The spatial heterogeneous impact of Airbnb on the housing market. Evidence from Puglia region (Italy).

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Abstract

This study explores the impact of Airbnb on the housing market in Puglia, Italy. Airbnb has disrupted the tourism industry by enabling individuals to rent out their extra rooms or houses, leading to a decrease in available homes for long-term residents and a shift towards the more profitable tourism sector. This raises social, environmental, and economic concerns for both residents and tourists. While short-term rentals benefit property owners and create job opportunities, they also drive up rental rates, displace lower-income residents, and contribute to the seasonality of economic activities. Policymakers need to implement regulations to ensure Airbnb contributes to broader community goals. While previous research has primarily focused on urban contexts, this study aims to fill this gap by examining the effects of Airbnb on small towns and rural areas with noteworthy differences from the urban context.

Keywords: *housing price, Airbnb, tourism, spatial effects, Puglia (Italy).*

JEL codes: R21, R31, Z30, Z32

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Introduction

The sharing economy is characterized by the sharing, renting, or trading of underutilized assets or services directly between individuals. People can leverage online platforms to connect with others who are willing to share their resources. This can include sharing or renting accommodations (e.g., Airbnb), sharing rides (e.g., Uber), sharing personal vehicles (e.g., car-sharing services), etc. The sharing economy has gained popularity due to several factors, including advancements in technology and a desire for more sustainable and cost-effective alternatives to traditional ownership models. Proponents argue that it can lead to greater resource efficiency, reduced waste, increased social interaction, and new income opportunities for individuals. However, there are also concerns about issues such as regulatory challenges, labour rights, safety, and fair competition.

The impact of the sharing economy extends well beyond its direct users, encompassing the broader society and potentially disrupting traditional market dynamics. In the case of Airbnb, the impact of the peer-to-peer platform extends beyond landlords and guests, reaching into the surrounding neighbourhood or even the entire city in which it operates. Since staying in an Airbnb accommodation is just one aspect of a tourist's expenditure within a destination, the local tourism sector as a whole, including restaurants, shops, and other businesses, benefits from its presence.

However, the expansion of Airbnb has been accompanied by various drawbacks, according to many critics. One prominent concern is that the availability of higher rental income through Airbnb has prompted landlords to shift their properties to the short-term rental market to capitalize on tourist demand (Barron et al., 2020). Since the total supply of housing is fixed or inelastic in the short run, this decrease in the supply of housing options leads to increased rental prices and adversely affects residents (Bao & Shah, 2020).

As we write this paper, local governments worldwide are struggling to regulate Short-Term Rentals (STRs) and their negative externalities. Newspapers from all over the world daily report the intent of politicians at both the local and national levels to curb the spread of Airbnb, which is considered, in a rather simplistic manner and without appropriate underlying empirical analysis, the primary cause of price and rent increases. In Italy, rental rates are skyrocketing in major cities, which is a pressing issue for students and low-to middle-income families. This demonstrates the current relevance and fundamental significance of the topic, underscoring the need for continued research and investigation.

Building upon the recommendations of Nieuwland & van Melik (2018) and DiNatale et al., 2018, our study delves into the impact of Airbnb not only on major urban centres but also on smaller destinations. Remarkably, no empirical investigations have explored the influence of short-term rentals (STRs) on small towns and rural areas. Our hypothesis posits that these communities, with their limited availability of long-term rental housing, may face an even greater challenge with the proliferation of STRs. This study aims to fill this gap by examining the spatial heterogeneous impact of Airbnb on the housing market, in all the municipalities in Puglia, South of Italy.

The Puglia region is among the Italian regions to experience a relevant tourism growth in the latest years. The steep increase in tourist demand in Puglia is primarily attributed to the agreements made by the Region with major low-cost airlines to establish direct flights between the airports of Bari and Brindisi and key cities in Europe and around the world, making it significantly more accessible. Both

public and private investments have been made to enhance the region's tourism services. Simultaneously, the rise of Airbnb has allowed many small destinations that lacked traditional hotels to accommodate the growing tourist demand in a quick and flexible way.

Directing our focus towards the impacts of Airbnb and the surge in tourism demand on the housing market, both positive and negative consequences arise. On the positive side, the growth of tourism can enhance the desirability of specific areas in Puglia, resulting in an appreciation of property values. This can prove advantageous for property owners seeking to sell their assets. Likewise, property owners who opt to rent their properties for short periods to tourists yield higher returns compared to long-term rentals to residents. Additionally, the expansion of tourism development generates new employment opportunities across various sectors, particularly in hospitality and food and beverage. Consequently, this surge in job opportunities might drive an increased demand for housing among employees.

On the flip side, the conversion of numerous private houses into more lucrative short-term rentals results in a reduction of available long-term housing options. Consequently, rental rates for locals escalate, exacerbating the pressure on the housing supply. As property values increase, lower-income residents are increasingly unable to afford living in highly touristic areas, compelling them to seek alternative accommodations elsewhere. This dynamic might lead to the displacement of vulnerable populations and a widening gap in housing affordability.

We use web-scraped data from Airbnb from January 2014 to August 2022 and from Immobiliare.it from February 2015 to May 2023 to estimate to what extent Airbnb is responsible for the increase in rental rates and house prices in the Apulian municipalities, focusing our attention to the potential spatial heterogeneity[4].

The rest of this paper is organized as follows. In Section 2 we present a review of the literature and the contribution of this study. Section 3 provides a theoretical framework on how Airbnb might be expected to affect the housing market. In Section 4, we present some descriptive statistics of the data we collected from Airbnb and from Immobiliare.it. In Section 5, we describe our empirical strategies. In Section 6, we discuss the results and present some robustness checks to reinforce the validity of our results. Section 7 provides some policy recommendations. Section 8 discusses our findings and the limitations of our work, and it provides concluding remarks. The Appendix contains all the outputs of the empirical analysis.

2. Literature review and contribution of the study

Over the past few years, there has been a growing body of research focusing on the negative consequences of Airbnb, with particular emphasis on its causal effect on rental rates and house prices increase, especially in big cities.

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Numerous studies have concentrated on analyzing the US market, including works by Bao & Shah (2020), Barron et al. (2020), Horn & Merante (2017), Sheppard & Udell (2018), and Wachsmuth et al. (2018), among others. Using Airbnb data from 10 neighbourhoods located within large metropolitan areas between 2013–2017, as well as rental data from the American online real estate database company, Zillow, Bao & Shah (2020) found that Airbnb's impact on rental rates depends on a neighbourhood's individual characteristics. This study also urges policy makers to create tailor-made solutions that help curb the negative impacts associated with the platform whilst still harnessing its economic benefits. Using a dataset of Airbnb listings from the entire United States between 2011 and 2016 and an instrumental variables estimation strategy, Barron et al. (2020) show that a one standard deviation increase in Airbnb listings at the ZIP code level raises rents by 0.54%. Additionally, they calculated that Airbnb accounts for one-fifth of the actual rent growth and approximately one-seventh of the actual price growth. Lastly, they demonstrated that Airbnb listings diminish the availability of long-term rental units.

Wachsmuth et al. (2018) apply the regression results identified by Barron et al. (2020) to the increase in Airbnb rentals in New York City. They found a 1.4% increase in NYC rents from 2015 to 2017 due to Airbnb's expansion in that city. Sheppard & Urdell (2018) also focus on the New York market while examining the impact of Airbnb listings on house prices. In contrast to the former studies, this study applies not only a hedonic approach but also a matched difference-in-differences approach. Their results suggest that sold properties subject to the treatment of having Airbnb properties nearby experienced an increase in price by 3.5% (if located far from the CBD, Wall Street, and with a treatment consisting of few Airbnb properties) to more than 65% for properties located near Wall Street and/or treated by having a larger number of Airbnb rentals nearby. Horn and Merante (2017) use Airbnb listing data from Boston in 2015 and 2016 and, find that a one standard deviation increase in Airbnb listings relative to the total number of housing units in a census tract, is associated with a 0.4% increase in asking rents. For census tracts in the highest decile of Airbnb listings relative to total housing units, this increase in rents ranges from 1.3% to 3.1%. Lee (2016) provides a descriptive analysis of Airbnb in the Los Angeles housing market, showing that the impact of STRs on rents is unevenly distributed across the city and that, in 2014, rents in neighbourhoods with the highest rates of Airbnb listings were 20% higher, and increased 33% faster, than rents citywide.

