EFFECTS OF THE SUPPLY REDUCTION IN THE PEER-TO-PEER MARKET FOR TOURIST ACCOMMODATION ON THE HOUSING MARKET

EFECTOS DE LA REDUCCIÓN DE LA OFERTA EN EL MERCADO PEER-TO-PEER DE ALOJAMIENTOS TURÍSTICOS EN EL MERCADO INMOBILIARIO

Beatriz Benítez-Aurioles (Universidad de Málaga)[1]

Abstract

The aim of this paper is to analyse the relationship between the supply of peer-to-peer accommodation and the housing market. Using data from Barcelona between 2018 and 2021 we take the variation in Airbnb density in neighbourhoods induced by the COVID-19 pandemic as a natural experiment and observe its effect on rents and housing prices. According to these estimates, using a feasible generalized least squares (FGLS) under a Differences-in-Differences (DiD) framework, the reaction of prices to an exogenous COVID-19 shock that reduces Airbnb density in 1% is of 7% for rents and of 39% for purchase prices, which is significant and in line with model predictions and current research.

Keywords: tourism, housing market, rents, Airbnb, Barcelona.
JEL Codes: L83, P25, R31

Resumen

El objeto de este trabajo es analizar la relación entre la oferta peer-to-peer de alojamientos y el mercado inmobiliario. Utilizando datos de Barcelona entre 2018 y 2021, tomamos la variación en la densidad de Airbnb en los barrios inducida por la pandemia de COVID-19 como un experimento natural y observamos su efecto en los alquileres y precios de la vivienda. Según estas estimaciones, utilizando el método de mínimos cuadrados generalizados factible (FGLS) dentro de un marco de diferencias en diferencias (DiD), la reacción de los precios a un choque exógeno de COVID-19 que reduce la densidad de Airbnb en un 1% es de un 7% para las rentas y del 39% para los precios de compra, de forma significativa y en línea con las predicciones del modelo y con los resultados de investigaciones existentes.

Palabras clave: turismo, mercado inmobiliario, alquiler, Airbnb, Barcelona.
Códigos JEL: L83, P25, R31

1. INTRODUCTION

After digital platforms fueled the growth of the short-term rental market for private homes, its impacts and possible regulation of the have been increasingly debated by the public and by

[1] Email: bbaurioles@gmail.com
ORCID: https://orcid.org/0000-0002-4224-9184

politicians. In particular, residents of urban areas complain about the pressure exerted by the massive influx of tourism (Smith et al., 2019). This led to the spread of terms such as *overtourism* or *tourismphobia* (Namberger et al., 2019; UNWTO, 2018), and to a negative perception of locals towards peer-to-peer accommodation (Ikeji & Nagai, 2020). This conjuncture challenges tourism development and city planning (Gurran et al., 2018). In this context, local governments often undertake political initiative and have been proposing a variety of legislative frameworks aimed at the desired objectives (Nieuwland & Van Melik, 2020).

Despite its positive effects such as its contribution to the creation of income and employment (Fang et al., 2016; Benítez-Aurioles, 2020), one of the main reasons for public intervention is related to the lack of long-term housing supply. The underlying theory is that, for as long as tourist rentals are more profitable than long-term contracts, housing supply will shift from long-term use to the short-term, tourist market (Hoffman & Heisler, 2020). As theory predicts, interaction of low supply and relatively high demand results in both higher rents and purchase prices, making housing less accessible for residents —especially in low-income groups (Gurran & Phibbs, 2017). Based on this, in the specific case of Barcelona, the City Council approved in 2017 a "special plan for tourist accommodation" (*Plan Especial Urbanístico de Alojamiento Turístico* or *PEUAT*) with the aim of guaranteeing the right to housing, stating categorically that "no type of tourist accommodation may replace a dwelling" (Ajuntament de Barcelona, 2021a). Basically, the *Plan* consists in the spatial division of the city into different areas. In the most touristically saturated areas—which are also the central neighbourhoods—the accommodation businesses that close down cannot be replaced, which should translate into less tourism. In intermediate areas, it lets the number of such businesses to be maintained; and in the least congested areas, the number of tourist accommodation is still allowed to increase. The *Plan* was updated in early 2021 and kept its original purpose: "to protect the neighbourhoods most affected by the saturation of tourism and allow for an orderly implementation of new tourist accommodation in the least congested neighbourhoods" (Ajuntament de Barcelona, 2021a).

On the other hand, the COVID-19 pandemic triggered a massive global tourism crisis (UNWTO, 2021) which has naturally taken a toll on the peer-to-peer market for tourist accommodation. In particular, there was a drop in demand following the restrictions imposed by governments on mobility to contain the pandemic, among other factors. However, in addition to that, the supply of tourist accommodation has also decreased dramatically, along with prices (Benítez-Aurioles, 2021a). In other words, the combination of a supply shock and a demand shock is responsible for an overall decline in both prices and volume in the peer-to-peer market for tourist accommodation. In this context, it is hypothesized that landlords looking for commercial gains, facing an increased perception of risk, will permanently leave the short-term market in favor of long-term rentals (Dolnicar & Zare, 2020).

How does an exogenous decline in short-term tourist accommodation impact long-term accommodation rents and prices? We answer this research question in the context of COVID-19 in Barcelona as a natural experiment. This study is structured as follows. First, we review the literature, paying particular attention to research that assesses the quantitative impact of the peer-to-peer tourist accommodation market on the residential housing market. Then, we advance the theoretical framework. Next, we move to the data and the methods used, including a descriptive analysis. Later, we present and discuss the results of the econometric estimations. We finish with conclusions.

2. LITERATURE REVIEW

The literature on peer-to-peer paid online accommodation is multifaceted and has reached a considerable size (Dann et al., 2019; Dolnicar, 2019; Guttentag, 2019; Hati et al.,

Benítez-Aurioles. B
Effects of the supply reduction in the peer-to-peer market for tourist accommodation on the housing market

SECCIÓN ESPECIAL

2021; Kuhzady et al., 2020; Ozdemir & Turker, 2019; Prayag & Ozanne, 2018; Sainaghi, 2020). However, beyond purely descriptive or speculative analyses (Gurran & Phibbs, 2017; Wachsmuth & Weisler, 2018), the contributions that provide quantitative estimates of the effects on the housing market are relatively recent. In this sense, the empirical evidence indicates a positive, albeit reduced, impact on both rents and house prices.

To begin with, Coles et al. (2017) showed, based on data from New York, that the short-term rental market does not appear to be as profitable as thought by many, and its profitability may actually have declined over time. While short-term rentals remained stable, they increased by 19 percent over the medium- and long-term, raising the number of nights needed to exceed the former's profitability with respect to the latter—from 194 in 2012 to 216 in 2016. These authors found a striking difference between neighbourhoods, such that the short-term to long-term rental price ratios were generally higher in low- and middle-income neighbourhoods and among homes outside of Manhattan.

Table 1 contains a collection of econometric studies that quantify the impact of Airbnb on the housing market. The work of Horn and Merante (2017) shows that Airbnb's activity in Boston has reduced the supply of housing for residents and made rents more expensive. Their conclusion is that an increase of one standard deviation in Airbnb listings is associated with a 0.4% increase in asking rents. Considering that the average annual rental growth in Boston has been 5%, it could be argued that the responsibility for the increase in the price of rents attributed to the expansion of the peer-to-peer market is relatively small. Similarly, the research developed by Barron et al. (2021) based on data from US municipalities concludes that a 1% increase in the number of tourist accommodations implies only a 0.018% increase in the price of rentals and a 0.026% increase in the sale and purchase price of homes. Findings vary depending on the methodology and spatial references used. For example, Sheppard and Udell (2016) for New York, Shen and Wilkoff (2022) for Austin, and Zou (2020) for Washington estimate larger impacts of Airbnb on home prices. Despite the differences found, the results are significant nonetheless and confirm a relatively weak influence of the peer-to-peer market for tourist accommodations on the housing market in the analysed cities in the United States.

A few research articles on the subject focusing on European cities have also been published. Ayouba et al. (2020), after analyzing data from 8 French cities, conclude that Airbnb listings have not systematically increased rents. According to their estimates, a one-point increase in Airbnb density (total number of Airbnb homes divided by the total number of homes) increased rents by 0.4 to 0.5% in Lyon, Montpellier, and Paris; meanwhile, the results in the other cities considered were not statistically significant. In the case of London, Benítez-Aurioles and Tussyadiah (2020) estimated that 100 new Airbnb listings in the borough produce an average increase of 0.021% in the average monthly rent and 0.031% in the price of homes. Other recent research has confirmed the positive but modest impact of housing supply via the Airbnb platform on London housing market prices (Todd et al., 2021; Shabrina et al., 2022). For Portugal, Franco and Santos (2021) estimate that a one percentage point increase in the Airbnb share of a civil parish leads to a 3.2% increase in house prices in Lisbon and Porto. However, Cunha and Lobão (2021) find substantially greater effects: increases in housing prices attributable to Airbnb activity were 27.4% and 16.1% in the metropolitan statistical areas of Lisbon and Porto, respectively.

