extent to which spanner proportion increases the price of real estate properties. In line with evidence from previous studies (Barron et al., 2021; Chen et al., 2022; Li et al., 2022), we find that spanner proportion has a positive and significant effect on real estate prices at  $t_1$  ( $\beta = 0.002$ ,  $p < .010$ ).

===== INSERT TABLE 4 ABOUT HERE =====

**Consumer attention.** When including consumer attention (Table 4, Model 3), the effect of the spanner proportion remains positive and significant. The interaction between consumer attention and spanner proportion negatively and significantly affects real estate prices ( $\beta = -0.001$ ,  $p < .100$ ).

A visual inspection of the interaction (Figure 2) shows that at high levels of consumer attention, the higher the proportion of spanners, the smaller the effect of spanners on real estate prices. The opposite is true at low levels of consumer attention.

**Regulated market.** Then, we run the model that includes the regulated market and its interaction with spanner proportion (Model 5, Table 4). We examine the three cities in our sample that implemented a legal change differentiating the SE category from other categories in the industry: Austin, Nashville, and Portland. The interaction between the regulated market and spanner proportion negatively and significantly affects real estate prices ( $\beta = -0.009$ ,  $p < .010$ ).

Figure 3 shows the predicted margins of real estate prices at different levels of spanner proportion before and after the law's approval. When the market is unregulated, the effect of

spanner proportion is positive: the higher the proportion of spanners, the higher the real estate prices. However, after the new law was passed, the effect of spanner proportion on real estate prices became negative: the higher the proportion of spanners, the lower the real estate prices.

===== INSERT FIGURES 2 AND 3 ABOUT HERE =====

### **Effect sizes**

To understand the size of our effects, we examine the change of values for increased consumer attention and the passage to a regulated market as moderators of the spanner proportion (Moral-Benito, Allison, & Williams, 2019).

Using the values from Model 3 in Table 4 (10-city sample), we calculate that, in the long run, an increase of one standard deviation in consumer attention (interacted with the average proportion of spanners) corresponds to a 0.2% decrease in the log of real estate prices (that is,  $-0.002 = 0.277 * 0.175 * (-0.001 / (1 - 0.978))$ ). In other words, it decreases the average real estate price by about \$800 (that is,  $-819.371 = 372,275 * e^{(0.002)} - 372,275$ ).

Finally, using the values of Model 5 in Table 4 (three-city sample of Austin, Nashville, and Portland), we estimate the effect of the approval of a regulation interacted with spanner proportion on real estate prices. We find that, in the long run, regulated market interacted with the mean proportion of spanners decreases the log of real estate prices on average by 3.8% per zip code (that is,  $-0.038 = 1 * 0.138 * (-0.009 / (1 - 0.967))$ ). It decreases the price of the average property by \$8,500 (that is,  $-8,669.13 = 234,701 * e^{(-0.038)} - 234,701$ ). This effect is sizeable, as the monthly average spanner proportion in these three cities is 0.138, and the average real estate price is \$234,701.

## **POST-HOC ANALYSES**

### **Exploring the Effect of Audiences**

***Existence of two categories.*** To understand the role of audiences' attention as a moderator of the effect of spanners on real estate prices, we needed to ensure that the two types of hosts (spanners and single-listing hosts) differ in the eyes of consumers. We used an automated textual analysis and performed a simple frequency count of the words in consumer reviews to identify the top 100 words used to describe each type of host. When we look at words that are unique to either spanners or single-listing hosts (i.e., words that appear in one list but not the other), we see that the words that are unique to single-listing hosts refer primarily to the rental experience (e.g., "friendly," "lovely," "feel," "cozy," "accommodating"). In contrast, the words that are unique to spanners typically refer to the rental place (e.g., "bathroom," "beds," "property," "shower"). We then created a ScatterText plot (Kessler, 2017) (Figure 2A in the Appendix) to identify the words most frequently used to review spanners and rarely used to describe single-listing hosts (and vice versa). For spanners, these words include "hostel," "staff," and "turnkey," which refer to professional services in either the hospitality or the real estate industry. For single-listing hosts, we find people's first names, presumably the names of hosts. This finding suggests that consumers recognize spanners as different from single-listing hosts in the types of service provided and in interpersonal interactions.

***Change in consumers' perceptions of the two types of hosts.*** Our primary analyses show that after a regulatory change that stresses the atypicality of spanners in the Airbnb platform, the effect of spanners on real estate prices decreases. To understand the mechanism behind this effect, we further inspect the consumer reviews (Table A4 in the Appendix reports sample reviews mentioning the new regulation). Using all reviews published about any host during the entire period of analysis, we create a multidimensional space with *word2vec*, where each word represents one dimension of the space (Garg, Schiebinger, Jurafsky, & Zou, 2018; Harrison, Thurgood, Boivie, & Pfarrer, 2019). We want to explore how the relationship between keyword

“host” and the most frequently used negative words differs *before* and *after* the regulatory change. Therefore, we compute a cosine similarity, which provides a measure interpretable similarly to a Pearson correlation index (Zhelezniak, Savkov, Shen, & Hammerla, 2019). We see that after the regulatory change, the distance between “host” and negative words about the listing’s space (i.e., “noise,” “hang,” “cold,” “hard,” “loud”) remains negative (indicating a negative correlation), both for spanners and single-listing hosts. In contrast, the distance between “host” and negative words about the overall experience of the stay (i.e., “issues,” “issue,” “problem,” “complex,” and “bad”) is primarily positive and increasing for spanners (but not for single-listing hosts) (Table A5 in the Appendix). We interpret this as evidence that consumers are more attentive to differences between spanners and single-listing hosts after regulators define spanners.

