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Short-term rentals and long-term residence in Amsterdam and Barcelona: A comparative outlook

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ABSTRACT

The aim of this study is to estimate the effects of tourism growth on residential stability in two cities: Amsterdam, The Netherlands, and Barcelona, Spain. Our focus is on short-term rentals advertised on Airbnb, which have been used to compute a measure of pressure on the available housing stock over a period of three years (2017–2019). The hypothesis was made that this measure would correlate with the average duration of residence in Amsterdam, and with the percentage of long-term residents in Barcelona, after controlling for rent and house prices, and demographic trends. Fixed effects panel regression models, with area and time-specific intercepts, are used to test the hypothesis. We found that negative externalities of Airbnb for residential stability are consistent in both cities, although these are mostly associated with a rent increase in Amsterdam, as opposed to rising property values in Barcelona. These results largely reflect the structural differences in tenure regimes and housing policies between the two case studies. More importantly, however, they point to a process of progressive social disinvestment in tourism destinations fuelled by the departure of long-term residents. The implications of our findings for urban policies in a post-pandemic scenario are discussed.

1. Introduction

In the thick of the pandemic period, debates on tourism in our cities were strongly polarized between the need for a radical restructuring and even downsizing of the role of the tourism industry as an agent of urban change (Fennell & Cooper, 2020; Fletcher et al., 2021; Lerpold & Sjöberg, 2021), and the idea that without it many cities would have lost a huge share of their revenues (Milano & Koens, 2022; World Travel & Tourism Council, 2019). This polarization has been reproduced in the present-day recovery debate in the academia and beyond, with some arguing in favour of going back to business as usual, also in terms of giving priority to funding schemes that would safeguard income and employment in cities (Butcher, 2021), and others advocating for taking the opportunity of the temporary breakdown of mobility systems to advance towards as a more sustainable industry (Benjamin et al., 2020; Brouder, 2020; Ioannides & Gyimóthy, 2021). In this paper, we focus on a specific facet of the problem by looking at the effects of tourism growth on residential stability, and we use the cities of Amsterdam and Barcelona as our case studies.

Somehow, these cities can be seen as two privileged standpoints from where to analyse this particular moment in history for at least two reasons. First, they were among the top European destinations for the number of international visitors in 2019 (Yasmeen, 2019), which translates into some twenty million overnight stays in accommodation establishments (ECM, 2021). Visitors staying in unregistered Airbnb accommodations and daily visitors inflate these figures further in two cities that have a total population of respectively 0.8 and 1.6 million in the same reference year. These data reveal that tourism in Amsterdam and Barcelona may have been reaching a tipping point before the pandemic, which is corroborated by the mounting social and political debate around the excesses of tourism and the related disruptions reported, among others, by Russo and Scarnato (2018), and Gerritsma (2019). Second, our case studies are quite dissimilar in terms of their housing stocks and tenure regimes (i.e., strong social housing tradition in Amsterdam, and dominance of homeownership in Barcelona), thus opening the possibility of understanding whether tourism pressure may act differently on residential stability patterns depending on the structural features of the city under scrutiny.

Keeping these differences in mind, we use pooled regressions with fixed effects to assess the influence of three years of Airbnb activity

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(2017–2019) on two proxy measures of residential stability. The contribution of this study to the literature is two-fold. First, from an empirical perspective, the proposed quantitative and comparative analysis of what has been called "tourism-led gentrification" (Cocola-Gant, 2018) goes against a predominant qualitative and single-case research trend. In this regard, our analysis aligns with current efforts to provide quantitative evidence on gentrification-induced displacement (Easton et al., 2020), and it does so by focusing on two European cities, while most of the relevant literature focuses on the US or UK. Second, from a conceptual and policy-oriented perspective, the novelty of our modelling strategy lies in its attempt to identify specific population groups that might potentially be at a greater risk of displacement due to the impact of tourism on housing prices. Our focus is on long-term residents, a status that the literature associates with greater social cohesion and access to social support (Clampet-Lundquist, 2010; Kasarda & Janowitz, 1974; Keene et al., 2013; Oh, 2003; Sampson, 1988), which, in turn, is considered to benefit health outcomes (Anguelovski et al., 2020; Kawachi & Berkman, 2001), and improve life satisfaction (Lewicka, 2011).