In the European context, the city of Barcelona (Spain) has attracted the attention of various scholars (Agustí et al., 2020; Coyle, & Yeung, 2016; Garcia-López et al., 2019, Segù, 2018; Valente et al., 2023). Barcelona is among the cities that have suffered the most from the negative effects of Airbnb on the rental rates and housing prices, and among the cities that have implemented the strictest policies to regulate this phenomenon in Europe. Segù (2018) uses a Bartik-like instrument approach that combines distance to the beach with city-wide levels of tourism to study the effect of Airbnb density on housing rents in Barcelona. The study suggests that Airbnb is responsible for a 4% increase in rents between 2009 and 2016, while García-Lopez et al. (2020) estimate that in neighbourhoods with the highest Airbnb activity, transactions increased by 17% between 2012 and 2016.

Notable contributions on the European context include the works of Alola et al., 2020 for Cyprus; Ayouba et al., 2020 for France; Benitez-Aurioles &Tussyadiah, 2020 for London; Biagi et al., 2016 for Italy; Churchill et al., 2021 for Germany; Coyle & Yeung, 2016 for 14 cities throughout Europe; Cunha & Lobão, 2021 and Franco et al., 2019 for Portugal; Elíasson & Ragnarss, 2018 for Iceland and Hübscher & Kallert, 2022 for Amsterdam, Berlin and London. Franco & Santos (2021) analyse

the cities of Lisbon and Porto and find that house prices in a high touristy district increased by 32.3% between 2014 and 2016. In the context of Italy, Biagi et al. (2016) conducted a distinctive study, employing a latent class model to assess the influence of tourism activities on housing prices. The study revealed a divergent pattern: in certain cities, increased tourism activity corresponded to higher housing prices, whereas in other cities, increased tourism activity coincided with decreased housing prices. Notably, approximately half of the sample demonstrated no significant impact on housing prices from increases in tourism activity. Similar conclusions are reached by Ayouba et al. (2020), who show that the density of Airbnb rentals puts upward pressure on rents in Lyon, Montpellier, and Paris, whereas it has no significant effect in the other five French cities analysed.

The unit of analysis varies from entire countries (Alola et al., 2020; Churchill et al., 2021; Elíasson & Ragnarsson, 2018) to neighbourhoods and ZIP codes (Agustí et al., 2020; Bao & Shah, 2020; Barron et al., 2020; Benitez-Aurioles & Tussyadiah, 2020; Brett Garcia et al., 2021; Chen et al., 2022; Clancy, 2022; Garcia-López et al., 2019; Valente et al., 2023), passing through regions (Balli et al., 2019), cities (Ayouba et al., 2020; Biagi et al, 2016, Coyle & Yeung, 2016) and municipalities (Cunha & Lobão, 2021; Franco et al., 2019).

Several authors have also investigated the efficacy of the regulatory policies to limit the negative effects of Airbnb on the housing market (Cócola Gant, 2016; DiNatale et al., 2018; Furukawa & Onuki, 2019; Gauß et al., 2022; Garz & Schneider, 2023; Gurran & Phibbs, 2017; Hübscher & Kallert, 2022; Nieuwland & van Melik, 2018; among others). In particular, Chen et al. (2022) leverage a unique quasi-experiment on Airbnb - the implementation of the "One Host, One Home" policy - and find that this restrictive policy reduced rents (in the long-term rental markets) and home value by about 3%. Koster et al. (2019) uses a spatial regression discontinuity design combined with a difference-in-differences set up to examine the changes in Airbnb listings and house prices close to the borders of the cities that have adopted Home-Sharing Ordinances. The authors find that the ordinances strongly reduced Airbnb listings by 50% and housing prices by 3%.

In general, this emerging literature finds that the widespread adoption of Airbnb has had notable effects on rental rates and house prices, particularly in areas with high tourism activity and limited housing supply. While the impact on rental rates is generally a rise in prices, the relationship with house prices is more nuanced and dependent on various factors. However, most of these studies have primarily focused on cities or metropolitan areas, leaving a gap in the research when it comes to understanding the effects of Airbnb in smaller destinations, like small towns and rural areas. This study aims to address this gap by examining the influence of Airbnb on the housing market in the diverse municipalities of the Puglia region in Italy. The impact of tourism on the housing market can vary depending on the characteristics of a destination. For example, in smaller towns that are heavily reliant on tourism, the impact on the housing market may be more pronounced than in larger, more diversified urban areas.

Our approach has different advantages: i) It allows us to observe potential spatial spillover effects, since the impact of Airbnb on the housing market in one area may spill over into neighbouring areas. ii) It is useful for policymakers to make informed decisions about how to regulate short-term rentals. iii) It allows us to observe market dynamics, since housing markets in different parts of the same region can be interdependent, and changes in one area can affect prices and availability in others. iv)

It provides a more comprehensive understanding of the impact of short-term rentals on the local economy and housing market.

Our study contributes to this emerging literature on the effects of home-sharing on rental rates and housing prices by using for the first time Airbnb web-scraped data and monthly data at a municipality-level about rental rates and house prices from the main real estate agency in Italy Immobiliare.it, using the Puglia region as a case study.

Through empirical analysis, our findings reveal the varied impact of Airbnb activity on rental rates and house prices at a municipal level, highlighting the necessity for tailored regulations that consider spatial heterogeneity. This insight is especially valuable at a time when cities worldwide are grappling with the regulation of the short-term rental market, with some implementing outright bans or imposing stringent legal restrictions on Airbnb rentals. Our study emphasizes the importance of moving beyond one-size-fits-all approaches and adopting targeted policies that account for the unique characteristics and dynamics of each locality.

3. Theoretical framework

After renting out air mattresses on their apartment floor to attendees of a conference in San Francisco, Brian Chesky and Joe Gebbia founded Airbnb in 2008, which is now recognised as the pioneer of not just the home-sharing industry, but the sharing economy as a whole. (Bao & Shah, 2020). Tourists and renters are non-overlapping populations with different needs, traditionally served by non-overlapping markets, while Airbnb has created a new category of rental housing which blurs the lines between traditional rentals and hotel accommodation.

Lee (2016) identifies two mechanisms in which Airbnb distorts the rental housing market. First, any housing unit that was previously occupied by a city resident, but is now listed on Airbnb year-round, is a unit that has been removed from the rental market and has essentially been added to the supply of hotel rooms. In tight housing markets with near-zero vacancy rates, a sudden reduction in supply naturally increases rents, particularly because unlike with most commodities, a shortage in housing supply cannot be ameliorated by importing or quickly building additional units. The building of new houses requires high costs and a varying period of time, and it depends on the amount of land available in the municipality, the stringency of land use regulations as well as the cost of construction (Gyourko & Molloy, 2015). The second mechanism is "hotelization." So long as a property owner can rent out a room on Airbnb for cheaper than the price of a hotel room, while earning a substantial premium over the residential market, there is an incentive to list each unit in a building on Airbnb rather than rent to residents. This decreases the supply of housing and spurs displacement and "turistification". In sum, STRs increase rents for residents and reduce the supply of affordable housing by removing units from the housing market through conversion and hotelization.

Nevertheless, it would be inaccurate to claim that every home rented on Airbnb has been withdrawn from the long-term rental market. In many cases, Airbnb has allowed owners to rent out properties that they would not have otherwise considered for long-term rentals. These homes might have remained vacant or even fallen into a state of disrepair.