Finally, we check whether the *Regulated market* leads to a decrease in spanners’ appeal in the eyes of consumers. The new regulation significantly decreases the sentiment of consumers’ reviews of spanners ( $\beta = -0.035$ ,  $p < .001$ ; Model 1 in Table A6 in the Appendix). In line with our overall findings, the change in regulation decreases the reviews’ sentiment for spanners but increases the reviews’ sentiment for single-listing hosts (Figure 3A in the Appendix).

Overall, these post-hoc analyses support our proposed mechanisms that the two types of hosts differ in the eyes of consumers and that regulating the market leads to a decrease in spanners’ appeal in the eyes of consumers.

### **Exploring Alternative Explanations and the Robustness of the Empirical Findings**

***Law enforcement.*** The observed change in the effect of spanners on real estate prices may be due to the city’s ability to enforce the new law. For Austin, we collected data on all the short-term rental code infractions after the city started enforcing the law (i.e., after July 2015).

Controlling for enforcement, we obtained results similar to our main analyses for the interaction between spanner proportion and regulated market (Table A9, Model 2).

***Change in quality of spanner hosts.*** The decrease in consumers' appreciation for spanners may be driven by the fact that after the regulatory changes, some hosts left Airbnb (Koster et al., 2021), reducing the average "objective" quality specifically of those remaining spanners. To investigate this alternative explanation, we look at the change in the number of reviews of spanners as a proxy for the number of bookings<sup>6</sup>. It is plausible that a decrease in the number of reviews for spanner listings after the regulatory change indicates an objective reduction in spanners' quality that consumers can observe before the booking, causing a decrease in demand and, thus, a lower number of bookings for these properties. Our analyses show a significant increase in the number of reviews of spanners after the new regulation is introduced (Model 2 in Table A6 in the Appendix).

***Different estimation methods.*** For the main results of this paper, we use the Arellano-Bond estimator (Arellano & Bond, 1991), which provides consistent results for dynamic panel models, i.e., models where one or more lags of the dependent variable are included among the predictors. This estimator is compatible with large samples of short time series, but it might suffer from instrument proliferation bias as the time series becomes more extended (Roodman, 2009). Indeed, the Sargan test shows evidence of model overidentification (for Model 7 in Table 4, the Sargan overidentification test result is 10,327.69,  $p < .001$ ). To check the robustness of the main results to the estimation method, we re-estimate the main models using the Within estimator with fixed effects at the zip code and month level (Table A8). In the presence of long time series, the results of the within estimator and the Arellano-Bond estimator are expected to converge

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<sup>6</sup> See Fradkin et al. (2021) for empirical evidence of the correlation between the number of reviews and the number of bookings of an Airbnb listing.

(Roodman, 2009; Verbeek, 2008), which is what we observe. Thus, the results remain consistent with alternative estimators and support the study's conclusions.

*Different operationalizations of independent variables.* We then address potential concerns regarding the results' sensitivity to the operationalization of our explanatory factors. First, we code spanners at different thresholds of the number of listings per host, i.e., 80<sup>th</sup> and 93<sup>rd</sup> percentiles. The results show that the effects of spanner proportion, regulated market, and consumer attention on real estate prices increase magnitude and significance as we increase the threshold for coding spanning actors (Table 5).

===== INSERT TABLE 5 ABOUT HERE =====

Second, we want to explore our findings' sensitivity to the public's announcement about the new regulation versus its enforcement. To this purpose, we operationalized the regulated market using data about the first news about the regulatory change in the three cities in our sample where the regulation changed and with data about the enforcement of the new regulation. The first news about the law significantly and negatively moderates spanners' effect on real estate prices ( $\beta = -0.013$ ,  $p < 0.010$ , Model 1 in Table A7 in the Appendix). Furthermore, the impact of law enforcement is also negative and significant but weaker ( $\beta = -0.005$ ,  $p < 0.010$ , Model 2 in Table A7 in the Appendix). Therefore, it appears that the first news about the new regulation has a more substantial effect than the enforcement of the new regulation in moderating the impact of spanners on real estate prices.

## **DISCUSSION OF EXPLANATIONS**

We first summarize our key findings to orient the discussion of our discovery and the mechanisms at play. This study offers an exploratory description of a phenomenon with “indisputably important and impactful” practical consequences (Bamberger & Ang, 2016, p. 1) and an examination of “the total costs and benefits of platform businesses to users and society”

(Cusumano, 2022: 12). By doing so, it enriches our understanding of the effect of digital technologies, which allow the organization of economic activities in new ways like the SE, on firms and industry dynamics (Ameri et al., 2017; Barley, 2015; Uzunca et al., 2018).