2. Effects of tourism on rent and housing prices: a pre-pandemic outlook

Before the outbreak of the pandemic, the travel and tourism sector contributed to 10.4 % of the GDP globally, with over 300 million jobs, according to the World Travel & Tourism Council (2019). However, evaluations of the economic impacts of tourism should not overlook the associated social costs, which makes net benefits more questionable (Dwyer et al., 2010), and have been tackled instead by the current post-pandemic recovery debate (Qiu et al., 2020). Pioneering research in this area found that tourism growth correlates with inflation, and an increase in taxes to finance infrastructure (Bull, 1991; Stynes, 1997), and ever since, a number of studies have reached similar conclusions (Dwyer et al., 2004; Gooroochurn & Sinclair, 2005; Tkalec & Vizek, 2016).

In a similar vein, scholars have gathered solid evidence of the effect of tourism activity on rent and housing prices. This line of research has received an additional impetus after the 2007–2008 financial crisis and the growth of short-term rentals (STRs). According to Simcock (2021: 4), platforms such as Airbnb "have been 'embraced' by Governments and commentators globally as a new route to increasing economic opportunities" after the 2007/08 financial crash. However, fifteen years later the set-up of Airbnb in San Francisco, criticism of the platform economy model is on the rise. While Airbnb allows property owners, including small-portfolio private landlords (Ronald & Kadi, 2017), to access a global market that would otherwise be precluded to them, it has also engendered a huge impact on housing availability and affordability (Crommelin et al., 2018). The mechanism through which this happens is well-documented in the literature: investments in STRs remove rental stock for longer-term rentals, therefore worsening housing availability for residents (Barron et al., 2021). In line with the rent gap theory (Smith, 1979), the growth of STRs widens the gap between actual and potential economic returns to properties, attracting investment flows and affluent newcomers to the detriment of low-income residents.

Narrowing the focus on studies at the city level, there is a large academic consensus on the fact that tourism and STRs drive up rents and housing prices. Ground-breaking analyses by Gotham (2005), and Gladstone and Préau (2008), established a link between changes in housing values due to tourism pressure and the displacement of low-income and African-American residents in New Orleans, Louisiana. Horn and Merante (2017) report that one standard deviation increase in Airbnb listings correlates with a 5.9 % decrease in the number of rental units in Boston, Massachusetts, and a 0.4 % increase in rental fees. On the other hand, Lee (2016) has shown how, in the case of Los Angeles, the impact of STRs on rents is unevenly distributed across the city landscape and that, in 2014, rents in neighbourhoods with the highest rates of Airbnb listings were 20 % higher, and increased 33 % faster, than rents citywide. Evidence of such uneven spatiality of STRs and their impacts on resident communities is also abundant in cases on the other side of the Atlantic (Amore et al., 2020; Clancy, 2022; Cocola-Gant & Gago, 2021; Cunha & Lobão, 2021; Grisdale, 2021; Koster et al., 2021), including Amsterdam and Barcelona, as discussed in the subsequent section.

Tourism-led gentrification has become a reality in many cities across the globe. Many cities have embraced early the growth of tourism activity to accompany inner area regeneration programs and transition to the post-industrial economy, under the paradigm of neoliberal strategic planning (Eisinger, 2000; Judd & Fainstein, 1999). These operations, generally achieved through cultural branding programs and iconic operations of redesign of the built environment and public space, have been germane to favouring processes of social regeneration and revalorization (Glass, 1964; Smith, 1979). Scholars have characterised this as the displacement of low-income residents in favour of wealthier ones. Contrasting this, tourism-driven gentrification, which is generally aligned with accounts of the "fifth wave of gentrification" and the related financialisation and cosmopolisation of housing property, could be described as a complex process of concentration of property by professional investors and substitution of long-term residents with temporary dwellers, including tourists in short-term vacational rentals. One common trait is that touristified neighbourhoods and city centres at large are losing a stable population base (e.g., Celata & Romano, 2022, for the Italian case).

Following Marcuse (1985), we can distinguish between "direct displacement", notably through eviction, and "exclusionary displacement", by means of indirect mechanisms that make properties and rents unaffordable. These are two different facets of the same process that has been analysed by Wachsmuth and Weisler (2018), who qualified the process of neighbourhood change in New York City during the period 2015–2017 as "Airbnb-induced gentrification". These authors found a strong overlap between STRs distribution and the racial segregation of African Americans and Hispanics. They also introduce a nuance that is of particular value to this paper, suggesting that the growth of Airbnb does not necessarily imply a reduction in housing availability for long-term residents. If owners rent their properties while they are out of the city or rent single rooms on a sporadic basis, "then even a large short-term rentals sector would be compatible with no long-term housing loss" (Wachsmuth & Weisler, 2018: 17). On the other hand, this loss is more likely to occur in neighbourhoods that concentrate STRs throughout the whole year, which eventually lead to severe shortage of rental housing.