Similarly, estimates of Airbnb's impact on the housing market have also been calculated outside the United States and Europe. Based on data from Taiwan, Chang (2020) finds that a one standard deviation increase in the number of Airbnb listings increases house rental prices by 0.38%. The results of Liang et al. (2022) determine that the arrival of Airbnb in Hong Kong would increase housing rent rates by about 3.6-4%. Ram and Tchetchik (2021) find that a 1%

TABLE 1. ECONOMETRIC STUDIES ON THE IMPACT OF AIRBNB ON THE HOUSING MARKET

Authors	Period	Spatial scope	Method (*)	Results
Ayouba et al. (2020)	2014-2015	8 cities in France	SHAC	The density of Airbnb rentals puts upward pressure on rents in Lyon, Montpellier, and Paris between 0.4 and 0.5%, while in the rest of the cities considered the results were not statistically significant.
Barron et al. (2021)	2011-2016	100 largest metropolitan areas in USA	OLS; 2SLS	A 1% increase in Airbnb listings leads to a 0.018% increase in rents and a 0.026% increase in house prices
Benítez-Aurioles & Tussyadiah (2020)	2016-2019	London	OLS with GMM	100 new Airbnb listings in the borough provoke an increase of 0.008%, 0.013%, 0.012%, 0.014%, 0.015% and 0.021% in the average monthly rents of rooms, studios, one-, two-, three-, and four or more-bedroom homes.
Chang (2020)	2013-2017	Taiwan	OLS with FE	A one-standard deviation increase in the number of Airbnb listings raises house rental prices by 0.38%
Cunha & Lobão (2021)	2011-2019	Lisboa and Porto	DiD	A 1% increase in short-term rental leads to a 14%-21.3% average increase in the housing prices
Etxezarreta-Etxarri et al. (2020)	2013-2018	San Sebastian	OLS with FE	A one standard deviation increase in Airbnb intensity is associated with an increase of 7.3% in rental prices
Franco & Santos (2021)	2010-2016	106 municipalities in Portugal	DiD	On average a 1 percentage point increase in a municipality Airbnb share results in a 3.7% increase in house prices
García-López et al (2020)	2009-2017	Barcelona	OLS with FE	For the average neighbourhood, Airbnb activity has increased rents by 1.9%, transaction prices by 4.6% and posted prices by 3.7%.
Horn & Merante (2017)	2015-2016	Boston	OLS with FE	A one standard deviation increase in Airbnb listings is associated with an increase in asking rents of 0.4%
Koster et al. (2021)	2014-2018	Los Angeles	DiD; RDD	Ordinances reduced listings by 50% and housing prices and rentals by 2%.
Liang et al. (2022)	2014-2019	Hong-Kong	DiD	The arrival of Airbnb would drive up housing rent rate around 3.6–4%;
Ram & Tchetchik (2021)	2015-2018	Tel Aviv	OLS with GMM	A 1% rise in the number of Airbnb listings is associated with 1.4% rise in rental prices of 4 and more rooms apartments, 0.22% in the rental prices of 3–4 rooms apartments, 1.17% in the rental prices of 2–3 rooms apartments and 0.77% in up to 2 rooms apartments

Authors	Period	Spatial scope	Method (*)	Results
Rodríguez-Pérez de Arenaza et al. (2019)	2018	Andalusian Coast	OLS	Sun-and-beach Airbnb listings explains 13.69% of the price of residential rental prices in the coastal area of Andalusia
Shabrina et al (2022)	2015-2017	London	OLS	A 100% increase in the density of possible Airbnb misuse can be associated with up to an 8% increase in unit rental price per-bedroom per-week
Shen & Wilkoff (2022)	2018-2020	Austin	DiD	Every 1% change in monthly Airbnb units conducts a 0.7% increase in monthly long-term rents
Sheppard & Udell (2016)	2003-2015	New York	OLS with FE	A doubling of Airbnb listings is associated with increases of 6% to 11% in house values
Sridhar (2021)	2020	125 Indian cities	OLS; 2SLS	An increase of up to 0.08% in the rent of two-bedroom apartments, 0.14% in the rents of three-bedroom apartments, and 0.39% in housing prices per square foot, for every 1-percentage-point increase in Airbnb density
Thackway et al. (2022)	2018-2020	Sydney	OLS; GWR	A 1% increase in Airbnb density is associated with approximately a 2% increase in property sales price
Todd et al. (2021)	2015-2018	London	OLS with FE and RE	A £14.78 per m² increase in house prices when there is a unit increase in the frequency of Airbnb listings
Trojanek et al (2021)	2020	Warsaw	QR	A 1% change in Airbnb listings leading to a 0.031% change in rents.
Zhou (2020)	2015-2017	Washington	OLS with FE	Airbnb alone could account for an increase in single-family property price by 0.66% to 2.24%

(*) DiD: difference-in-differences; FE: fixed effect; GMM: generalized method of moments; GWR: Geographically Weighted Regression; OLS: ordinary least squares; QR: quantile regression; RE: random effects; RDD: spatial regression-discontinuity design; SHAC: spatial heteroskedasticity and autocorrelation consistent; 2SLS: two-stage least squares;

Source: Elaborated by author

increase in the number of Airbnb listings in Tel Aviv is accompanied by a 1.4% increase in rents for apartments with four bedrooms or more, 0.22% in rents for three- or four-bedroom apartments, and 1.17% in rents of one- or two-bedroom apartments. Sridhar's (2021) results are somewhat different for a large group of cities in India, as they find that every 1% increase in Airbnb density leads to a 0.08% increase in the rent of two-bedroom apartments, 0.14% for three-bedroom apartments, and 0.39% for the price of houses per square foot. Finally, Thackway et al. (2022) indicate that a 1% increase in Airbnb density is associated with an increase in the sale price of real estate of around 2% in the case of Sydney.

The studies available for Spain estimate relatively larger impacts. Rodríguez-Pérez de Arenaza et al. (2019) calculate that Airbnb is responsible for 13.69% of the average price of

SECCIÓN ESPECIAL

Benítez-Aurioles. B
Effects of the supply reduction in the peer-to-peer market for tourist accommodation on the housing market

residential leases in Andalusian coastal municipalities; and García-López et al. (2020) estimate that the causal effect of Airbnb activity in Barcelona represented on average a 1.9% increase in rents and 4.6% and 3.7% in the sale and listed prices of homes, respectively. And Etxezarreta-Etxarri et al. (2020) finds that in San Sebastian, a one standard deviation increase in Airbnb intensity is associated with a 7.3% increase in rents.

On the effectiveness of administrative measures, Koster et al. (2021) evaluated the impact of the Airbnb ban in some Los Angeles counties by comparing closely spaced areas separated only by an administrative boundary. The authors found that the ban reduced Airbnb's activity by 50% and consequently lowered rents by 2%. This evidence supports the implementation of restrictions on the peer-to-peer market for tourist accommodation to improve housing access for residents. Our goal is to determine the extent to which this argument can be sustained in the case of Barcelona, where the implementation of the PEUAT in 2017 and the pandemic resulted in a significant contraction of the tourism market from early 2020. We take advantage of the fact that, despite the lockdown and travel bans affecting all areas of Barcelona, there have been variations in the intensity of the contagion.

However, among the mentioned studies, only three cover a portion of the period during which the pandemic was declared and/or explicitly refer to the impact of COVID-19 on the housing market. Shen and Wilkoff (2022) estimated that in Austin, the pandemic led to a 25% decrease in available listings, and those that remained in the market experienced a 22% income loss, accompanied by a 20% decline in occupancy. They also highlighted the positive relationship between Airbnb supply and long-term rentals, suggesting that a decrease in supply results in a 0.7% monthly decrease in long-term rentals for every 1% decrease in monthly Airbnb units.

Similarly, Thackway & Pettit (2021) directly link the decline in Airbnb activity to the decrease in rental prices. They provide two examples: in Sydney, a clear relationship was observed, with rental prices dropping by up to 7.1% in certain neighborhoods, while in Hobart City, the reduction in Airbnb supply during the COVID-19 lockdown caused a 6% decline in rents. Finally, Trojanek et al. (2021) demonstrate the contraction of the Airbnb market and its impact on long-term rentals in Warsaw between March and December 2020. They estimate that a 1% reduction in short-term rental supply leads to a 0.031% decrease in the price of long-term rentals.

Overall, the empirical evidence presented in Table 1 suggests that the functioning of short-term rentals interacts with long-term housing markets. In all of these studies, there seems to be a modest but positive and significant correlation between Airbnb and home prices. Most of the time, OLS regressions are used to analyze these relationships in a linear or log-linear manner, likely due to the limited availability of aggregate data. Whether it's an increase in Airbnb listing count, Airbnb density, or a one standard deviation increase, the observed effects on rents or house prices are generally less than 10%. There is limited information regarding the geographic variation of these effects, as there is no clear hierarchy between the magnitudes of the estimated effects in different regions such as Europe, North America, East/South Asia, or Australia. However, recent research suggests that the pandemic has highlighted the strength of the link between house prices and the prevalence of short-term rentals.