Specifically, this study investigates the controversial impact of Airbnb on real estate prices while accounting for the differing effects of single-listing hosts and firms spanning the long-term rental industry on consumers and regulators. Our findings show that the impact of spanners on real estate prices diminishes with the increase in consumer awareness of the atypicality of the spanner hosts. Another important finding of this study is that regulations describing the spanner host as atypical decrease spanners' effect on real estate prices. These findings about the consequentiality of Spanner hosts –especially considering the introduction of new regulations and changing consumers' awareness –are interesting, given that Spanner hosts represent a minority of hosts on the platform and do not represent the typical host described and promoted by Airbnb. Given these findings, we next discuss our study's possible theoretical, managerial, and policy implications.

## **Implications for research on platforms**

### *Expanding demand-side explanations*

Our discovery calls for a more nuanced and broader understanding of the dynamics and actors involved in increasing real estate prices upon the advent of Airbnb. Prior research on platforms explained the increase in real estate prices attributable to Airbnb and other SE marketplaces, such as VRBO, with a demand-supply story. Essentially, studies adopting a supply-side view found that Airbnb contributed to increasing the price of real estate properties because it allegedly created the opportunity to move multiple real estate properties from other commercial uses into the SE, thus increasing their financial value for their owners (Barron et al., 2021; Chen et al., 2022; Li et al., 2022). Those studies adopting a demand-side view linked the

increase in real estate prices to a higher demand from consumers for Airbnb's properties, which in turn would also increase their financial value for their owners (Filippas, Horton, & Zeckhauser, 2020; Quattrone, Proserpio, Quercia, Capra, & Musolesi, 2016; Valentin, 2021). Although the supply-side view accounts for different types of hosts, neither the supply- nor the demand-side view has yet accounted for how the relevant audience might perceive different kinds of hosts. However, the categories literature has already acknowledged its importance (Cattani, Porac, & Thomas, 2017; Negro & Leung, 2013; Zuckerman, 1999).

Starting from the observation that multiple audiences are pressuring local and national authorities to regulate the operations of SE platforms, such as Airbnb (Edelman & Geradin, 2015; Gottlieb, 2013), we note an apparent tension. On the one hand, enforcing regulations might reduce the supply on SE platforms. On the other hand, the steady consumer demand for SE products might counter these efforts. Thus, to understand why the possibility of short-term rentals on Airbnb may shape the sale price of real estate properties and the mechanisms behind this effect, we examine the hosts that operate on Airbnb and the intervening impact of consumers and regulations.

Our observations do not merely suggest that a change in demand or supply matters but that a shift in demand or supply likely matters differently for different types of hosts depending on and because of consumers' perceptions and the regulators' characterization of the hosts operating on the platform. We found that even controlling for the possible effect of a change in demand or supply, Airbnb's effect on real estate prices is moderated by consumers' perceptions and the regulators' categorization of the hosts operating on the platform. In performing our analyses, in line with prior studies, we accounted –and empirically controlled –for the possibility that spanners are perceived as atypical. Thus, the sentiment of their reviews worsens (Alexy & George, 2013; Hsu, 2006; Hsu et al., 2009), and the demand for their properties also declines

(Kennedy et al., 2010). In cities where the regulatory change took place, which has allowed for a crisper definition of the emerging category boundaries (Vergne & Wry, 2014), the demand for these properties also declined. Even accounting for these possibilities, we still found that consumers and regulators moderate the effect of Airbnb on real estate sale prices.

### *Offering new insights on audiences and platforms*

The observation that the ongoing increase in real estate prices is partially attributable to participation in the SE by firms shifting properties from the long-term rental market to Airbnb is more complex than reported by early studies on supply-side explanation (Barron et al., 2021; Chen et al., 2022; H. Koster et al., 2021). We build on the consideration that multiple audiences have reacted to the insurgence of Airbnb and other SE platforms by pressuring local and national authorities to regulate their operations (Edelman & Geradin, 2015; Gottlieb, 2013), allegedly reducing the supply of SE platforms. However, we uncover that as the steady consumer demand for SE products might counter these efforts, the effect of regulations and consumers' perceptions shape this effect in an intertwined manner.

Within the broader conversation about the sharing economy and its consequences, this study directs attention to how two types of audiences –consumers and regulators –can shape the effect of Airbnb's spanner hosts on real estate prices. Prior research on platforms has extensively examined the behavior of various actors such as complementors and suppliers (e.g., Cennamo & Santalo, 2013; Rietveld & Eggers, 2018; Rietveld & Schilling, 2020). However, our study focuses on a different type of actor, namely audiences. We present a novel discovery that the categorization of audiences has an impact on the performance of hosts (Negro & Leung 2013, Zuckerman 1999). Specifically, we disentangled the effect of consumers and regulators and found that regulation can help consumers discriminate among types of hosts.