Despite the valuable contributions mentioned above, this is an area in the field of gentrification studies that has scope for further research addressing the consequences of price hike on neighbourhood change. Also, research on tourism-led gentrification is mostly grounded on qualitative analysis, or mixed-method design in which quantitative accounts are generally limited to a critical examination of descriptive trends on long-term rental capacity. Filling these gaps motivates the present analysis.

3. The state of play in Amsterdam and Barcelona

One of the reasons that make Amsterdam and Barcelona particularly suitable for a comparison of the effects of tourism growth on residential stability lie in their radically different historical tradition in housing policies. According to Statistics Netherlands (2020), home ownership in Amsterdam accounted for 29.1 % in 2020, while the remaining stock was in the rental market, as social housing (40.4 %), and private renting (30.5 %). However, the share of social housing has been shrinking in recent years to the advantage of the private rental market, which in 2011 included only 25 % of the housing stock (Aalbers et al., 2020; Bosma et al., 2018). Although this revival of private rental is part of a broader and cross-national process of economic restructuring since the 2007–2008 financial crisis, the Amsterdam case contrasts with that of other cities at the international level as this shift has been "not only

state-controlled but also state-initiated" (Hochstenbach & Ronald, 2020: 1627). In the 1990s, housing policy reforms in The Netherlands started to pro-actively promote homeownership (Aalbers, 2016) to the point that the share of owner-occupied dwellings increased from 12 % of all housing in 1998 to roughly one-third of the total stock in 2020. While pro-homeownership policies initially led to a decrease in both social housing and private sector rentals, the financial crisis contributed to bringing in new players willing to invest in private rental supply, and second, by restricting access to mortgage credits, hence to homeownership. As a result, access to affordable housing has become particularly problematic for middle-income residents who do not qualify for social rent allocation but are also unable to buy at current market prices (Hoekstra & Boelhouwer, 2014). The housing shortage in Amsterdam has been further exacerbated as a result of the abrupt growth of Airbnb, which has been a significant driver of rising housing costs, according to Neuts et al. (2021). Prices of owner-occupied homes rose by 66 % in five years (2015–2020), while rent prices per m^2 have increased by an average of 3 % per year, according to Statistics Netherlands (2020).

As for Barcelona, in spite of the steady increase in rental tenure over the past 10 years, ownership still accounts for almost two-third of the total housing market (Sender et al., 2021). At the same time, the stock of social housing (1.07 %, that is, 8758 units according to the Ministry of Transport, Mobility and Urban Agenda, 2020), is significantly lower compared to Amsterdam or other cities in Europe (Barnett et al., 2020). These figures can be largely interpreted along the lines of the Spanish tradition of public policies on housing, which have been strongly oriented towards home ownership, as recognized in the Royal Decree-Law 7/2019, of 1 March, on urgent measures relating to housing and rental matters. According to Gil-García and Martínez-López (2021), "Spain is well-known for its outstanding economic specialization in the real estate sector (in close relationship with tourism)", a feature that has been initially fostered by the dictatorial regime, but that further consolidated during the period between 1995 and 2007. Here again, mortgage defaults and the devaluation of residential properties following the financial crisis inaugurated a new cycle of housing financialization, the erosion of tenants' rights and a progressive privatization of public housing (García-Lamarca, 2020; Vives-Miró, 2018; Yrigoy, 2018). State-led actions in the housing sector landed quite badly in urban areas like Barcelona with a deficit in their housing stock and that were facing the emergence of a phenomenon such as Airbnb, which encouraged the tourist accommodation business. Also, in relation to this, house prices went up by 38.1 % in the new-build market and by 50.3 % in the second-hand market between 2013 and 2018, with the result of "a systematic expulsion of local residents from Barcelona's centre and their removal to its outskirts" (Rolnik, 2019: 8). Measures to redress the situation are currently in place (e.g., the 2016–2025 Plan for the Right to Housing in Barcelona through which the City Council has planned to invest 1671.8 million euros in the construction of public housing), but enforcement proves difficult. In the context of structural deficits in terms of affordable housing, the analysis of Garcia-López et al. (2020) indicates that rents and housing prices went up between 2012 and 2016 at higher rates in neighbourhoods with a greater presence of Airbnb listings. Rising prices, coupled with pressure derived from the arrival of highly educated young migrants (López-Gay et al., 2020), have increased competition to reside in inner-city neighbourhoods in the Catalan capital (López-Gay et al., 2021).