Our research contributes to the literature in three principal ways. First, while most Airbnb panel data studies cover periods when Airbnb is on the rise, thus using upward variation over time for their estimates, this one differs from them in that it uses downward variation stemming from the Coronavirus contagion and measures to put a halt to it. In this sense, it is interesting to see whether these estimates are also valid in "normal" when the movement in the market is happening in the opposite direction; in other words, to verify whether the effect is symmetric.

Our research contributes to the literature in three principal ways. First, while most Airbnb panel data studies cover periods when Airbnb is on the rise, thus using upward variation over time for their estimates, this one differs from them in that it uses downward variation stemming from the Coronavirus contagion and measures to put a halt to it. In this sense, it is interesting to see whether these estimates are also valid in "normal" when the movement in the market is happening in the opposite direction; in other words, to verify whether the effect is symmetric.

Secondly, this pandemic is precisely a negative exogenous health shock that does not stem from the presence of Airbnb in Barcelona (unlike, for example, the laws that emerged from the *PEUAT* as a response to residents' complaints about the growth of the short-term accommodation market). Therefore, we exploit it in a quasi-experimental way (DiD), which allows us to address the problem of endogeneity that is usually present in this type of work.

Secondly, this pandemic serves as a negative exogenous health shock unrelated to the presence of Airbnb in Barcelona, unlike the laws that emerged from the PEUAT in response to residents' concerns about the growth of the short-term accommodation market. Therefore, we exploit the pandemic as a quasi-experimental setting (DiD), allowing us to address the issue of endogeneity typically present in this type of study.

Third, we employ the Feasible Generalized Least Squares (FGLS) method for estimation, which we believe is less commonly used in Airbnb and short-term rental market studies. Despite its lower frequency of use, FGLS enables the correction of serial correlation when it is present in time series data, as demonstrated in Cunha and Lobão (2021).

3. THEORETICAL FRAMEWORK

The analysis of the literature reveals that estimates of the quantitative effect of the short-term rental market on the housing market vary depending on the temporal and spatial context. Various factors influence house prices and rents. However, the COVID-19 pandemic has added complexity to the analysis (Balemi et al., 2021). Estimations during the pandemic may be influenced by confounding factors. For instance, the spread of the Coronavirus has made small apartments, often located in high-density tourist areas, less popular, leading many people to seek larger apartments in other parts of the city. Unemployment may have also compelled individuals to leave their homes and return to live with friends and relatives, increasing housing supply and lowering rents.

On the other hand, understanding changes in the housing market requires considering the preferences and behavior of the residents themselves, in addition to the demand and supply of tourist accommodation. Tourists and residents often compete for the same resources. Therefore, even in cases of so-called overtourism, it is not solely caused by tourists if a particular area is attractive to both tourists and local residents. Similarly, conventional changes in prices and the availability of homes for rent or sale depend on fluctuations in supply and demand in the markets. These fluctuations are ultimately influenced by the decisions of both tourists and residents.

The following model of the housing market is based on Benitez-Aurioles and Tussyadiah (2020). The total housing supply is $H = S + L$, where S are the short-term rental homes (for tourists) and L represents the long-term ones (for residents). The short-term rental rate is $I - bS$, which depends on the international market (exogenous component I), and has a negative relationship with S, this time through a linear inverse demand function. A higher S also leads to relatively lower L, resulting in long-term accommodation being more expensive and potentially causing displacement of the resident population between neighborhoods.

The profit per unit of long-term housing is $I - bS - c - \varepsilon_i$, where c is a constant cost component (e.g. efficiency of STR trading platforms) and $\varepsilon_i \sim f$ varies by individual

(e.g. preferences). As long as $R < I - bS - c - \varepsilon_i$, it is preferable for owner i to rent short-term. The proportion of owners who choose to rent short-term will be $Pr.(\varepsilon_i < I - bS - c - R) = f(I - bS - c - R)$. Each seller is small enough to consider S as fixed and not to consider its own impact on the market. However, overall, we have that $f(I - bS - c - R)H = S$. Given that H is fixed, S will be in equilibrium and stabilized at a certain level.

$$f\left(I-bS-c-R\right)-S\frac{\partial f\left(I-bS-c-R\right)}{\partial S}=0$$

$$S=\frac{f\left(I-bS-c-R\right)}{\dfrac{\partial f\left(I-bS-c-R\right)}{\partial S}}$$

The numerator decreases with c, and the denominator also decreases with c but not to a greater extent (because the derivative of the cumulative distribution is the probability distribution function). Under the assumption that we could isolate it from the effect of R, we have the following equilibrium condition:

$$S^* \equiv S\left(c^-\right)$$

In other words, the supply of short-term rentals is negatively correlated with the cost of supplying short-term rentals (e.g., through online advertising platforms) compared to long-term ones. The long-term rental rate, denoted by r, is a decreasing function of its argument, which represents the number of houses in the long-term market:

$$R=r\left(\left[1-f\left(I-bS\left(c\right)-c-R\right)\right]H\right)$$

Therefore, a home is worth its value in terms of potential short-term or long-term rental profits:

$$P=\Sigma_{t=0}^{\infty}\delta^t\left(R+\mathbb{E}\left[I-bS\left(c\right)-c-R-\varepsilon\mid\varepsilon<I-bS\left(c\right)-c-R\right]f\left(I-bS\left(c\right)-c-R\right)\right)$$

We can deduce the derivative of R with respect to c and Q,

$$\frac{\partial R}{\partial c}=\frac{r'Hf'\left(I-bS\left(c\right)-c-R\right)}{1-r'Hf'\left(I-bS\left(c\right)-c-R\right)}\in\left(-1,0\right)$$

$$\frac{\partial R}{\partial I}=-\frac{r'Hf'\left(I-bS\left(c\right)-c-R\right)}{1-r'Hf'\left(I-bS\left(c\right)-c-R\right)}\in\left(0,1\right)$$

and that for P instead of R they are,

$$\frac{\partial P}{\partial c}=\frac{1}{1-\delta}\left[\frac{\partial R}{\partial c}-\left(1+\frac{\partial R}{\partial c}\right)\frac{\partial g}{\partial c}\right]$$

$$\frac{\partial P}{\partial I}=-\frac{1}{1-\delta}\left[\frac{\partial R}{\partial I}-\left(1+\frac{\partial R}{\partial I}\right)\frac{\partial g}{\partial I}\right]$$

where

$$g \equiv \mathbb{E}\left[I - bS(c) - c - R - \varepsilon \mid \varepsilon < I - bS(c) - c - R \right] f\left(I - bS(c) - R \right)$$

Contrary to the model proposed by Benitez-Aurioles and Tussyadiah (2022), the effects of an increase in I or a decrease in c become more ambiguous when considering the short-term rental rate as exogenous. This ambiguity arises due to the moderating factor of the increased size of the short-term market. Consequently, it is necessary to empirically analyse the relationship between short-term rental penetration and housing rental and purchase prices to clarify the direction of this impact.

4. DATA

One of the persistent challenges in analysing the peer-to-peer market for tourist accommodation is the limited availability of statistical information, as platforms facilitating these exchanges often hesitate to provide the necessary data. In such situations, researchers have employed various methods to gather insights, including interviews with involved parties (Deale & Crawford, 2018), surveys (Tussyadiah & Pesonen, 2016), analysis of customer and host feedback (Quattrone et al., 2018), and experiments (Fradkin et al., 2021). Additionally, scraping techniques have been utilized to collect information from online listings offered by platforms like Airbnb (Jiao & Bai, 2020). Concurrently, commercial initiatives (AirDNA, 2022) and non-commercial initiatives (InsideAirbnb, 2022) have emerged to facilitate researchers' work, although concerns have been raised regarding the nature of their data (Agarwal et al., 2021; Alsudais, 2021). For our study, we utilize the data provided by AirDNA on active listings in each neighborhood of Barcelona. To ensure accuracy and exclude properties that appear in web searches but are unavailable for rental, AirDNA defines active rentals as those that have had at least one booking or at least one day available to book during the relevant period. This methodology enables us to obtain a reliable approximation of the supply in the peer-to-peer market for tourist accommodation.

It should be noted that AirDNA not only provides data from Airbnb but also from the VRBO platform. Indeed, in addition to Airbnb, there are other platforms that facilitate transactions in the peer-to-peer short-term rental market, such as Homeaway (with its various brands—VRBO, Vacationrentals.com, Travelmob, Stayz, etc.), Flipkey, Couchsurfing, Homestay, and Booking.com (Wyman et al., 2020). However, the data shows that Airbnb has established itself as the undisputed leader among platforms dedicated to short-term private home trading (Hajibaba & Dolnicar, 2018). In 2017, it already had more listings worldwide than the top five hotel brands combined (Hartmans, 2017). By 2021, it had reached over 7 million listings in 100,000 cities in virtually every country in the world (Deane, 2021). Projections suggest that it will continue to grow in the coming years (Gassmann et al., 2021). Airbnb's leadership in the case of Barcelona is demonstrated by the fact that, according to AirDNA (2022), 78% of rentals were advertised on Airbnb, 6% on VRBO, and 16% on both platforms. Based on this high market share, we will refer to Airbnb as the main representative of the platforms operating in the peer-to-peer market for tourist accommodation.