Owners may choose short-term rentals (STRs) not only because of the higher profits but also for other reasons. Firstly, in the case of owner-occupied homes (primary residences), owners may rent out an extra room or the entire apartment while they are away to generate additional income. It must be noted that these homes potentially belong to the short-term market but would never be part of the long-term market, regardless of the presence of platforms like Airbnb. Secondly, for homes where owners spend their vacations, they may choose to rent out the entire apartment only during the months when they are not using it. These homes also fall into the short-term market category and are unlikely to be part of the long-term rental market, regardless of the presence of Airbnb. Thirdly, in some cases, public sector investments are made to convert uninhabitable second homes into accommodation facilities such as bed and breakfast establishments. These initiatives, funded by programs like GAL Funds in Puglia, restrict owners from renting for long periods. Additionally, owners may prefer STRs due to the flexibility they offer. Long-term leases can be seen as restrictive, and STRs provide owners with the option to use the property for personal purposes, such as accommodating family or friends. Moreover, owners may opt for STRs to take advantage of potential future increases in long-term rents while capitalizing on current surges in short-term demand, as noted by Barron et al. (2020). Lastly, owners might favour STRs due to the potential complexities of legal proceedings when dealing with non-paying or non-evicting long-term tenants. Taking legal action against such tenants can be lengthy and complex.

In contrast, some owners may choose long-term rentals due to the ongoing commitment required for short-term rentals (STRs). Managing STRs involves various responsibilities, such as check-ins, check-outs, guest registrations, cleaning, and linen changes. These activities often necessitate the engagement of specialized professionals to ensure smooth operations. In contrast, long-term rentals typically involve less frequent turnover and fewer immediate management requirements, making them a more convenient choice for some owners.

4. Data and variables

4.1 Airbnb

To measure Airbnb activity, we rely on web-scraped data taken from the Airbnb website. Although this source is not an official register, in the absence of this, it provides an indication of the number of STRs available. For all the Airbnb listings located in Puglia from 2008 to August 2022, we extract the following information: name of the property, name and location of the host, host's registration date, approximate geographic locations, date of first and last review, and number of available days per year.

To determine the activity period of each listing, we calculate the duration between the date of the first review and the date of the last review. This approach is based on the fact that approximately 72% of guests leave a review on Airbnb (Airbnb). In cases where review data is unavailable, we use the host's registration date on the platform as the starting point and consider the last period of data scraping as the ending point for determining the activity period.

4.2 Rents and prices

To measure the evolution of rental rates and sale prices in the Apulian municipalities, we use the information provided by the online real estate portal Immobiliare.it. They provide the average of the posted prices on their portal, at a municipality-level in the last 100 months (Feb, 2015-May, 2023).

4.3 Descriptive statistics

According to Oskam & Boswijk (2016), whether Airbnb has positive or negative effects on cities depends on a multitude of factors such as the size of the city and the amount, location and concentration of Airbnb listings. Since the launch of the platform in 2008 until 2022, there have been 41,391 Airbnb listings in Puglia. In Fig. 1, we plot the evolution over time of Airbnb activity, differentiating between whole properties and of shared/individual rooms.

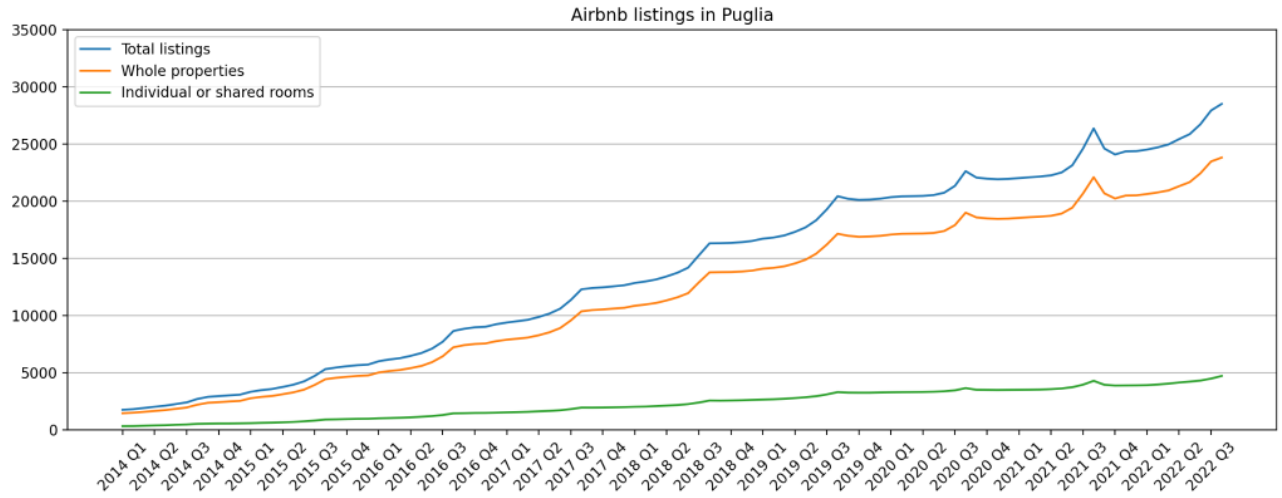

Fig. 1 - Evolution over time of Airbnb activity in Puglia from 2014 to 2022.

The graph clearly illustrates that in the absence of regulations, the number of Airbnb listings has steadily increased in a linear manner. Notably, there are seasonal peaks during the third quarter, which align with the high tourist season in Puglia. It is worth mentioning that a significant majority, specifically 83.11%, of the listings consist of entire properties.

In our analysis, we classify commercial hosts in Puglia based on two criteria: those who manage more than three listings and those whose listings are available for more than 300 days a year. Based on these criteria, we find that 68% of the hosts in Puglia fall into the commercial category.

Fig. 2 shows the geolocation of the Airbnb listings in 2022, differentiating again between whole properties and of shared/individual rooms. A clear spatial pattern emerges, revealing that most Airbnb listings are concentrated along the Adriatic and Ionian coasts, especially in the southern region known as "Salento," as well as in the area south of the capital, Bari, referred to as the “Valle d'Itria”, extending from the hinterland to the Adriatic coast. In the following paragraph, we delve into the underlying reasons behind these distinctive spatial patterns.