Against this background, the housing affordability crisis has become one of the most pressing issues for residents and municipal institutions in Amsterdam and Barcelona. Following the example of other cities worldwide, in the aftermath of the 2007–2008 crisis, further growth of tourism activity (through a progressive liberalisation of accessibility and hospitality systems) was sought to mitigate the impacts of the financial shock and favour post-industrial transitions (Eisenschitz, 2016). However, such intensification of the tourism function of cities, and the simultaneous reconversion of a sizeable part of the housing stock towards STRs have contributed to inflate a housing bubble, whose social consequences have been severe for resident communities. The City Council of Amsterdam has been among the forerunners in its attempt to reduce the negative externalities of STRs, and the first city in Europe to reach in 2015 an agreement with Airbnb. Private properties could have been rented out for a maximum period of 60 days per year (further limited to 30 days per year starting from January 2019), while subsequent updates introduced additional constraints, for instance, by limiting to four the maximum number of guests, and requesting the payment of tourist and income taxes. However, the collaboration between Airbnb and the Amsterdam City Council has been interrupted in January 2019. Ever since, municipal policies have become growingly restrictive, and starting from April 2021, it is mandatory for STRs to state their registration number in the advertisement of the accommodation (Registratiesysteem Toeristische Verhuur, 2021). This has led to the abrupt reduction in total listings advertised on Airbnb, which went down from 16,648 in March 2021 to 2924 in October of the same year, that is, 82.4 % less in a few months.

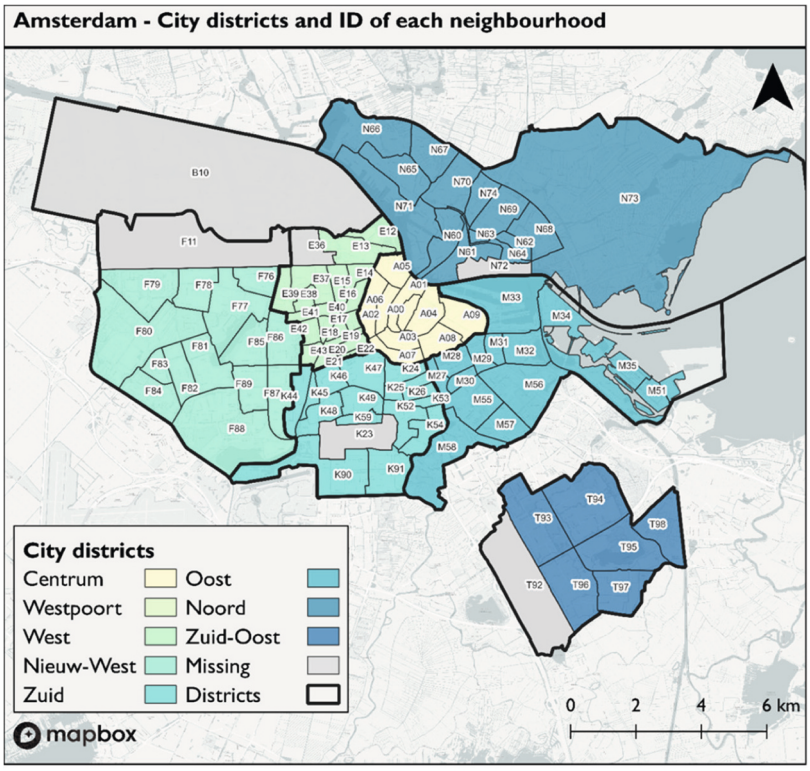
As for the regulation of short-term rentals in Barcelona, the Catalan capital is widely considered to have implemented the most restrictive measures. The government of mayor Ada Colau – an anti-evictions activist, leader of a wide grouping of social movements then integrated in the political group *Barcelona en Comú* – was elected in 2015 promising to challenge the increasing touristification of the city; as a result, a Special Urban Plan for Tourist Accommodation (PEUAT) was passed in 2017, capping the expedition of new permits for hospitality establishments – both hotels and short-term rentals – by zone. The main goal of this plan was to steer towards a better integration of the supply of STRs in the social geography of the city, 'de-growing' permits in central areas where this offer was estimated to produce the most adverse effects for residents, and allowing residual growth (e.g. to the extent in which permits in the central areas were withdrawn) in other less vulnerable areas (Blanco-Romero et al., 2018; see also Arias-Sans et al., 2022, for a comprehensive review of the legal frameworks).