For the distribution of the incidence in the neighborhoods during the pandemic, we used data sourced from the COVID-19 register of the Health Department of the Generalitat de Catalunya (Agència de Salut Pública de Barcelona, 2022). We extracted the information on a quarterly basis, starting from when cases began to be registered in Barcelona in February until 2021.

As shown in Figure 1, the number of Airbnb listings per household declined at the aggregate level over the reporting period, most notably from 2020, coinciding with the onset of

FIGURE 1. EVOLUTION OF AIRBNB DENSITY IN THE CITY OF BARCELONA. *D* = 1000 * (*LISTINGS/HOMES*)
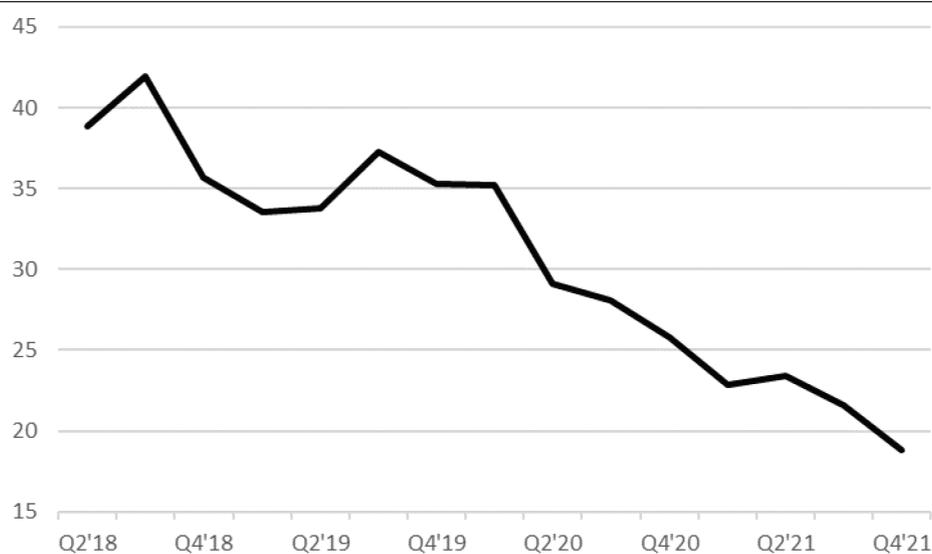
Source: Compiled from AirDNA (2022) and Ajuntament de Barcelona (2021b)

the COVID-19 pandemic. In the third quarter of 2018, which corresponds to the high summer season, there were 41.8 listings per one thousand homes in Barcelona. Two years later, that figure had dropped to 28.6, and in the second quarter of 2021, it reached 23.4.

However, there is evidence of an uneven spatial distribution of the supply in the peer-to-peer market for tourist accommodation, as it tends to be concentrated in urban centres and tourist sites (Benítez-Aurioles, 2018; Gutiérrez et al., 2017). In this sense, when comparing the situation at the beginning and end of the analysed period, as shown in Figure 2, it can be observed that although the highest density of Airbnb is still maintained in the most central parts of the city, the number of neighborhoods with a particularly high share of listings per household has decreased. Thus, while in the second half of 2018 there were 15 neighborhoods where the number of listings per 1,000 homes exceeded 50, in 2021 there were only 6.

All neighborhoods have experienced a decrease in Airbnb density. However, despite the decline being more pronounced in neighborhoods that initially had higher levels, as mentioned earlier, they still remain among the highest. In fact, at the end of the period, the data continues to indicate a high concentration in the central and tourist neighborhoods of the city. One could argue that the spatial dispersion of accommodation supply in the peer-to-peer market has barely changed. This is evident from the Gini index, which measures the inequality of the number of accommodations per neighborhood, showing minimal change from 0.65 in 2018. Q2 to 0.69 in 2021.Q4.

In summary, while the unequal distribution of accommodation supply in the peer-to-peer market for tourist accommodation persists, it is evident that the pressure exerted by Airbnb on the city of Barcelona has decreased in recent years. Based on this, our objective is to determine the extent to which this decline has affected the housing market. To achieve this, in addition to considering Airbnb density by neighborhood, we utilize data on rental prices and the sales price of homes, obtained from the Barcelona city council (Ajuntament de Barcelona, 2021b). Specifically, we will examine the monthly rent and sale prices per surface area (€/m²) of registered home sales.

FIGURE 2. RELATIONSHIP BETWEEN THE RENTAL PRICE (€/M²) AND PURCHASE PRICE (€/M²) OF HOMES IN 2018.Q1 (HORIZONTAL AXIS) AND ITS PERCENTAGE GROWTH BETWEEN 2018.Q1 AND 2021.Q4
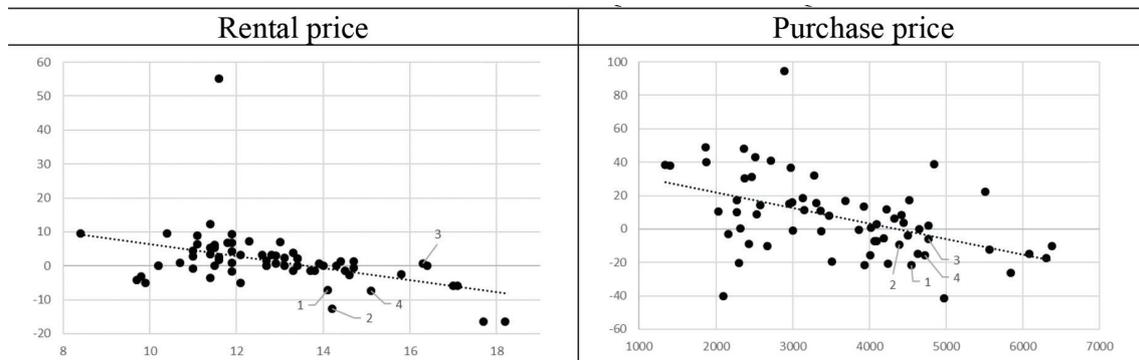
Neighborhoods of the Ciutat Vella district: 1. Raval; 2. Barri Gotic; 3. Barceloneta; 4. Sant Pere, Santa Caterina i la Ribera

Source: Compiled from Ajuntament de Barcelona (2021b)

5. METHODOLOGY

To conduct an econometric evaluation of the relationship between the relative importance of supply in the peer-to-peer tourist accommodation market and the rental and sale prices of homes, we utilize seven additional variables as controls. These variables include the percentage of individuals with a university or higher education diploma, the proportion of the population aged 65 or over, the share of homes smaller than 61 m², the percentage of surface area designated for Tourism and Hospitality (m²), the percentage of foreign-born population, the ratio of long-term unemployment to total unemployment, the proportion of homes built before 1960, and the average number of people per household. These control variables not only vary across different neighborhoods but also exhibit fluctuations over different time periods, which, in our dataset, correspond to quarters within each neighborhood. This variability aligns with the presence of fixed neighborhood effects throughout the entire period from 2018.Q2 to 2021.Q1.

Some of these variables are related to economic development. One variable pertains to unemployment. Gan et al. (2018) discovered that regions with higher unemployment tend to exhibit lower housing demand, partially due to tightened credit conditions and precarious employment. This relationship is particularly pronounced in the Spanish context (Álvarez-Román & García-Posada, 2021). Specifically, considering the significance of long-term unemployment in Spain (Bentolila et al., 2017), we include the proportion of long-term unemployed individuals (more than 12 months) in relation to the total registered unemployed as an explanatory variable. We anticipate a negative correlation between this variable and both purchase and rental prices. Lastly, extensive literature exists on the returns on investment in education, particularly in higher education (Psacharopoulos & Patrinos, 2018). We anticipate that the proportion of individuals holding a tertiary education diploma will have a positive impact on prices. In developed countries, this serves as an indicator of economic development and a higher standard of living for the population.

Other variables in this study measure demographic factors, including the percentages of individuals aged 65 or older and the foreign-born population. Our prediction is that we expect older neighborhoods to be less dynamic, thus having lower prices. It is worth noting that

relatively few studies have analysed the impact of immigration on the housing market (Nguyen et al., 2021). Among these studies, there are more estimates on the impact of immigration on house prices than on rents. Some studies have concluded that immigration contributes to an increase in house prices (Moallemi & Melser, 2020). However, others argue that immigration has led to a decline in house prices due to increased pressure on public goods and services, resulting in locals moving to other areas and reducing the demand for housing (and therefore prices). Consequently, studies examining the influence of immigration on house prices and rents have produced conflicting results (Saiz & Wachter, 2011; Mussa et al., 2017). However, in the specific case of the foreign population, there are indicators suggesting a positive impact on the expansion of the peer-to-peer tourist accommodation market (Benítez-Aurioles, 2018; Domínguez-Mujica et al., 2021). Therefore, one would expect that a higher proportion of foreign population in the total would correspond to higher house prices and rents. The inclusion of the average number of cohabitants per household follows. On one hand, this variable can be seen as a demographic factor influenced by family size or lifestyle. On the other hand, it serves as a sign of relatively higher demand compared to supply in an area.