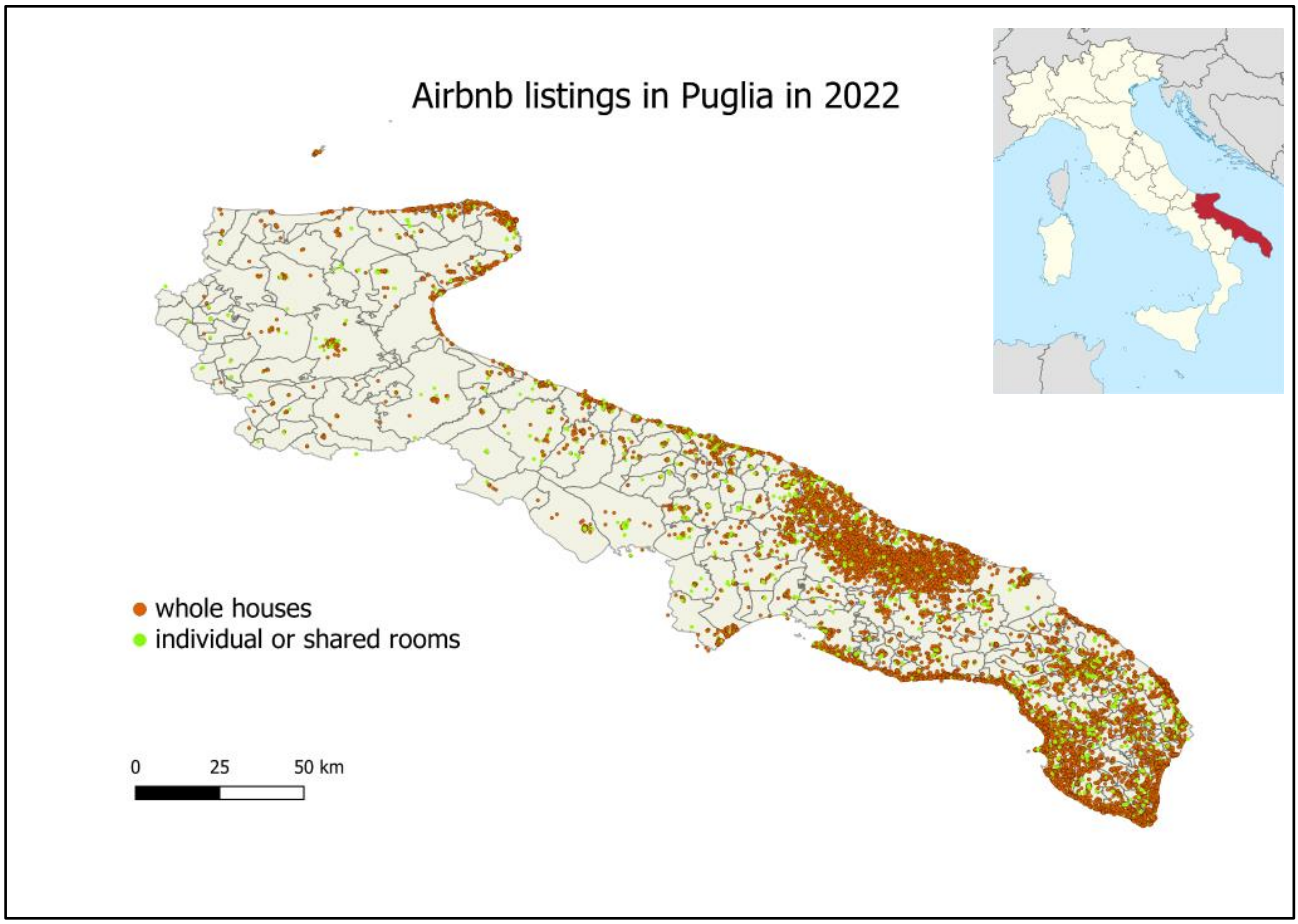

Fig. 2- Geography of Airbnb listings in Puglia (2022).

4.4 The spatial diffusion of tourism in Puglia

Tourism in Puglia has not been driven by a major city. The region's main allure has always been its seaside, particularly along the Southern coast (Salento) and the Northern coast (Gargano). However, larger cities like Bari and Lecce have experienced notable growth in recent years. Additionally, the inland area of Valle d'Itria has gained popularity, especially among foreign visitors. Valle d'Itria stands out due to its captivating landscape, which permeates the entire area rather than being confined to specific attractions. Hence, the Airbnb accommodations are evenly distributed throughout the entire area, rather than being concentrated solely in the historical centres, which are usually the most popular tourist destinations. The appeal of this area was initially recognized by British tourists, who began investing by purchasing houses and renting them out. Some even established travel agencies, tour operators, and real estate agencies with offices abroad. Moreover, a distinctive feature of Valle d'Itria is the presence of "trulli," cone-shaped traditional houses that attract the curiosity of tourists. The public sector, particularly the GAL (local action group), utilized European and Regional Funds to incentivize the renovation of these distinctive private structures. The aim was to revitalize and preserve the region's rural heritage, with the clause to convert trulli into accommodation facilities to address the limited accommodation supply.

Table 1 shows the 25 Municipalities with the highest number of Airbnb listings, the number of listings per 1000 inhabitants and the average price (€) per night, while Table 2 provides the means of some

key variables, namely the number of Airbnb accommodations, the number of Airbnb accommodations over population, the share of Airbnb on the total housing stock, the rental rates and the house price, at the first and last period available, and allows us to compare them between all municipalities and the top decile for number of Airbnb listings.

	Municipality	Population (2022)	Airbnb listings	Airbnb listings per 1000 inhabitants	Airbnb av. price (€/night)
1	Ostuni	30,302	2,398	79.14	63.48
2	Lecce	94,783	1,963	20.71	116.84
3	Bari	315,948	1,961	6.21	368.00
4	Gallipoli	19,561	1,927	98.51	51.52
5	Porto Cesareo	6,300	1,835	291.27	64.40
6	Nardò	30,790	1,556	50.54	48.76
7	Monopoli	48,078	1,394	28.99	46.00
8	Melendugno	9,996	1,056	105.64	146.28
9	Otranto	5,715	969	169.55	92.00
10	Ugento	12,075	898	74.37	55.20
11	Salve	4,485	871	194.20	384.56
12	Polignano a Mare	17,680	840	47.51	110.40
13	Martina Franca	47,301	810	17.12	100.28
14	Vieste	13,434	765	56.95	50.60
15	Fasano	38,943	740	19.00	199.64
16	Carovigno	16,925	722	42.66	103.04
17	Manduria	30,117	697	23.14	138.00
18	Ceglie Messapica	18,880	648	34.32	64.40
19	Taviano	11,551	638	55.23	41.40
20	Castrignano del Capo	5,143	620	120.55	453.56
21	Racale	10,743	594	55.29	76.36
22	Cisternino	11,231	547	48.70	64.40
23	Taranto	189,461	478	2.52	27.60
24	Locorotondo	13,978	444	31.76	73.60
25	Alliste	6,481	401	61.87	41.40

Table 1 - Top 25 municipalities in Puglia per number of Airbnb accommodations.

	February 2015		August 2022	
	All municipalities	Top decile	All municipalities	Top decile
Airbnb count	13.9	59	112.5	472
Airbnb count / population	0.0037	0.0160	0.0196	0.0734
Share of Airbnb on housing stock	0.1742	0.5678	1.0359	3.2772
Rental rate (€/m2)	5.49	5.99	7.70	9.50
House price (€/m2)	1,057.93	1,410.22	902.67	1,359.87

Table 2 - Descriptive statistics: Variables' means across municipalities for 2015 and 2022.
Notes: Columns 1 and 3 report the mean for all municipalities in February 2015 and August 2022. Columns 2 and 4 report the means of the top decile of the number of Airbnb listings February 2015 and August 2022. The share of Airbnb on the total housing stock has been calculated for February 2015 and December 2020, which is the last available period in our dataset.

Fig. 3 shows the evolution of house prices for sale (left) and the evolution of rental rates (right) in Puglia from February 2015 to May 2023.

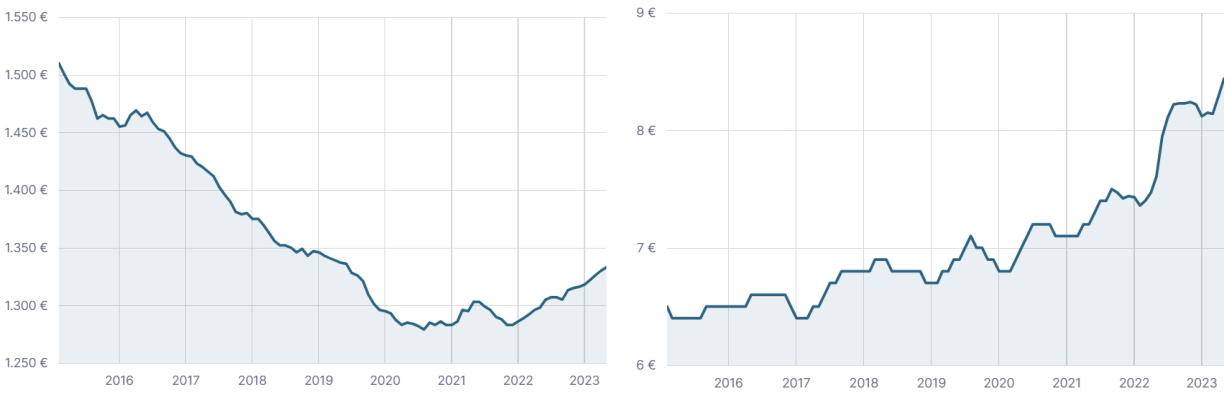

Fig. 3 - Left: trend of house prices for sale in Puglia from February 2015 to May 2023. Right: Trend of rental rates in Puglia from February 2015 to May 2023 (source: Immobiliare.it)..