This discovery thus calls for more research on how other types of rules, such as certifications (Elfenbein, Fisman, & McManus, 2015; Hukal, Henfridsson, Shaikh, & Parker, 2020; Parker, Gamble, Moroz, & Branzei, 2019; Rietveld, Seamans, & Meggiorin, 2021), may influence how consumers assess the value or quality of products that they purchase and thus may shape platform dynamics. Certifications might further narrow the set of attributes allowed to prototypical actors. Furthermore, we found that the effect of regulation is driven not by enforcement but rather by its announcement. Future research should separate the two stages of certifications (approval and implementation) and investigate their potentially different effects on transactions completed within the platform.

### **Implications for research on categories**

#### *Categories as pathways to legitimacy*

Our discovery suggests that how consumers and regulators categorize the hosts on Airbnb may have an interdependent effect on how Airbnb shapes real estate prices and thus calls for greater engagement of the research on platforms with the literature on categories. Specifically, this study makes two novel contributions to the literature on categories. First, we contribute to the literature on categories as a pathway to legitimacy (O’Kane et al., 2015; Ozcan & Gurses, 2018). We found that both the regulation of the SE and increased consumer attention to the differences between spanners and single-listing hosts reduce the positive impact of spanners on real estate prices and that the regulatory changes shaped consumer perceptions. Audiences generally differ in their categorization of the same industry (Pontikes, 2012; Tauscher & Rothe, 2021; Zhao, Fisher, Lounsbury, & Miller, 2017). However, our study suggests that audiences influence each other; regulators and consumers have intertwined effects. More research is needed to investigate the conditions under which heterogeneous audiences (beyond these two) develop a

homogeneous understanding of the same industry. Furthermore, different types of consumers (or other audiences) might respond differently to third-party pressures (e.g., certifiers or regulators).

Second, building on research on the effect of spanning on competition (Carnabuci et al., 2015; Montauti & Wezel, 2016; Zuckerman, 1999), we discover that this effect is not limited to the category where spanners enter (Montauti & Wezel, 2016), but also shapes prices in the larger competitive space. Hosts switching properties across the long-term rental market and the SE increase the competition for resources needed to operate in either category (i.e., houses). Hence, – we found – increase their prices. Contributing to the growing discussion about categories as competitive barriers (Cattani, Porac, & Thomas, 2017), our findings invite future research to expand its focus from the category entered by spanners to the system of categories in which spanners operate.

In sum, while the research on platforms and the research on categories have yet to interact, the findings of this study suggest that the inclusion of the scholarship on categories in work focused on platforms deserves greater attention. Part of the challenge is that these two scholarly traditions have different research objectives and that data about categorization processes and platforms and their ecosystems are difficult to obtain. To overcome these difficulties, we used automated textual analysis to understand the role of audiences' attention as a moderator of the effect of spanners on real estate prices and to ensure that the two types of hosts differ in the eyes of consumers. We then performed a sentiment analysis in consumers' reviews to explore whether, after a regulatory change that stresses the atypicality of spanners in the Airbnb platform, the effect of spanners on real estate prices decreases. Building on our empirical approach and beyond our focus on the categorization explicitly associated with consumers and regulation, future studies can use sentiment and textual analyses to tease out the mechanisms underlying platform dynamics.

### *The role of regulators as third parties*

This study highlights the importance of regulators beyond their enforcement ability. Doing so contributes to the long-term interest of management scholars on the role of regulators in shaping organizations (Edelman & Suchman, 1997; Gao & McDonald, 2022; Lucas, Grimes, & Gehman, 2022; Zhang, 2022). By documenting the influence exercised by regulators on audiences' perceptions, our study shows the culturalist approach at play. While the enforcement approach sees laws as influencing organizational behaviors by setting incentives and punishments, the culturalist approach focuses on the influence of legal symbols to induce desirable behaviors (Zhang, 2022). This study found that SE regulation reduced the positive impact of spanners on real estate prices by focusing consumers' attention on the differences between spanners and single-listing.

Future research should further disentangle the pathways through which regulators affect consumers' perceptions and prices in a market. A promising avenue for research is the growing literature on how categories change consumer attention and, consequently, the bargaining power of organizations competing in a market (Cattani et al., 2017; Cattani, Sands, Porac, & Greenberg, 2018). The study of how regulators affect organizations' value creation and capture appears particularly interesting in platform markets, where complementors contributing the most to the platform growth might be able to capture the most negligible value due to regulators' interventions. This hypothetical scenario can have important and hard-to-predict consequences for the viability of the overall ecosystem.

### **Limitations**

We note here two specific limitations of our study. First, this study examines the earlier years of the sharing economy. This choice allows us to focus our investigation on audiences' categorization of the SE and its consequences for real estate prices. However, more data will be

needed to study hosts' reactions to this categorization process and its implications. Similarly, more research will be necessary to tease out specific preferences, e.g., business travelers versus tourists, especially after Airbnb started diversifying into the hotel industry, e.g., by purchasing HotelTonight in 2019.

Second, we did not collect data on hosts' performance over time. Although the fact that reduced consumer appeal decreases host performance is well-established and largely replicated in the categories literature (Hsu et al., 2009; Negro & Leung, 2013, Zuckerman, 1999), we could not directly test the effect of audience categorization on hosts' performance for Airbnb. Moreover, our data suffers from a survival bias as we could collect data only on hosts who remained active on Airbnb until 2015 (the time of our data collection). While we do not expect that this will affect our conclusions, though it might affect the size effect of our results.