We have included other variables directly related to the quality of homes. The first one is the share of homes built before 1960. We propose a negative relationship with prices since we expect old homes to lack modern amenities and have a worse insulation system. The next one is the percentage of homes up to 61 square meters. Because bigger dimensions are valued, a smaller home should be less expensive, all else equal. Finally, we add the percentage of surface area devoted to tourism and hospitality. Although this variable is most directly related to the presence of the tourism industry, which is partly the object of our study, we can also imagine that it affects housing prices. Higher values of this variable indicate neighborhoods with more attractions and visitors, both of which contribute to a more expensive area.

The specific definitions of the variables used and their basic descriptive statistics are presented in Tables 2 and 3, respectively. Barcelona has 73 neighborhoods; however, Airbnb density was not available for a few of them (specifically, la Marina del Prat Vermell, la Clota, Can Peguera, Torre Baró, Vallbona, Baró de Viver). The data for rents and purchase prices is also missing for most of the period in these neighborhoods, so we excluded them from our analysis. There are also some isolated gaps in a few other neighborhoods, but they do not impede the analysis.

TABLE 2. DEFINITION OF VARIABLES

Rental price	Average monthly rent per square meter (€/ m² per month)
House price	Purchase price of registered properties (€/m²)
AirDen	Active Airbnb Listings per 100 households
TertEd	Percentage of the population with higher education than the population aged 16 and over (0-100)
Aging	Population 65 years and over to total population (0-100)
SmallHouse	Homes smaller than 61 m² to total number of homes (0-100)
PercTour	Percentage of surface area designated to Tourism and Hospitality (m²)
Foreig	Percentage of foreigners to total population (0-100)
LtUnem	Percentage of long-term unemployed (more than 12 months) to total unemployed (0-100)
OldHous	Homes built before 1960 to total number of homes (0-100)
PersHome	Population / number of homes

Benítez-Aurioles. B
Effects of the supply reduction in the peer-to-peer market for tourist accommodation on the housing market

SECCIÓN ESPECIAL

TABLE 3. DESCRIPTION OF VARIABLES

Name	Unit	Obs.	Mean	S.D.	Min.	Max.
Rental price	Euros/m²	1,004	13.13	1.8	8.1	20.9
House price	Euros/m²	996	3,745.5	1,185.6	740.7	10,961.2
AirDen	Airbnb per 100 homes	1,001	2.59	3.8	0.06	30.69
TertEd	0-100	1,005	31.04	13.0	7.1	54.67
Aging	0-100	1,005	21.21	3.0	9.7	29.66
SmallHouse	0-100	1,005	31.51	14.7	1.5	76.96
PercTour	0-100	1,005	7.03	6.62	0	27.5
Foreig	0-100	1,005	20.26	9.41	4.7	63.86
LtUnem	0-100	1,005	42.52	8.85	29.2	60.11
OldHous	0-100	1,005	30.90	20.81	0.07	88.5
PersHome	Person per home	1,005	2.54	0.20	2.2	3.48

Inspired by the differences-in-differences method estimated with feasible generalized least squares by Cunha and Lobão (2021), we estimate the following two regression equations:

$$
\begin{aligned}
\ln Price_{it} = {} & \beta_1 Treat_{it} * \ln AirDen_{it} + \beta_2 * Treat_i + \beta_3 \ln TravelLockdown_t + \lambda t \\
& + \rho \ln Price_{it-1} + \delta \overline{\ln Price_{d(i)t}} + \Sigma_{i=1}^{66} \gamma_i D_i + \theta_1 \ln TertEd_{it} \\
& + \theta_2 \ln Aging_{it} + \theta_3 \ln SmallHouse_{it} + \theta_4 \ln PercTour_{it} + cons + u_{it}
\end{aligned}
\tag{1}
$$

$$
\begin{aligned}
\ln Price_{it} = {} & \beta_1 Treat_{it} * \ln AirDen_{it} + \beta_2 * Treat_i + \beta_3 \ln TravelLockdown_t + \lambda t \\
& + \rho \ln Price_{it-1} + \delta \overline{\ln Price_{d(i)t}} + \Sigma_{i=1}^{66} \gamma_i D_i + \theta_1 \ln TertEd_{it} \\
& + \theta_2 \ln SmallHouse_{it} + \theta_3 \ln PercTour_{it} + \theta_4 \ln Foreig_{it} \\
& + \theta_5 \ln LtUnem_{it} + \theta_6 \ln OldHouse_{it} + \theta_7 \ln PersHome_{it} + cons + u_{it}
\end{aligned}
\tag{2}
$$

where i represents the neighborhood and t denotes the period (t = 2018. Q2,2018. Q3,...,2021. Q4), the variable *Treat* takes on a value of 1 when a neighborhood exceeds 900 cases per 100,000 inhabitants cumulated over a quarter, indicating a moderate sanitary alert situation. To address endogeneity concerns, we utilize the interaction with "AirDen" to instrument for the exogenous variation in Airbnb density resulting from this external health shock. The baseline level is captured by the coefficient β_2, accounting for neighborhood characteristics prior to the COVID-19 pandemic. Additionally, a binary variable "Travel_Lockdown" is included, transitioning from value 0 to 1 after reaching t=2020.Q2, to account for the effects of the lockdown and international travel restrictions across Spain.

The parameter λ captures the underlying time trend that would have continued in the absence of this unpredictable event. To control for temporal correlation, the lagged dependent variable ($lnPrice_{-1}$) is included with a first-order autocorrelation coefficient ρ. Accounting for spatial correlation, the average of the dependent variable in each district, $\overline{lnPrice_{d(i)t}}$, is used, where $d(i)$ refers to the district to which neighborhood i belongs (e.g., El Raval to Ciutat Vella).

SECCIÓN ESPECIAL

Benítez-Aurioles. B
Effects of the supply reduction in the peer-to-peer market for tourist accommodation on the housing market

The products of dummies for each of the 66 neighborhoods (D_i) excluding the base level of i = 1, along with their associated fixed effect coefficient (γ_i). are represented by $\Sigma_{i=1}^{66}\gamma_i D_i$.

The coefficients $\theta_1 ... \theta_7$ represent the effects of a set of control variables that were tested for robustness, varying in length. In equation [1], only the variables that demonstrated robust significance were retained, while all variables were included in equation [2]. A regression intercept (constant) has been incorporated, and u_{it} represents the independent and identically distributed random error term. Despite a few missing observations, the panel data is strongly balanced overall. The inclusion of Barcelona-level volume of Google searches was tested, but it did not yield statistically significant results.

6. RESULTS AND DISCUSSION

The results of the estimation are shown in Table 4. The coefficient of interest (the average treatment effect, or β_1 in equations [1] and [2]) is significant for both rents and purchase prices as dependent variables and takes relatively similar values in the basic and extended model — differing by hundredths. For a 1% reduction in the density of Airbnb over one hundred homes (i.e., 1 Airbnb listing less), monthly rent per m^2 falls by 7%. Because Barcelona has an average Airbnb density of 2.59 per resident homes across all its neighbourhoods, this means Aibnb is responsible for raising rents by around 18%. This percentage is slightly higher than that found by Rodríguez-Pérez de Arenaza et al. (2019) for the municipalities of the Andalusian coast (13.69%).

For a one-percentage-point increase in the population with a tertiary education diploma, the average increase in local rents is around 50% in both the basic and extended models. This is very high, as it probably captures other latent factors of economic development. Another relevant variable is the percentage of houses below 61 m^2 that exist in the neighborhood, although it only appears significant in the extended regression for rent. The associated coefficient is very high, perhaps because of other unmeasured factors of average accommodation quality in the neighborhoods.

For the sale and purchase price, we obtain strong significance: for each 1 new property listed in Airbnb per 100 residential homes in a Barcelona neighborhood during the study period, the purchase price per m^2 of homes increases by almost 40% (39% in the basic regression and 39.9% in the extended). According to these estimates and within our confidence bounds, it is clearly above the impact that the negative shock of Airbnb density had on rents during the pandemic. This is in line with the model on which we base our theoretical framework and confirms previous results obtained by García-López et al. (2020) with data also covering Barcelona.

Although the coefficients are not included in the table, the joint significance of the fixed effects was prevalent in all regressions, so we decided to leave them. The rents seem to be in harmony with those of the surrounding neighborhoods in its district (significant coefficients of 0.104 and 0.113 in the basic and extended models, respectively), but that of houses seems, if anything, negatively correlated in the sense that houses across neighborhood borders face less competition than rentals do. The time trend appears nonsignificant, while the timing of the pandemic has indeed had a strong negative effect on both rents and purchase prices.