For our analysis we rely on a strongly balanced panel dataset consisting of 28,024 observations. This dataset encompasses 248 municipalities, which accounts for nearly all the 257 municipalities in Puglia, over a span of 113 months from February 2015 to May 2023.

The dependent variables are house prices (€/m^2) and rental rates (€/m^2), which are the monthly prices aggregated at a municipality level, retrieved by one of the most important real estate online agencies in Italy, Immobiliare.it.

The main independent variable is the number of Airbnb listings at municipality i at time t. We will also consider the distinction between whole properties and individual/shared rooms across Airbnb listings.

As control variables we might use:

- Yearly housing stock provided by IPRES We include buildings classified as: Luxury residences, Civilian residences, Affordable housing, Popular housing, Ultra-popular housing, Rural housing, Townhouse-style housing, Villa-style housing, Castles, palaces of outstanding artistic or historical value, Private offices and studios, Typical local dwellings and accommodations, such as “trulli”.
- Monthly interest rates for housing purchase loans that are uniform across all municipalities, provided by Bankitalia.
- Yearly income per capita, provided by IPRES.
- Yearly population, surface (km^2) and population density, provided by ISTAT (National Institute of Statistics).
- A dummy variable is used to distinguish between municipalities on the coast and municipalities in the hinterland (source: Google Maps).

5. Empirical strategies

5.1 Baseline OLS specification

We use a panel data regression model to estimate the impact of Airbnb on the housing prices and rental rates, controlling for other factors that could affect the housing market, such as income levels, population density, local amenities, and macroeconomic indicators. By including them in the regression model, we can isolate the specific impact of Airbnb while accounting for other relevant determinants. Using panel data allows us to account for both cross-sectional and temporal variations.

Our baseline specification is represented as

$$Y_{it} = \beta_0 + \beta_1 Airbnb_{it} + \beta_2' C_{it} + \tau_t + \mu_i + + \varepsilon_{it}$$

where:

- Y_{it} = house price or rental rate at time *t* and municipality *i*.
- β_0 = intercept term.
- $\beta_1 \text{Airbnb}_{it}$ = a measure of Airbnb supply, which can be the number of active Airbnb listings at time *t* and municipality *i*, the share of Airbnb accommodations on the total housing market or the number of Airbnb accommodations standardized based on the population size.
- $\beta_2' C_{it}$ = a vector of observed time-varying municipality characteristics: population density and income per capita.
- τ_t = time fixed effects, namely time-related factors that affect the dependent variable but do not vary across different municipalities.
- μ_i = municipality fixed effects that account for time-invariant municipality characteristics.
- ε_{it} = idiosyncratic error term.

We specify our model using a loglinear transformation, where all the continuous variables are transformed into logarithmic form. Taking the logarithm of variables reduces potential issues of heteroskedasticity and allows for the estimation and interpretation of elasticities, which represent the proportional change in one variable associated with a given percentage change in another variable. When our independent variable (Airbnb supply) has a value of 0, we employ a mathematical workaround by using the expression log (x + 1). This approach ensures that the logarithm is defined even when the value is 0. By adding 1 to the value before taking the logarithm, the value 0 is transformed to 1, resulting in a logarithm of 0 instead of being undefined.

Our dependent variables are measured in price (€) per square meter. This allows us to avoid controlling for hedonic characteristics such as the number of rooms and size. We ise fixed effects to account for time-invariant unobservable factors that may systematically affect housing prices and rental rates across municipalities.

6. Results

6.1 Baseline results

	(1)	(2)	(3)
Panel A	Rents		
Airbnb	0.013	0.016*	0.046***
	(0.009)	(0.009)	(0.009)
N	22,295	20,335	17,324
Panel B	House prices		
Airbnb	0.026***	0.016**	0.013**
	(0.009)	(0.007)	(0.005)
N	22,295	20,335	17,324
Time FE	X	X	X
Municipality FE	X	X	X
Controls		X	X

Table 3 - Impact of Airbnb on rents and prices - Baseline specifications.

In Table 3, we report our baseline results for the impact of Airbnb on rents (Panel A) and house prices (Panels B). In column 1, we regress the outcome of interest against the number of Airbnb listings while controlling only for time and municipality-fixed effects. In column 2, we add municipality time-varying controls, namely population density and income per capita. Coefficients are positive and statistically significant for both rents and prices, which implies that an increase in the number of listings translates into an increase in rents and prices. Interestingly, they show the same magnitude, indicating that a one-percent increase in Airbnb accommodations is associated with a 0.016% increase in both rental rates and house prices, holding all other factors constant.

In column 3, we use an alternative measure of Airbnb intensity, namely the share of Airbnb listings on total housing stock. Coefficients are positive and statistically significant for both rents and prices, respectively at 99% and 95% confidence level.

6.2 Spatial heterogeneous effects

To examine the potential variation in the impact of Airbnb on rental rates or house prices based on the size of the town, as measured by its population, we segmented the dataset into four distinct groups according to the quartiles of the population distribution. Subsequently, we incorporated an interaction term between population and the number of Airbnb accommodations. The estimates derived from this analysis are presented in Table 4 and Table 5.

	(1)	(2)	(3)	(4)	(5)	(6)
	(1st quartile)	(2nd quartile)	(3rd quartile)	(4th quartile)		
Airbnb	0.011	0.023	0.015	-0.009	0.036***	0.082**
	(0.010)	(0 .017)	(0.030)	(0.027)	(0.013)	(0.041)
Population	0.401**	0.34	-0.895	0.383	0.131	0.206
	(0.154)	(0.708)	(0.677)	(0.962)	(0.213)	(0.218)
Interactions						
(1st quartile)					-0.027**	
					(0.012)	
(2nd quartile)					*base category*	
(3rd quartile)					-0.029*	
					(0.015)	
(4th quartile)					-0.026*	
					(0.015)	
Population (continuous)						-0.007
						(0.004)
N	5,312	4,980	5,063	4,980	20,335	20,335

Table 4 - Regressions on rental rates.
Notes: reported standard errors are clustered at the municipality level.
*** p < 0.001, **p<0.005, *p<0.01.

	(1)	(2)	(3)	(4)	(5)	(6)
	(1st quartile)	(2nd quartile)	(3rd quartile)	(4th quartile)		
Airbnb	0.020*	0.005	0.024	-0.031**	0.003	-0.038
	(0.012)	(0.014)	(0.014)	(0.013)	(0.011)	(0.031)
Population	0.586***	1.942***	0.677	1.033*	0.993***	1***
	(0.191)	(0.471)	(0.456)	(0.566)	(0.163)	(0.162)
Interactions						
(1st quartile)					0.0003	
					(0.013)	
(2nd quartile)					*base category*	
(3rd quartile)					0.022*	
					(0.012)	
(4th quartile)					0.021**	
					(0.011)	
Population (continuous)						0.005*
						(0.003)
N	5,312	4,980	5,063	4,980	20,335	20,335

Table 5 - Regressions on house prices.
Notes: reported standard errors are clustered at the municipality level.
*** p < 0.001, **p<0.005, *p<0.01.

In columns 1-4 of both tables, we report the coefficients for our independent variable (Airbnb) and population, respectively, on rental rates and house prices. We use four subsamples that correspond to

the four quartiles of the population distribution in the Apulian municipalities. We consider the year 2022 for the segmentation in order to have a consistent definition over time.

In column 5, we report the results of a joint regression with the interactions between Airbnb and the dummy variables of the four quartiles, using the second quartile as a base category. As we can see, the coefficients for rents are statistically significant and negative, while the coefficients for house prices become statistically significant in the third quartile.