### **Normative implications**

From a normative perspective, this study offers important insights about institutional contexts, specifically regulations, and industry dynamics. In 2016, Airbnb received several criticisms about its distorting effect on housing prices. The Federal Trade Commission began investigating how Airbnb affected housing costs, and New York Governor Andrew Cuomo signed a bill charging Airbnb fines for violations of local housing laws.<sup>7</sup> The *New York Times* reported that these events were part of a “plan that the hotel association started in early 2016 to thwart Airbnb.” Airbnb denied “the so-called ‘Airbnb effect’ on local housing,” but in 2019 it pledged to invest \$25 million toward affordable housing and other community needs in the

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<sup>7</sup> <https://www.nytimes.com/2016/10/22/technology/new-york-passes-law-airbnb.html>, <https://www.nytimes.com/2017/04/16/technology/inside-the-hotel-industrys-plan-to-combat-airbnb.html>, <https://www.forbes.com/sites/garybarker/2020/02/21/the-airbnb-effect-on-housing-and-rent/>, <https://www.cnbc.com/2018/05/03/airbnb-raises-nyc-rents-comptroller.html>, and <https://www.latimes.com/business/story/2019-09-17/airbnb-pledges-25-million-to-support-affordable-housing-and-small-business>

United States. The findings of our study are aligned with these reactions and suggest that, in fact, Airbnb and possibly other major operators in other sharing economy industries do distort the competitive dynamics in industries proximate to the one they help create. Our findings also suggest that different hosts follow different competitive strategies that have heterogeneous implications for the competitive dynamics in the industry.

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## TABLES AND FIGURES

**Table 1: Comparison of Airbnb listings' features of spanners and single-listing hosts.**

	Spanners: 6 or more listings (N = 7,995)		Single-listing hosts: 1 listing only (N = 48,577)		Mean Difference
	Mean	SD	Mean	SD	
<b>Number of listings</b>	37.17	85.33	1.00	0.00	36.17***
<b>Score rating</b>	89.73	10.19	94.08	7.76	-4.34***
<b>Price (per listing)</b>	211.41	391.77	178.92	237.93	32.49***
<b>Response time</b>	1.65	0.73	2.02	0.89	-0.37***
<b>Response rate</b>	92.66	11.56	89.16	17.65	3.50***
<b>Acceptance rate</b>	85.89	16.51	86.17	24.05	-0.28
<b>Host is "super host"</b>	0.08	0.27	0.09	0.29	-0.00
<b>Cleaning fee</b>	87.57	75.29	63.76	46.78	23.80***
<b>Number of reviews</b>	15.84	27.30	12.52	24.61	3.32***
<b>Score accuracy</b>	9.14	1.07	9.60	0.76	-0.46***
<b>Score cleanliness</b>	9.03	1.17	9.30	1.06	-0.27***
<b>Score check-in</b>	9.39	0.95	9.76	0.63	-0.37***
<b>Score communication</b>	9.41	0.95	9.80	0.57	-0.40***
<b>Score location</b>	9.16	1.06	9.48	0.82	-0.31***
<b>Score value</b>	8.95	1.03	9.36	0.86	-0.41***
<b>Instant booking</b>	0.20	0.40	0.09	0.28	0.12***
<b>Cancellation policy</b>	2.57	0.78	1.94	0.84	0.63***
<b>Reviews per month</b>	1.78	1.71	1.66	1.61	0.12***

Note: \*p < 0.05; \*\*p < 0.01; \*\*\*p < 0.001

**Table 2: Correlation matrix**

	1	2	3	4	5	6	7	8	9	10	11	12	13
<b>1. Real estate prices at <math>t_1</math> (log)</b>	1												
<b>2. Spanner proportion</b>	-0.005	1											
<b>3. Regulated market</b>	-0.114***	-0.062***	1										
<b>4. Consumer attention</b>	-0.028***	0.029***	-0.116***	1									
<b>5. Real estate prices at <math>t_0</math> (log)</b>	1***	-0.004	-0.116**	-0.025***	1								
<b>6. No. of spanners</b>	0.245***	0.258***	0.066***	-0.100***	0.244***	1							
<b>7. No. of single-listing actors</b>	0.343***	-0.047***	0.125***	-0.137***	0.341***	0.710***	1						
<b>8. No. of not spanning actors</b>	0.346***	-0.036***	0.103***	-0.133***	0.344***	0.744***	0.992***	1					
<b>9. Change in no. new building permits</b>	-0.003	0.001	0.002	0.031***	-0.003	-0.003	-0.008	-0.007	1				
<b>10. Change in no. houses sold</b>	-0.007	-0.002	0.005	0.005	-0.003	0.003	-0.000	-0.000	0.048***	1			
<b>11. No. of reviews</b>	0.110***	0.033***	0.141***	-0.191***	0.107***	0.230***	0.241***	0.244***	-0.010	0.026**	1		
<b>12. Population (log)</b>	0.310***	0.049***	-0.309***	-0.060***	0.311***	0.018*	0.055***	0.062***	0.001	-0.000	0.021*	1	
<b>13. Income (log)</b>	0.389***	-0.038***	-0.130***	-0.100***	0.389***	0.074***	0.276***	0.269***	-0.001	-0.003	0.074***	0.470***	1