In summary, the analysis suggests that the reduction in pressure exerted by Airbnb's supply in Barcelona (measured as the percentage of active accommodations on the platform relative to the total number of households) has had an impact on the housing market. In other words, there is still a direct relationship between short-term rental supply and property prices, both for rentals and purchases. Within the usual statistical significance rules of thumb, a 1% decline in Airbnb density leads to a reduction of 7% per m^2 for rents and 39% for housing purchases.

TABLE 4. FGLS REGRESSION OF [1] AND [2]

	Rental prices [1]		Purchase prices [2]	
	Basic	**Extended**	**Basic**	**Extended**
Treat * ln(*AirDen*)	0.0748**	0.0716**	0.390***	0.399***
	(2.95)	(2.82)	(13.86)	(14.14)
Treat	−0.218***	−0.212**	−3.189***	−3.263***
	(−3.32)	(−3.23)	(−13.80)	(−14.11)
TravelLockdown	−0.00370	−0.00933	−0.0733*	−0.0303
	(−0.35)	(−1.61)	(−2.31)	(−1.78)
Time trend	−0.00122	−0.000384	−0.00297	−0.00276
	(−1.19)	(−0.40)	(−1.01)	(−0.98)
lag(ln *Price*)	0.0166	0.0287	−0.102***	−0.108***
	(0.51)	(0.89)	(−3.43)	(−3.66)
District avg.(ln *Price*)	0.104***	0.113***	−0.0740	−0.0832*
	(3.35)	(3.67)	(−1.82)	(−2.05)
ln(*TertEd*)	0.449***	0.516***	0.133	0.338
	(4.12)	(5.85)	(0.41)	(1.27)
ln(*Aging*)	0.07	−0.0682	−0.342	−0.0957
	(0.64)	(−0.80)	(−0.95)	(−0.35)
ln(*SmallHouse*)	−0.564	−1.065***	−5.773***	−3.746***
	(−1.11)	(−3.76)	(−3.66)	(−4.28)
ln(*PercTour*)	0.00954	0.0206	-0.0919	-0.11
	(0.44]	(0.97]	(-1.41]	(-1.73]
ln(*Foreig*)		0.0802		0.242
		(1.52)		(1.55)
ln(*LtUnem*)		−0.0691		0.283
		(−1.19)		(1.61)
ln(*OldHouse*)		−0.218		0.987
		(−1.13)		(1.66)
ln(*PersHome*)		0.11		−0.585
		(0.77)		(−1.33)
Constant	3.669*	4.954***	27.55***	23.94***
	(2.38)	(4.21)	(5.76)	(6.53)
N	936	936	931	931
Avg.obs.per group	13.9	13.9	13.5	13.5
Groups	67	67	67	67

Neighborhood fixed effects coefficients have been omitted. Cross-sectional time-series FGLS regression with heteroskedastic panels and common AR(1) coefficient for all panels. t-statistics in parentheses.
* p<0.05, ** p<0.01, *** p<0.001

However, it is important to be cautious about generalizing these results as similarity in biases introduced in accommodation-price regressions could confound the interpretation of the results.

Compared with the previous empirical evidence in Table 1, these results confirm two things. Firstly, the quantitative impact of Airbnb on the housing market is significantly determined by the spatial and/or temporal context. Secondly, the impact remains appreciable during the expansive and contractive cycles of Airbnb's supply, and therefore, should be part of the debate on housing prices and rents in cities.

When generalizing these effects to public policy, we need to be cautious as measures aimed at limiting the supply of short-term rental accommodation may not reduce the tourist demand pressure if they result in a more intensive use of accommodation in the market (Benítez-Aurioles, 2021b). Moreover, in destinations with high tourism demand, the peer-to-peer accommodation industry has demonstrated its ability to adapt to the regulations imposed by policy makers and maintain high levels of activity (von Briel & Dolnicar, 2021).

7. CONCLUSIONS

The growth of the peer-to-peer market for tourist accommodation has not only impacted the traditional tourism industry (Benítez-Aurioles, 2019) but also other markets, particularly the housing market. Empirical evidence has consistently shown that the expansion of Airbnb's supply has contributed to increasing housing rents and purchase prices. These impacts have generally been relatively modest, although the calculations are naturally influenced by the methodology, spatial references, and timeframe used. Most econometric estimates have been conducted during periods of increasing pressure from Airbnb on the market. Conversely, there is limited evidence regarding the consequences of Airbnb's presence when the supply of accommodations in the peer-to-peer market decreases. The case of Barcelona provides an excellent opportunity for analysing whether a decrease in the relative number of tourist short-term rentals has a similar effect on housing as previous studies have indicated.

Indeed, during the analyzed period (2018.Q2-2021.Q4), there has been a significant decrease in the pressure exerted by Airbnb on the housing market. Part of this decline can be attributed to the legislative actions taken by the city council in 2017 to restrict the supply. The recent reduction in Airbnb pressure has affected all neighborhoods but to varying degrees, and we aim to leverage this variation to derive meaningful insights regarding its impact on housing market prices. It is worth noting, however, that while the dispersion of peer-to-peer short-term accommodation across neighborhoods has remained relatively unchanged during the period, it has remained highly concentrated in the central and tourist areas of the city.

Regarding the recent price trends, the city center has witnessed the most significant decline both in terms of price evolution and the proportion of homes offered as short-term rentals. This observation suggests that the reduction in Airbnb's influence in certain areas has contributed to mitigating the housing shortage. The econometric estimates support this hypothesis.

In terms of rents, the findings indicate that in response to a negative external demand shock affecting short-term tourist rentals, a 1% decrease in Airbnb density per one hundred homes (equivalent to one fewer Airbnb listing) leads to a 7% decrease in monthly rent per square meter. Additionally, based on the methodology employed, each withdrawal of an Airbnb listing from the market per 100 homes corresponds to a 39% decrease in house prices. Furthermore, the percentage of smaller houses in a neighborhood appears to have a negative effect on average prices, while the percentage of residents with tertiary education (particularly for rents) has a positive impact on prices.

The evidence presented for Barcelona has important implications for tourism planning and development, as it highlights the connection between the peer-to-peer market for tourist accommodation and the housing market, particularly when there is a decline in the supply of such accommodations. However, it is necessary to make a few additional remarks. Firstly, it is evident that the impact of Airbnb alone does not entirely explain price dynamics in the housing market. While the relative size of the short-term rental supply in certain cities or neighborhoods can have a significant effect on housing prices, it cannot be conclusively determined as the sole causal factor for the entire economy. For instance, in the case of Spain, high unemployment rates and temporary employment, especially among young individuals, have contributed to increased demand for rental housing. Given the limited availability of short-term rentals, this factor largely explains the observed rent increases in some areas.

On the other hand, it is important to recognize that there are factors beyond the supply of short-term rental properties that influence the residential housing market. The peer-to-peer market for tourist accommodation also has other effects, which are often overlooked. While its negative consequences have been highlighted, it is essential to consider its positive impacts in the debate surrounding its regulation. Additionally, measures aimed at restricting the supply of short-term rentals may not effectively mitigate the perceived inconveniences caused by tourists to the resident population or the strain on certain public services.

We must acknowledge the limitation posed by the issue of endogeneity. Correlation does not imply causation, so a positive coefficient should not be solely interpreted as certain neighborhoods being more expensive and offering higher profits to property owners in both the long-term and short-term markets. While our use of a demand shock as a treatment helps address the issue of reverse causality (e.g., policies being enacted due to the high presence of peer-to-peer accommodation in an area initially), there is still a possibility that this shock also affects the resident population's demand for long-term housing, introducing a bias in the coefficients due to this confounding factor affecting both the dependent and independent variables simultaneously. As for potential spurious elements, fixed effects attempt to control for attributes related to public policies (such as the PEUAT, initiated before the period under analysis) that have a greater impact on certain neighborhoods. However, it is possible that changes occurring in the middle of the period, affecting both prices and Airbnb density, are not adequately captured.

Furthermore, while it would have been interesting to conduct a seasonal analysis of tourism accommodation prices in Barcelona to assess the impact of the summer months before and after the coronavirus, it would have required a longer time series of rental and house price data. Unfortunately, only recent data was available. Nevertheless, we do not exclude the possibility of exploring such impacts in future research if larger datasets become available.

Finally, among other potential avenues for future research, it would be valuable to replicate our study in other cities. Additionally, given that our research pertains to a unique period characterized by a historic contraction in both tourism demand and supply due to a pandemic that has affected the entire economy, more information will become available in the coming years to assess the extent of the recovery in the peer-to-peer market for tourist accommodation, the validity and effects of public regulations, and whether the estimated impact on the housing market has undergone any changes.