In Column 6 we use the following model, treating population as a continuous variable:

$$ln(rents/prices) = \alpha + \beta_1 ln(Airbnb) + \beta_2 ln(population) + \beta_3 ln(income) + \\ + \beta_4 ln(Airbnb) \cdot ln(population)$$

To interpret the coefficient of the interaction (β_4) in a log-log model, we need to compute the derivative with respect to Airbnb, using the chain rule. This allows us to find the elasticities both for rents and prices, as represented in Fig. 4.

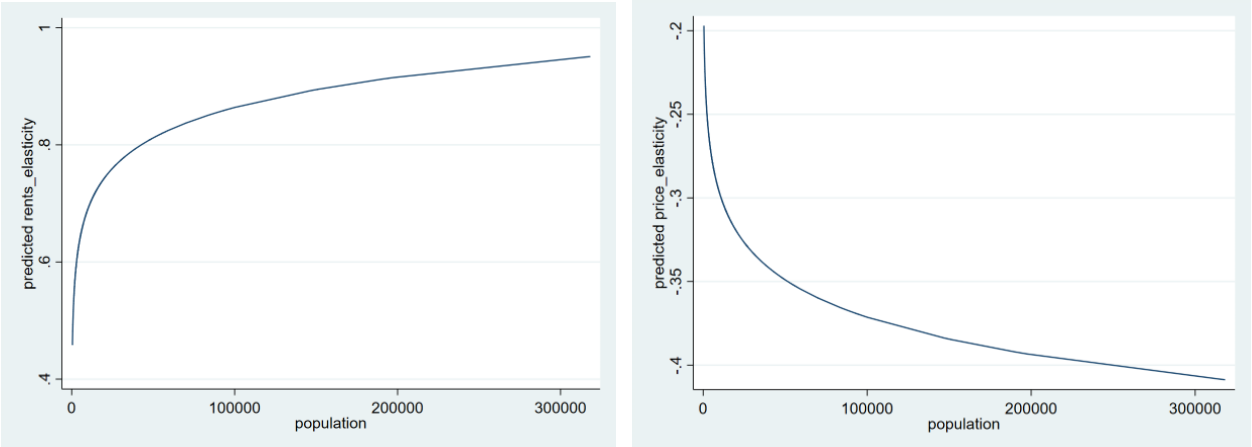

Fig. 4 - Elasticity of rents (left) and house prices (right) vs. population.

The left graph indicates that as the population increases, the impact of Airbnb listings on rental rates decreases. In other words, the presence of Airbnb has a smaller effect on rental rates in big cities compared to small towns. These results confirm our hypothesis that the effect of Airbnb on rental rates is context-dependent and influenced by the size of the town. As we can see from table 3 (column 6), the negative interaction coefficient implies that the presence of Airbnb listings has a lesser impact on rental rates in larger towns, where other factors related to town size may play a more prominent role.

The right graph displays a range of negative elasticities, ranging from -0.2 to -0.4. As we can see in table 4 (column 6), the coefficient for the interaction term is marginally significant at 90% confidence level and positive, indicating that the impact of Airbnb on house prices is bigger when the city size,

proxied by the population, increases. In other words, the presence of Airbnb listings has a bigger effect on prices in big cities than in small towns.

7. Policy recommendations

The regulation of short-term rentals has sparked public debate, especially in heavily touristic cities. Residents worldwide have increasingly expressed their grievances regarding the adverse effects of Airbnb rentals in their neighbourhoods, including noise disturbances from visitors, traffic congestion, parking, waste management, and safety concerns arising from unfamiliar individuals entering the neighbourhood and buildings (Gurran & Phibbs, 2017). Furthermore, Cócola Gant (2016) argues that many cities around the world have been witnessing a decline in local culture and social cohesion within their neighbourhood. In consideration of this, both local and national policy makers feel the urge to regulate Airbnb and other STR platforms to balance the interests of visitors and residents/businesses.

7.1 Classification of policies

The regulation of short-term rentals (STRs) encompasses a wide range of approaches, spanning from complete bans to unrestricted "laissez-faire" policies. Regulatory measures can be classified into three categories: quantitative, spatial, and qualitative (Nieuwland & van Melik, 2018; Hübscher & Kallert, 2022).

- **Quantitative regulations** encompass limitations on the number of STR accommodations, the number of allowed visitors or days rented, on the number of times an Airbnb can be rented out per year, as well as restrictions on entire dwellings while permitting individual bedrooms, and taxation.
- **Spatial restrictions** involve controlling the number of STRs per multi-family house, allowing owner associations to have a say, establishing a balance between regular flats and Airbnb listings in a neighbourhood, restricting STRs to specific locations and imposing spatial distance requirements between listings.
- **Qualitative restrictions** involve setting standards for listing qualifications such as hygiene and security, as well as implementing licensing/registration numbers.

7.2 Examples of policies implemented in the world

Overall, European cities have a more receptive approach to Airbnb than American cities, which are stricter. In addition to cultural differences, an explanation could be that Airbnb has been active longer in the US, possibly having bigger impacts on cities by now and requiring stricter regulations.
However, many European cities have already responded to the growing number of short- term rentals and proposed a variety of regulations, although little is known about their efficiency. Amsterdam and Barcelona have adopted the most stringent tools. In 2014, Amsterdam was the first city to reach agreements with Airbnb to collect the tourist tax from the owners on behalf of the municipality. In 2019, they imposed an absolute ban on using recently acquired properties for tourist rentals. In 2020, they banned tourist rentals on Airbnb in the historic centre of the city. In addition, in the rest of the

city, permits are only granted if the property is occupied for most of the time, if it is not rented for more than 30 days, and if it is rented to no more than four people, with owners required to register every rental period with the city. Sanctions of up to 21,000 euros are imposed for those who do not comply with these rules.
Barcelona, like Los Angeles, New York, and Vienna, banned STRs within certain areas of a city. In Berlin, as of March 1, 2023, short-term rental listings on Airbnb must display a valid registration number, or the platform will deactivate the listings, while second homes can only be rented for a total of 90 days per year. Paris also established a limit of 120 days per year. In 2023, the Portuguese government has presented a plan which will block new licenses in all urban areas. Between 2018 and 2019, governments in Denmark, Estonia, and Norway negotiated data-sharing agreements with Airbnb to better enforce hosts' tax obligations.

7.3 Policy analysis and evaluation

Taxation and data-sharing agreements. Garz & Schneider (2023) conducted an analysis to examine the impact of the Danish data-sharing agreement on hosts' behaviour using a difference-in-differences approach, comparing it with Sweden as a control. According to their study, hosts with a single property were the most likely to exit the platform, whereas hosts with multiple properties and those in areas with low initial Airbnb presence increased the availability of their rentals and witnessed a surge in bookings. These findings indicate that the data-sharing agreement had contradictory effects: it boosted tax evasion detection but simultaneously promoted the commercialization of short-term rentals, conflicting with the goals of regulatory measures. Garz & Schneider (2023(1)) also analysed the "Airbnb tax" introduced in Norway in 2018. They found that the policy did not induce hosts to exit the platform, nor did it lead to an increase in rental prices. These findings support the notion that the tax enforcement was inadequate, as it relied on taxpayers to self-report their rental income.

In this regard, the EU Council Directive 2021/514 (commonly known as DAC7) focuses on the automatic exchange of information in the field of taxation, requiring digital platforms (like Airbnb) to report earnings of hosts to local tax agencies. It entered into force on 1 January 2023, therefore analyses on its efficacy are not available yet.

Complete ban. Koster et al. (2018) conducted a study to evaluate the effectiveness of Home Sharing Ordinances (HSOs), a type of ban, in Los Angeles' housing market. Their findings revealed that, on average, HSOs managed to reduce rents in the city by 2%. However, they argue that this policy has limited impact on the broader issue.