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

**Table 3: Descriptive statistics**

	<b>Mean</b>	<b>Standard deviation</b>	<b>Min</b>	<b>Max</b>
<b>1. Real estate prices at <math>t_1</math> (log)</b>	5.9246	0.694	4.221	7.948
<b>2. Spanner proportion</b>	0.175	0.245	0	1
<b>3. Regulated market</b>	0.080	0.271	0	1
<b>4. Consumer attention</b>	0.147	0.277	0	1
<b>5. Real estate prices at <math>t_0</math> (log)</b>	5.9196	0.693	4.234	7.941
<b>6. No. of spanners</b>	8.233	18.590	0	220
<b>7. No. of single-listing actors</b>	37.137	78.319	0	952
<b>8. No. of not spanning actors</b>	54.515	118.613	0	1264
<b>9. Change in no. new building permits</b>	18.516	1437.082	-18640	6993
<b>10. Change in no. houses sold</b>	0.202	10.613	-114	91
<b>11. No. of reviews</b>	1.877	1.779	0	18
<b>12. Population (log)</b>	14.560	0.923	13.260	15.952
<b>13. Income (log)</b>	11.024	0.408	10.600	11.987

**Table 4: Main models (a spanner manages 6 or more listings).**

All models use the Arellano-Bond estimator (1991). Models 1 to 3 and model 7 use the 10-city sample, models 4 to 6 use the three-city sample.

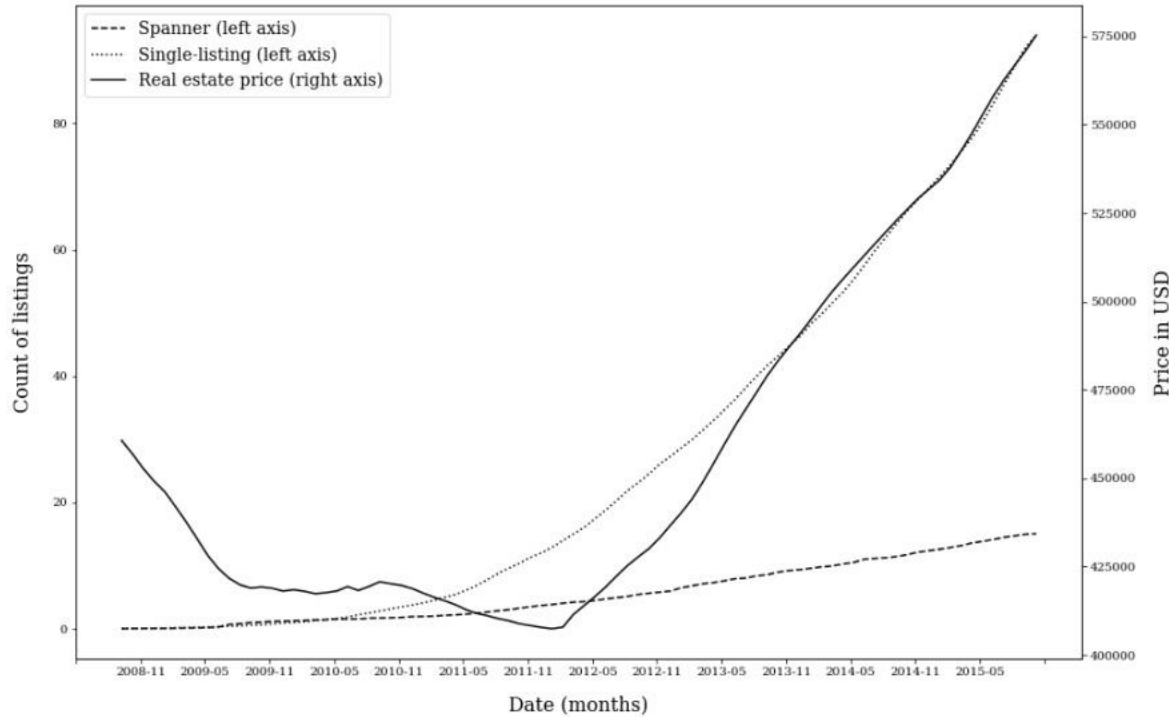
	10-city			3-city			10-city
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
<b>Spanner proportion</b>		0.002*** (0.001)	0.003*** (0.001)	0.003*** (0.001)	0.003*** (0.001)	0.003*** (0.001)	0.003*** (0.001)
<b>Consumer attention</b>			0.001 (0.001)			-0.012*** (0.001)	0.003*** (0.001)
<b>Spanners proportion * Consumer attention</b>			-0.001* (0.001)				-0.001* (0.001)
<b>Regulated market</b>					0.003*** (0.000)	0.003*** (0.000)	0.005*** (0.000)
<b>Spanners proportion * Regulated market</b>					-0.009*** (0.001)	-0.009*** (0.001)	-0.007*** (0.002)
<b>Log of real estate prices (t0)</b>	0.979*** (0.002)	0.978*** (0.002)	0.978*** (0.002)	0.972*** (0.003)	0.967*** (0.003)	0.967*** (0.003)	0.977*** (0.002)
<b>No. of not spanning actors</b>	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)
<b>Change in no. of new building permits</b>	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
<b>Change in no. of houses sold</b>	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)
<b>No. of reviews</b>	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000 (0.000)
<b>Population (ln)</b>	0.062*** (0.007)	0.058*** (0.007)	0.059*** (0.007)	-0.082*** (0.014)	-0.102*** (0.014)	-0.104*** (0.014)	0.007 (0.008)
<b>Income (ln)</b>	-0.045*** (0.007)	-0.044*** (0.007)	-0.044*** (0.007)	0.025** (0.010)	0.035*** (0.010)	0.035*** (0.010)	-0.020*** (0.007)
<b>Constant</b>	-0.287** (0.115)	-0.248** (0.115)	-0.253** (0.115)	0.987*** (0.154)	1.189*** (0.164)	1.205*** (0.164)	0.237* (0.127)
<b>Month &amp; Zip code FE</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Observations</b>	13,215	13,215	13,215	4,143	4,143	4,143	13,215
<b>Wald Chi<sup>2</sup> (,000)</b>	8,110***	8,120***	8,120***	3,390***	3,400***	3,400***	8,110***
<b>Number of zip codes</b>	259	259	259	73	73	73	259

Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 5: Robustness checks with alternative measures of spanner host.**

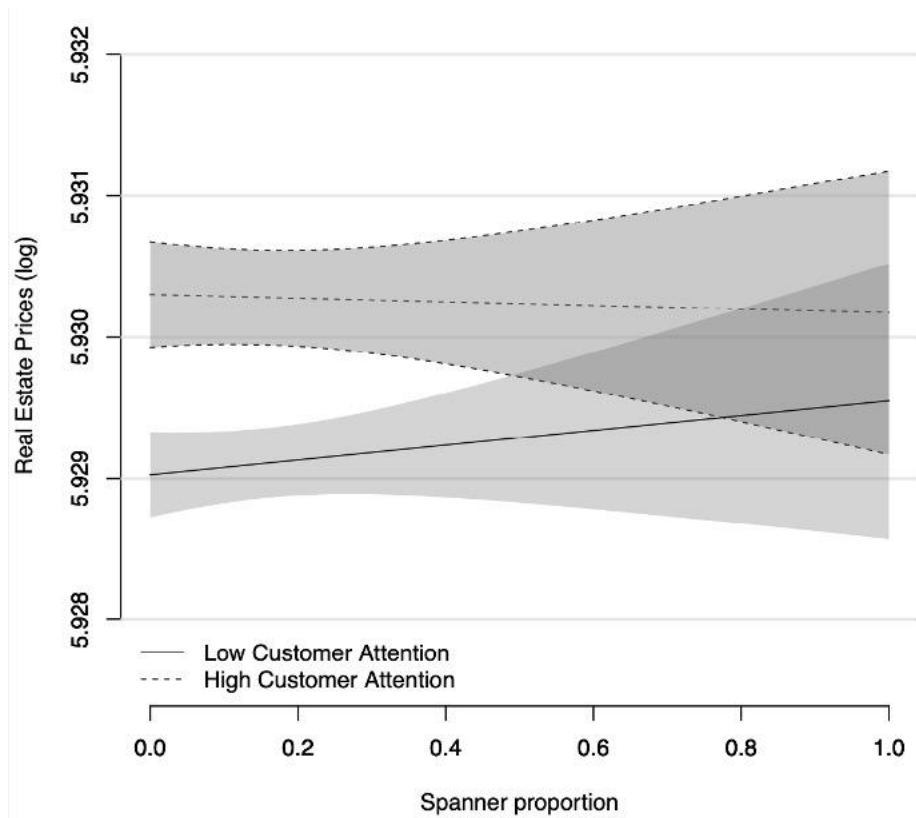
We check for the results' robustness to alternative measure of spanner. Specifically, we check the effect of spanner proportion (Models 1 and 2), of its interaction with Consumer attention (Models 3 and 4), and with Regulated market (Models 5 and 6) on the price of resources if the spanner manages 3 or more listings (i.e., 80<sup>th</sup> percentile, Models 1, 3, and 5), and 8 or more listings (i.e., 93<sup>rd</sup> percentile, Models 2, 4, and 6). All models use the Arellano-Bond estimator (1991). These results show that the more extreme the spanning behavior of the host (i.e., the more listings managed by a spanner), the stronger and more significant are each of the three effects investigated.