FINANCIACIÓN

REFERENCES

Agarwal, V., Koch, J. V., & McNab, R. M. (2021). Airbnb's Success: Does It Depend on Who Is Measuring?. *Cornell Hospitality Quarterly*, 19389655211029914. https://doi.org/10.1177/19389655211029914

Agència de Salut Pública de Barcelona (2022). Evolució de la infecció per coronavirus SARS-CoV-2 (COVID-19) a Barcelona. https://aspb.shinyapps.io/COVID19_BCN/

AirDNA (2022). Vacation Rental Data. https://www.airdna.co/

Ajuntament de Barcelona (2021a). About the PEUAT. Retrieved from http://ajuntament.barcelona.cat/pla-allotjaments-turistics/en/

Ajuntament de Barcelona (2021b). Open Data BCN. https://opendata-ajuntament.barcelona.cat/en

Alsudais, A. (2021). Incorrect data in the widely used Inside Airbnb dataset. *Decision Support Systems*, *141*, 113453. https://doi.org/10.1016/j.dss.2020.113453

Álvarez-Román, L., & García-Posada, M. (2021). Are house prices overvalued in Spain? A regional approach. *Economic Modelling*, *99*, 105499. https://doi.org/10.1016/j.econmod.2021.105499

Ayouba, K., Breuillé, M. L., Grivault, C., & Le Gallo, J. (2020). Does Airbnb disrupt the private rental market? An empirical analysis for French cities. *International Regional Science Review*, *43*(1-2), 76-104. https://doi.org/10.1177/0160017618821428

Balemi, N., Füss, R., & Weigand, A. (2021). COVID-19's impact on real estate markets: review and outlook. *Financial Markets and Portfolio Management*, *35*(4), 495-513. https://doi.org/10.1007/s11408-021-00384-6

Barron, K., Kung, E., & Proserpio, D. (2021). The effect of home-sharing on house prices and rents: Evidence from Airbnb. *Marketing Science*, *40*(1), 23-47. https://doi.org/10.1287/mksc.2020.1227

Benítez-Aurioles, B. (2018). The role of distance in the peer-to-peer market for tourist accommodation. *Tourism Economics*, *24*(3), 237-250. https://doi.org/10.1177/1354816617726211

Benítez-Aurioles, B. (2019). Is Airbnb bad for hotels?. *Current Issues in Tourism*, 1-4. https://doi.org/10.1080/13683500.2019.1646226

Benítez-Aurioles, B. (2020). Impacts of the peer-to-peer market on tourist accommodation on the Balearic Islands of Mallorca and Menorca. *Island Studies Journal*, *15*(2), 353-370. https://doi.org/10.24043/isj.108

Benítez-Aurioles, B. (2021a). How the peer-to-peer market for tourist accommodation has responded to COVID-19. *International Journal of Tourism Cities*. https://doi.org/10.1108/IJTC-07-2021-0140

Benítez-Aurioles, B. (2021b). A proposal to regulate the peer-to-peer market for tourist accommodation. *International Journal of Tourism Research*, *23*(1), 70-78. https://doi.org/10.1002/jtr.2393

Benitez-Aurioles, B., & Tussyadiah, I. (2020). What Airbnb does to the housing market. *Annals of Tourism Research*, 103108. https://doi.org/10.1016/j.annals.2020.103108

Bentolila, S., García-Pérez, J. I., & Jansen, M. (2017). Are the Spanish long-term unemployed unemployable?. *SERIEs*, *8*(1), 1-41. https://doi.org/10.1007/s13209-017-0155-z

Chang, H. H. (2020). Does the room sharing business model disrupt housing markets? Empirical evidence of Airbnb in Taiwan. *Journal of Housing Economics*, *49*, 101706. https://doi.org/10.1016/j.jhe.2020.101706

Coles, P., Egesdal, M., Ellen, I., Li, X., & Sundararajan, A. (2017). Airbnb Usage across New York City Neighbourhoods: Geographic Patterns and Regulatory Implications. In N. Davidson, M. Finck, & J. Infranca (Eds.), *The Cambridge Handbook of the Law of the*

Sharing Economy (Cambridge Law Handbooks, pp. 108-128). Cambridge: Cambridge University Press. https://doi.org/10.1017/9781108255882.009

Cunha, A. M., & Lobão, J. (2021). The effects of tourism on housing prices: applying a difference-in-differences methodology to the Portuguese market. *International Journal of Housing Markets and Analysis*. https://doi.org/10.1108/IJHMA-04-2021-0047

Dann, D., Teubner, T., & Weinhardt, C. (2019). Poster child and guinea pig–insights from a structured literature review on Airbnb. *International Journal of Contemporary Hospitality Management ,31*(1), 427-473. https://doi.org/10.1108/IJCHM-03-2018-0186

Deale, C. S., & Crawford, A. (2018). Providers' perceptions of the online community marketplace for lodging accommodations. *Tourism and Hospitality Research*, *18*(4), 470-477. https://doi.org/10.1177/1467358416682067

Deane, S. (2021). 2021 Airbnb Statistics: Usage, Demographics, and Revenue Growth. https://www.stratosjets.com/blog/airbnb-statistics/

Dolnicar, S. (2019). A review of research into paid online peer-to-peer accommodation: Launching the Annals of Tourism Research Curated Collection on peer-to-peer accommodation. *Annals of Tourism Research*, *75*, 248-264. https://doi.org/10.1016/j.annals.2019.02.003

Dolnicar, S., & Zare, S. (2020). COVID19 and Airbnb–Disrupting the disruptor. *Annals of Tourism Research*, *83*. https://doi.org/10.1016/j.annals.2020.102961

Domínguez-Mujica, J., González-Pérez, J. M., Parreño-Castellano, J. M., & Sánchez-Aguilera, D. (2021). Gentrification on the Move. New Dynamics in Spanish Mature Urban-Tourist Neighbourhoods. *Urban Science*, *5*(1), 33. https://doi.org/10.3390/urbansci5010033

Etxezarreta-Etxarri, A., Izagirre-Olaizola, J., Morandeira-Arca, J., & Mozo Carollo, I. (2020). Urban touristification in Spanish cities: consequences for the rental-housing sector in San Sebastian. *Economic research-Ekonomska istraživanja*, *33*(1), 1294-1310. https://doi.org/10.1080/1331677X.2020.1755878

Fang, B., Ye, Q., & Law, R. (2016). Effect of sharing economy on tourism industry employment. *Annals of Tourism Research*, *57*, 264-267. https://doi.org/10.1016/j.annals.2015.11.018

Fradkin, A., Grewal, E., & Holtz, D. (2021). Reciprocity and Unveiling in Two-sided Reputation Systems: Evidence from an Experiment on Airbnb. http://dx.doi.org/10.2139/ssrn.2939064

Franco, S. F., & Santos, C. D. (2021). The impact of Airbnb on residential property values and rents: Evidence from Portugal. *Regional Science and Urban Economics*, *88*, 103667. https://doi.org/10.1016/j.regsciurbeco.2021.103667

Gan, L., Wang, P., & Zhang, Q. (2018). Market thickness and the impact of unemployment on housing market outcomes. *Journal of Monetary Economics*, *98*, 27-49. https://doi.org/10.1016/j.jmoneco.2018.04.007

García-López, M. À., Jofre-Monseny, J., Martínez-Mazza, R., & Segú, M. (2020). Do short-term rental platforms affect housing markets? Evidence from Airbnb in Barcelona. *Journal of Urban Economics*, *119*, 103278. https://doi.org/10.1016/j.jue.2020.103278

Gassmann, S.-E., Nunkoo, R., Tiberius, V. & Kraus, S. (2021). My home is your castle: forecasting the future of accommodation sharing. *International Journal of Contemporary Hospitality Management*, *33*(2), 467-489. https://doi.org/10.1108/IJCHM-06-2020-0596

Gurran, N., & Phibbs, P. (2017). When tourists move in: how should urban planners respond to Airbnb?. *Journal of the American planning association*, *83*(1), 80-92. https://doi.org/10.1080/01944363.2016.1249011

Gurran, N., Searle, G., & Phibbs, P. (2018). Urban planning in the age of Airbnb: Coase, property rights, and spatial regulation. *Urban Policy and Research*, *36*(4), 399-416. https://doi.org/10.1080/08111146.2018.1460268

SECCIÓN ESPECIAL

Benítez-Aurioles. B
Effects of the supply reduction in the peer-to-peer market for tourist accommodation on the housing market

Gutiérrez, J., García-Palomares, J. C., Romanillos, G., & Salas-Olmedo, M. H. (2017). The eruption of Airbnb in tourist cities: Comparing spatial patterns of hotels and peer-to-peer accommodation in Barcelona. *Tourism Management*, *62*, 278-291. https://doi.org/10.1016/j.tourman.2017.05.003

Guttentag, D. (2019). Progress on Airbnb: a literature review. *Journal of Hospitality and Tourism Technology*, *10*(4), 814-844. https://doi.org/10.1108/JHTT-08-2018-0075

Hajibaba, H. and Dolnicar, S. (2018). Airbnb and its Competitors. In S. Dolnicar, *Peer-to-Peer Accommodation Networks: Pushing the boundaries*, Oxford: Goodfellow Publishers, 63-76. http://dx.doi.org/10.23912/9781911396512-3604

Hartmans, A. (2017). Airbnb now has more listings worldwide than the top five hotel brands combined, *BusinessInsider*. https://www.businessinsider.com/airbnb-total-worldwide-listings-2017-8