This is also evidenced by Lee (2016), who argues that a complete ban on short-term rentals (STRs) would address Airbnb's role in Los Angeles' affordability crisis, but it would also deprive the city of the economic benefits associated with STRs.
Gauß et al. (2022) analysed the effects of HSOs in Berlin, Munich, and Hamburg. They provide evidence that HSOs (unintentionally) reduce the short-term rental activity of occasional hosts, while many commercial hosts continue to operate in violation of existing regulations. Additionally, the

study reveals that only few properties are redirected from short-term rental use to the long-term residential market, and there is no evidence of a decrease in long-term rental prices.

"One Host, One Home". Chen et al. (2022) studied the so-called "One Host, One Home" policy, which was implemented between 2016 and 2017 in New York City, San Francisco and Portland, Oregon. This policy mandated that hosts could only list properties at a single address on Airbnb. Non-compliance with this regulation could result in the removal of properties by Airbnb and even suspension of host accounts. Such a policy may, on the one hand, remove properties from the platform and force the hosts to list them in the local residential markets. On the other hand, it may prevent hosts from displacing additional properties from the local residential markets to Airbnb.

7.4 Why is it so difficult to regulate Airbnb?

As argued by Guttentag (2015), regulating Airbnb turns out to be quite challenging. Traditional regulatory models, which have predominantly focused on business-to-business (B2B) or business-to-consumer (B2C) interactions, have struggled to effectively address the unique nature of Airbnb as a peer-to-peer (P2P) platform.
Hübscher & Kallert (2022) identified four aspects that complexifies the aim of regulating STRs, namely (i) legal, (ii) economic, (iii) technical and (iv) political aspects.
From a **legal** perspective, regulating short-term rentals (STRs) is complicated due to the involvement of multiple levels of jurisdiction. Local impacts of STRs often clash with regional, national, and even supra-national objectives, creating complexities in the legislative process. Additionally, finding the right balance between regulation and safeguarding personal rights, such as property ownership, is a challenge that can render regulations vulnerable to legal challenges. Lee (2016) argues that regulations on Airbnb STRs are municipal in nature. However, national governments might negotiate with Airbnb and exchange greater cooperation with targeted enforcement efforts.
From an **economic** standpoint, STRs play a significant role in driving urban development and contribute to the local economy. Various stakeholders, including providers of accommodation, food and beverages, and transportation, benefit from the presence of STRs. Consequently, policymakers try not to cut-off the positive effects, such as tax revenues.
The **political** dimension of STR regulation is marked by the influence of lobby groups representing different stakeholders. These groups actively advocate for favourable regulations, and their influence can be observed at the local and national levels. However, according to Lee (2016), regulators should prioritize the housing needs of residents over the needs of tourists when the two aims conflict.
Technical challenges further complicate the efficient regulation of sharing platforms like Airbnb. Limited access to detailed data from platforms hinders decision-making, as regulations need to be crafted with imperfect information. Moreover, despite the recent scholarly investigations into Airbnb's effects on rental markets, policy makers have had inadequate information with which to make effective informed policy decisions (Horn & Merante, 2017).

The complexity of regulating platforms like Airbnb is also highlighted by Nieuwland & van Melik (2018), who questioned to what extent regulating Airbnb and other STR platforms is actually feasible, since it seems that no matter if cities decide to prohibit or restrict, enforcement is difficult and could

possibly stimulate the illegal operation of STRs. However, not responding to the rise of STRs and their externalities is no option either. What is clear, is that many cities are far from figuring out how to handle this new player in the tourism field. According to Sequera & Nofre (2018), many global cities show a lack of efficient tools in tackling and addressing the negative impacts derived from touristification, since our understanding of the effectiveness and political feasibility of these regulatory attempts remains woefully inadequate (Wachsmuth & Weisler, 2018).
Wegmann and Jiao (2017) outlined four guiding principles for regulating urban vacation rentals:

1. Collecting data to gain understanding about their own local urban vacation rental market.
2. Limiting the concentration of urban vacation rentals within specific neighbourhoods.
3. Considering redistributive mechanisms between neighbourhoods and deploying dedicated staff to enforcement, funded via permit fees.
4. Distinguishing between commercially oriented operators and true "mom-and-pop" hosts.

Two key aspects emerge that require particular attention in the regulation of STRs: the spatial differentiation of policies and the differentiation between commercial and non-commercial hosts.

7.5 Spatial differentiation of policies

Scholars concur there is no one-size-fits-all solution. Even if the aim of a policy might be quite similar, the underlying processes and consequences differ per city or even per neighbourhood (Gurran & Phibbs, 2017; DiNatale et al., 2018), depending on geographic location and the type of property rented out or the popularity of the destination. While some cities want to embrace Airbnb to stimulate tourism, others would like to ban it completely or experiment with regulations based on taxation or security issues (Oskam & Boswijk, 2016). As suggested by Bao & Shah (2020), each policy recommendation must be tailored specifically to a district or neighbourhood, since Airbnb's effects are heterogeneous at the neighbourhood level. Regulations must differ according to the kinds and degrees of issues cities are facing, the available land within the city, the rigor of land use regulations, and construction costs (Gyourko & Molloy, 2015; Furukawa & Onuki, 2019).
Spatial restrictions, like those imposed in Vienna, Dublin, Barcelona and Madrid, can counteract the STR pressure on particular areas, such as the central residential neighbourhoods, without depriving less affected areas of benefits (Quattrone et al., 2016; Hübscher & Kallert, 2022).
Lee (2016) suggests assigning STR permits and restricting the number of permits per square mile or neighbourhood, or establishing a requirement that Airbnb STRs are permitted only in buildings that meet a specific affordability threshold. For instance, the city could encourage inclusionary housing by permitting STRs only in neighbourhoods or buildings where at least 30% of the units are affordable. This approach would incentivize property owners to subsidize apartments that are currently priced at market rates, thereby increasing the availability of affordable units for long-term residents. However, implementing and enforcing such solutions could be complex and challenging in practice.
Lastly, Nieuwland & van Melik (2018) suggests that not only big cities, but also smaller tourism destinations with relatively few STRs should be thinking about how to deal with these platforms.

7.6 Commercial and non-commercial hosts

Scholars also concur that the negative effects of Airbnb on local residents largely relate to commercial Airbnb hosts who offer whole properties exclusively for short-term rentals rather than hosts who sublet their own residence during occasional absences (Ayouba et al., 2020; Bao & Shah, 2020; Gauß et al., 2022).

According to Gauß et al. (2022), a commercial activity is a property for which at least one of these four criteria applies: (i) the property is offered by a host who simultaneously lists several properties for short-term rental, (ii) the whole property is continuously offered as available on the Airbnb platform, (iii) the whole property is rented out for more days than allowed by the city's HSO, (iv) the rental of the property on the Airbnb platform generates high revenues.

In numerous cities, particularly Lisbon, a significant phenomenon unfolded as foreign investors bought up houses and apartments to permanently rent out on platforms like Airbnb. Consequently, entire apartment blocks or even neighbourhoods turn into vacation rentals that operate in a similar way as hotels.

Commercial hosts undermine the very idea of home sharing, which is meant to constitute a peer-to-peer market. However, despite the evident conflict between commercial short-term rental activity and the fundamental principles of the home-sharing business model, platforms like Airbnb have not implemented measures to prohibit or decrease commercial activity. The reason is easy to understand, as they derive substantial fees from commercial short-term rentals, and such listings may enhance the overall appeal of the platform by expanding property availability and offering superior quality and convenience, such as professional cleaning, housekeeping services, and streamlined check-in and check-out processes.

In the absence of a move by Airbnb, it is then up to local and national regulators to prioritize their focus on commercial hosts. One possible approach to safeguard the local rental market from the influence of commercial operators is to design policy measures that encourage the listing of individual rooms rather than entire units in short-term rentals. This approach would encourage residents to utilize their spare capacity, allowing them to earn additional income while also aligning with the original purpose of Airbnb.