	10-city		3-city		10-city	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
<b>Spanner proportion</b>	0.000 (0.000)	0.004*** (0.001)	0.001** (0.001)	0.003*** (0.001)	0.001** (0.001)	0.002*** (0.001)
<b>Consumer attention</b>			-0.011*** (0.001)	-0.012*** (0.001)	0.001 (0.001)	0.003*** (0.001)
<b>Spanners proportion * Consumer attention</b>					-0.001* (0.001)	-0.002** (0.001)
<b>Regulated market</b>			0.003*** (0.000)	0.003*** (0.000)	0.005*** (0.001)	0.005*** (0.000)
<b>Spanners proportion * Regulated market</b>			-0.004*** (0.001)	-0.013*** (0.002)	-0.002 (0.002)	-0.007*** (0.003)
<b>Log of real estate prices (t0)</b>	0.934*** (0.002)	0.928*** (0.002)	0.949*** (0.003)	0.953*** (0.003)	0.985*** (0.002)	0.977*** (0.002)
<b>No. of not spanning actors</b>	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000 (0.000)	0.000*** (0.000)
<b>Change in no. of new building permits</b>	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
<b>Change in no. of houses sold</b>	0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
<b>No. of reviews</b>	-0.000 (0.000)	-0.000 (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000 (0.000)	0.000 (0.000)
<b>Population (ln)</b>	0.109*** (0.007)	0.112*** (0.007)	-0.113*** (0.014)	-0.086*** (0.014)	0.000 (0.009)	0.011 (0.009)
<b>Income (ln)</b>	0.031*** (0.006)	0.039*** (0.006)	0.031*** (0.010)	0.060*** (0.010)	-0.030*** (0.007)	-0.018** (0.007)
<b>Constant</b>	-1.539*** (0.125)	-1.625*** (0.116)	1.464*** (0.165)	0.784*** (0.172)	0.407*** (0.140)	0.160 (0.132)
<b>Month &amp; Zip code FE</b>	Yes	Yes	Yes	Yes	Yes	Yes
<b>Observations</b>	13,544	13,089	4,215	4,095	13,544	13,089
<b>Wald Chi<sup>2</sup> (.000)</b>	8,560***	8,490***	3,520***	3,420***	8,130***	8,090***
<b>Number of zip codes</b>	262	259	73	73	262	259



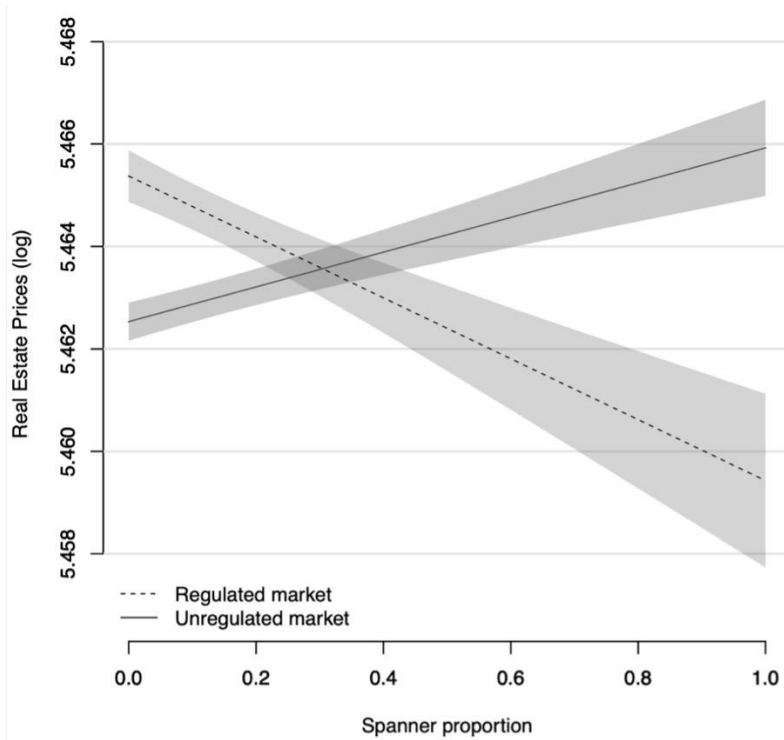
**Figure 1: Number of listings by type of host, i.e. spanners and single-listing hosts, and real estate prices.**

The left y-axis refers to the zip code average number of listings, by type of host managing them, present on the Airbnb platform each month in time. Spanners are defined as those hosts that manage an above average number of listings on the platform (i.e., six or more). Single-listing hosts are defined as those hosts that manage only one listing on the platform. The right y-axis refers to the average across zip codes of the median real estate price at each month.



**Figure 2: Predictive margins of the interaction effect of Spanner proportion and Consumer attention on the real estate prices (with 90% confidence interval).**

When the consumer attention is high (low), the model predicts a negative (positive) effect of Spanner proportion on Real estate prices. This graph plots results from the three-city sample model: Austin, Nashville, Portland (Model 3, Table 4).



**Figure 3: Predictive margins of the interaction effect of Spanner proportion and Regulated market on the real estate prices (90% confidence interval).**

When the market is regulated (unregulated), the model predicts a negative (positive) effect of Spanner proportion on Real estate prices. This graph plots results from the three-city sample model: Austin, Nashville, Portland (Model 5, Table 4).

**Authors' short bios:**

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