Hati, S. R. H., Balqiah, T. E., Hananto, A., & Yuliati, E. (2021). A decade of systematic literature review on Airbnb: the sharing economy from a multiple stakeholder perspective. *Heliyon*, *7*(10). https://doi.org/10.1016/j.heliyon.2021.e08222

Hoffman, L. M., & Heisler, B. S. (2020). *Airbnb, Short-Term Rentals and the Future of Housing*. Routledge. https://doi.org/10.4324/9780429279768

Horn, K., & Merante, M. (2017). Is home sharing driving up rents? Evidence from Airbnb in Boston. *Journal of Housing Economics*, *38*, 14-24. https://doi.org/10.1016/j.jhe.2017.08.002

Ikeji, T., & Nagai, H. (2020). Residents' attitudes towards peer-to-peer accommodations in Japan: Exploring hidden influences from intergroup biases. *Tourism Planning & Development*, 1-19. https://doi.org/10.1080/21568316.2020.1807400

InsideAirbnb (2022). About Inside Airbnb. http://insideairbnb.com/about.html

Jiao, J., & Bai, S. (2020). An empirical analysis of Airbnb listings in forty American cities. *Cities*, *99*, 102618. https://doi.org/10.1016/j.cities.2020.102618

Koster, H. R., van Ommeren, J., & Volkhausen, N. (2021). Short-term rentals and the housing market: Quasi-experimental evidence from Airbnb in Los Angeles. *Journal of Urban Economics*, *124*, 103356. https://doi.org/10.1016/j.jue.2021.103356

Kuhzady, S., Seyfi, S., & Béal, L. (2020). Peer-to-peer (P2P) accommodation in the sharing economy: A review. *Current Issues in Tourism*, 1-16. https://doi.org/10.1080/13683500.2020.1786505

Liang, C., Yeung, M. C. H., & Au, A. K. M. (2022). The impact of Airbnb on housing affordability: Evidence from Hong Kong. *Environment and Planning B: Urban Analytics and City Science*, *49*(3), 1048-1066. https://doi.org/10.1177/23998083211043123

Moallemi, M., & Melser, D. (2020). The impact of immigration on housing prices in Australia. *Papers in Regional Science*, *99*(3), 773-786. https://doi.org/10.1111/pirs.12497

Mussa, A., Nwaogu, U. G., & Pozo, S. (2017). Immigration and housing: A spatial econometric analysis. *Journal of Housing Economics*, *35*, 13-25. https://doi.org/10.1016/j.jhe.2017.01.002

Namberger, P., Jackisch, S., Schmude, J., & Karl, M. (2019). Overcrowding, overtourism and local level disturbance: how much can Munich handle?. *Tourism Planning & Development*, *16*(4), 452-472. https://doi.org/10.1080/21568316.2019.1595706

Nguyen, T. T. H., Balli, H. O., Balli, F., & Syed, I. A. (2021). Immigration and regional housing markets: prices, rents, price-to-rent ratios and disequilibrium. *Regional Studies*, 1-13. https://doi.org/10.1080/00343404.2021.1955097

Nieuwland, S., & Van Melik, R. (2020). Regulating Airbnb: how cities deal with perceived negative externalities of short-term rentals. *Current Issues in Tourism*, *23*(7), 811-825. https://doi.org/10.1080/13683500.2018.1504899

Ozdemir, G., & Turker, D. (2019). Institutionalization of the sharing in the context of Airbnb: a systematic literature review and content analysis. *Anatolia*, *30*(4), 601-613. https://doi. org/10.1080/13032917.2019.1669686

Prayag, G. and Ozanne, L.K. (2018). A systematic review of peer-to-peer (P2P) accommodation sharing research from 2010 to 2016: progress and prospects from the multi-level perspective. *Journal of Hospitality Marketing & Management*, *27*(6), 649-678. https:// doi.org/10.1080/19368623.2018.1429977

Psacharopoulos, G., & Patrinos, H. A. (2018). Returns to investment in education: a decennial review of the global literature. *Education Economics*, *26*(5), 445-458. https://doi.org/10. 1080/09645292.2018.1484426

Quattrone, G., Nicolazzo, S., Nocera, A., Quercia, D., & Capra, L. (2018). Is the Sharing Economy About Sharing at All? A Linguistic Analysis of Airbnb Reviews Over Time. In *The 12th International AAAI Conference On Web and Social Media (ICWSM-18)* (pp. 1-4). e http://hdl.handle.net/2318/1730547

Ram, Y., & Tchetchik, A. (2021). Complementary or competitive? Interrelationships between hotels, Airbnb and housing in Tel Aviv, Israel. *Current Issues in Tourism*, 1-12. https:// doi.org/10.1080/13683500.2021.1978954

Rodríguez-Pérez de Arenaza, D., Hierro, L. Á., & Patiño, D. (2019). Airbnb, sun-and-beach tourism and residential rental prices. The case of the coast of Andalusia (Spain). *Current Issues in Tourism*, 1-18. https://doi.org/10.1080/13683500.2019.1705768

Sainaghi, R. (2020). The current state of academic research into peer-to-peer accommodation platforms. *International Journal of Hospitality Management*, *89*. https://doi. org/10.1016/j.ijhm.2020.102555

Saiz, A., & Wachter, S. (2011). Immigration and the neighbourhood. *American Economic Journal: Economic Policy*, *3*(2), 169-188. https://doi.org/10.1257/pol.3.2.169

Shabrina, Z., Arcaute, E., & Batty, M. (2022). Airbnb and its potential impact on the London housing market. *Urban Studies*, 0042098020970865. https://doi. org/10.1177/0042098020970865

Shen, L., & Wilkoff, S. (2022). Cleanliness is next to income: The impact of COVID-19 on short-term rentals. *Journal of Regional Science*, 62, 799-829. https://doi.org/10.1111/ jors.12581

Sheppard, S., & Udell, A. (2016). Do Airbnb properties affect house prices? *Williams College Department of Economics Working Papers*, *3*(1), 43. https://web.williams.edu/ Economics/wp/SheppardUdellAirbnbAffectHousePrices.pdf

Smith, M. K., Sziva, I. P., & Olt, G. (2019). Overtourism and resident resistance in Budapest. *Tourism Planning & Development*, *16*(4), 376-392. https://doi.org/10.1080/21568316. 2019.1595705

Sridhar, K. S. (2021). Understanding the Digital Platform Economy: Effect of Airbnb on Housing in Indian Cities. *Housing Policy Debate*, 1-17. https://doi.org/10.1080/105114 82.2021.1929389

Thackway, W. T., Ng, M. K. M., Lee, C. L., Shi, V., & Pettit, C. J. (2022). Spatial Variability of the 'Airbnb Effect': A Spatially Explicit Analysis of Airbnb's Impact on Housing Prices in Sydney. *ISPRS International Journal of Geo-Information*, *11*(1), 65. https:// doi.org/10.3390/ijgi11010065

Thackway, W. T., & Pettit, C. J. (2021). Airbnb during COVID-19 and what this tells us about Airbnb's Impact on Rental Prices. *Findings*, June. https://doi.org/10.32866/001c.23720

Todd, J., Musah, A., & Cheshire, J. (2021). Assessing the impacts of Airbnb listings on London house prices. *Environment and Planning B: Urban Analytics and City Science*, 23998083211001836. https://doi.org/10.1177/23998083211001836

Trojanek, R., Gluszak, M., Hebdzynski, M., & Tanas, J. (2021). The COVID-19 pandemic, Airbnb and housing market dynamics in Warsaw. *Critical Housing Analysis*, *8*(1), 72-84. https://dx.doi.org/10.13060/23362839.2021.8.1.524

Tussyadiah, I. P., & Pesonen, J. (2016). Impacts of peer-to-peer accommodation use on travel patterns. *Journal of travel Research*, *55*(8), 1022-1040. https://doi.org/10.1177/0047287515608505

UNWTO (2018). 'Overtourism'? Understanding and managing urban tourism growth beyond perceptions. Madrid: UNWTO. https://doi.org/10.18111/9789284420070.

UNWTO (2021). Tourism back to 1990 levels as arrivals fall by more than 70%". www.unwto.org/news/tourism-back-to-1990-levels-as-arrivals-fall-by-more-than-70

von Briel, D. & Dolnicar, S. (2021). The evolution of Airbnb regulations. In S. Dolnicar (Ed.) *Airbnb before, during and after COVID-19*, University of Queensland. https://doi.org/10.6084/m9.figshare.14195972

Wachsmuth, D., & Weisler, A. (2018). Airbnb and the rent gap: Gentrification through the sharing economy. *Environment and Planning A: Economy and Space*, *50*(6), 1147-1170. https://doi.org/10.1177/0308518X18778038

Wyman, D., Mothorpe, C., & McLeod, B. (2020). Airbnb and VRBO: The impact of short-term tourist rentals on residential property pricing. *Current Issues in Tourism*, 1-12. https://doi.org/10.1080/13683500.2019.1711027

Zou, Z. (2020). Examining the impact of short-term rentals on housing prices in Washington, DC: Implications for housing policy and equity. *Housing Policy Debate*, *30*(2), 269-290. https://doi.org/10.1080/10511482.2019.1681016