Barron et al. (2020) suggested levying occupancy tax on hosts who rent the entire home for an extended period or to require proof of owner-occupancy to avoid paying occupancy tax. A targeted taxation system focusing solely on commercial operators could enable local governments to generate revenue through occupancy taxes from commercial operators who are often accused of evading taxes by utilizing home-sharing platforms. This policy would discourage the commercial use of Airbnb while allowing local landlords to rent out their surplus space. Moreover, the tax revenue generated could be utilized to fund the development of additional affordable housing units, directly addressing the larger problem at hand. Other cities have taken a different approach, establishing rules to permit short term rentals so long as they are hosted by residents who remain primary occupants of the dwelling.

Lee (2016) made several proposals, such as to implement a ban on year-round listings of apartments on Airbnb and similar platforms, with a limit on the number of days a unit can be listed, to exempt occasional hosts from taxes on short-term rental transactions, to set a cap on the number of units that hosts can list on Airbnb in a given year and on the number of units in a building that property owners and managers can list on Airbnb. Finally, to address the issue of unfair competition between Airbnb hosts and hotels, the author proposes to impose an occupancy tax on units listed on Airbnb that exceed

the established cap. The revenue generated from this tax can then be allocated towards strengthening code enforcement efforts within the city.

7.7 The current regulation in Italy and Puglia

In Italy, the regulation of short-term rentals for tourist purposes is governed by Article 53 of the Tourism Code[5]. According to this article, dwellings rented exclusively for tourism fall under the provisions of the Civil Code regarding leases (Articles 1571-1614). These leases are limited to a maximum duration of three months. If the rental period exceeds thirty days within a calendar year, registration is mandatory, and the landlord must declare the personal information of their guests to the local Public Security Authority[6].

Law no. 144 of June 23, 2017, further clarifies that short-term rentals refer to lease contracts for residential properties with a duration not exceeding 30 days, including those that provide additional services such as linen and cleaning.

The option to apply a 21% flat tax regime is available, except when the tenants are conducting business or self-employment activities. Thus, the flat tax can only be chosen if both parties involved act as private individuals. However, contracts that include additional services such as breakfast, food and beverage service, car rental, tourist guides, or interpreters are considered taxable activities under business criteria, even if they are performed occasionally.

The Italian law, therefore, falls under the "laissez-faire" approach. In fact, it seems to facilitate the spread of Airbnb by minimizing taxes, especially for non-commercial rentals.

To date, Venice stands as the sole city in Italy with regulatory measures in place to restrict the number of properties designated for tourist purposes. They opted for a limitation of 120 days per year and in case the landlord decides to exceed this threshold, he will have to change the intended use of the property.

Other big cities, such as Milan and Florence appear to be inclined to regulate Airbnb. On June 1st, 2023, the Mayor of Florence announced a ban on further rentals of properties on Airbnb in the UNESCO area of the historic city centre, and a 3-year tax reduction for families who decide to transition from short-term rentals to long-term rentals.

On May 30th, 2023, after insistent pressure from several trade unions (firstly Federalberghi) and some Italian mayors, the Minister of Tourism presented a draft law to limit "the Airbnb Far-West". This draft law aims to "provide a uniform regulation at national level aimed at tackling the risk of oversized tourism compared to the local accommodation potential and at safeguarding the residential nature of historic centres and preventing depopulation". Some of the proposed changes (still under discussion) include the implementation of a national identification code, the establishment of a minimum two-day stay requirement in Municipalities with a high tourist density (determined by ISTAT based on data from hotels and non-hotel accommodations rather than short-term rentals), and the official recognition of property managers, who would be required to act as tax substitutes.

Meanwhile, since tourism falls exclusively under the jurisdiction of the regions[7], each region has the authority to legislate on matters related to Airbnb and short-term rentals. Puglia stands out as one of the few regions in Italy that has taken steps to regulate short-term rentals within its territory. Through Regional Law 17 December 2018, No. 57, the Region has implemented a free license known as the

[5] Annex to Legislative Decree 23 May 2011, n. 79.

[6] https://alloggiatiweb.poliziadistato.it/PortaleAlloggiati/. This declaration must always be made, regardless of the duration of the lease, when the rental is intended for non-EU or stateless citizens.

[7] Article 117 of the Italian Constitution.

CIS (Structure Identification Code). Starting from July 1, 2020, it has become mandatory for hosts to obtain this code, which can be easily obtained online and at no cost. The CIS should be displayed in all advertising media, including platforms like Airbnb. Failure to comply with this requirement may result in fines ranging from €500.00 to €3,000.00 for each advertised activity.
Moreover, 90 municipalities in Puglia are authorized by the Region to impose the tourist (or occupancy) tax. However, out of these 90 municipalities, only 38 have currently implemented the tax, while the rest are still in the process of doing so. It's important to note that the implementation of the tourist tax is determined at the local level, and different municipalities may have varying regulations regarding its application. Therefore, some municipalities may require the payment of the tourist tax also for short-term rentals, while others may not.

7.8 Final suggestions

Policymakers should prioritize the objective of their regulations, which should aim to limit the reallocation of housing from long-term to short-term rentals while still encouraging owner-occupiers to engage in home-sharing. Quantitative regulations, such as limiting the number of days per year a unit can be listed, can effectively prevent "hotelization". It is crucial to tailor measures to specific cities/neighbourhoods and differentiate between commercial and non-commercial hosts.
Furthermore, policymakers should prioritize transparency and awareness by enhancing information accessibility for both guests and hosts. Guests need comprehensive information about quality, safety measures, and other relevant aspects of public and private lodging options. Similarly, hosts and operators must be well-informed about their rights and responsibilities to ensure responsible practices.
Lastly, it is important to recognize the challenges involved in monitoring these policies, given the limited access local authorities have to comprehensive listings data. Monitoring efforts not only increase administrative burdens but also incur additional costs and require significant time and effort.

8. Conclusions, limitations of the study and future research

The aim of this study was to quantify the impact of Airbnb on both the rental rates and the house prices in the Apulian municipalities, and to investigate whether this impact could be related to the size of the municipality. The baseline results indicate that an increase in the number of Airbnb accommodations is associated with a 0.016% increase in both rental rates and house prices.

Although the contemporaneous effects may show statistical significance, it is important to note that the housing market often requires some time to react to the presence of Airbnb, particularly in terms of its impact on house prices. Therefore, incorporating lagged effects in the analysis will provide a more comprehensive understanding of the relationship between Airbnb and housing market dynamics. Therefore, we will try to employ a Fixed Effects Autoregressive Model in future research.

The fact that municipalities with a higher number of Airbnb accommodations also show higher rental rates could indicate a spurial correlation and not necessarily a causal relationship. Indeed, it is plausible that both variables are driven by a common factor, such as a higher quality of life, which

attracts both long-term residents (leading to higher demand for rentals) and short-term tourists (leading to higher demand for Airbnb rentals). Unfortunately, we lack the necessary data at the municipality level to control for factors such as the unemployment rate, the number of schools, the crime index, etc. In econometrics this situation in which the relationship between the variables is bi-directional is known as simultaneity, and it violates the assumption of exogeneity. To overcome the endogeneity issue, we will employ an instrumental variable.

Then, we divided the sample according to the quartiles of the population distribution and incorporated an interaction term between population and the number of Airbnb accommodations in order to examine the potential variation in the impact of Airbnb on rental rates or house prices based on the size of the town, as measured by its population. However, we could go further with this analysis by considering the area and the density of the municipalities, or even finding other factors that allow us to distinguish between an urban and a rural context.

Due to these various factors, we have obtained conflicting results, emphasizing the necessity for further investigation.

Moreover, we examined the impact of COVID pandemic restrictions on the relationship between Airbnb and rentals. However, the available data does not sufficiently capture this effect. While the listings may have remained active (free), it is plausible that they did not receive any reservations during that period. Conducting further analysis with data on the number of reviews per month could provide valuable insights in estimating this potential effect.

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