Despite these efforts to avert the negative externalities of STRs, speculative processes have not relented in the two cities considered, as rent and housing prices continued to rise (Garcia-López et al., 2020; Statistics Netherlands, 2020). And yet, the consequences of rising prices for residents under the pressure of rising STRs are often presumed, but not proved. In what follows, we address this shortcoming by means of a comparative analysis of the effect of STRs pressure and changes in housing prices on residential stability in Amsterdam and Barcelona. To this end, fixed-effect panel regressions are implemented, with a test for mediation.

4. Data and method

Data on STRs, demographic trends, housing and economic indicators are retrieved from official statistical agencies in Amsterdam (Gemeente Amsterdam, 2021) and Barcelona (Statistics and Data Dissemination Department, 2021). The analysis is based on a 3-years period, with 2017 as the reference category, and 2019 as one of the correlates of the unrestricted model. Data are aggregated at the neighbourhood level, labelled as *wijken* in Amsterdam ($N = 92$), and *barris* in Barcelona ($N = 73$). The geographical units of analysis can be visualized in Figs. 1 and 2, respectively.

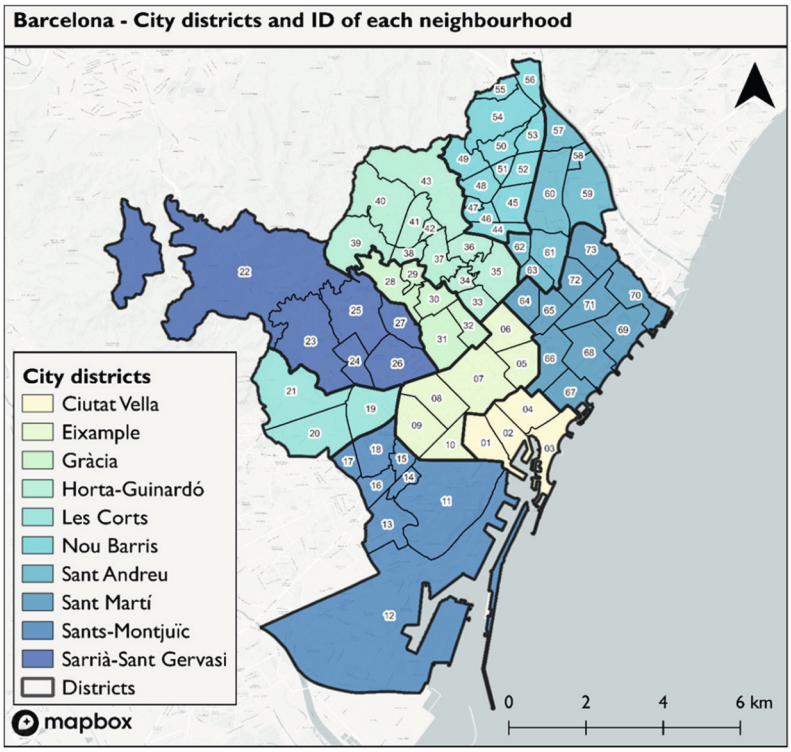
The operationalization of an equivalent measure of residential stability was prevented by data scarcity and heterogeneity. Prior research agrees on two structural elements that are inherent to residential stability, the length of residence and home ownership, which are thought to correlate with residents' willingness to invest in the community (Leviten-Reid & Matthew, 2018; Yang et al., 2019). However, addressing both elements was unfeasible in our case due to lack of data on the share of home ownership per neighbourhood in Barcelona, and because this would have introduced a bias in the analysis considering structural differences in the owner to renter ratio in the two cities. To overcome these limitations, we selected two proxies that ensured as much



Legend:

Table of neighbourhoods in Amsterdam			
ID	**Name**	**ID**	**Name**
A00	Burgwallen-Oude Zijde	K23	Zuidas
A01	Burgwallen-Nieuwe Zijde	K24	Oude Pijp
A02	Grachtengordel-West	K25	Nieuwe Pijp
A03	Grachtengordel-Zuid	K26	Zuid Pijp
A04	Nieuwmarkt/Lastage	K44	Hoofddorppleinbuurt
A05	Haarlemmerbuurt	K45	Schinkelbuurt
A06	Jordaan	K46	Willemspark
A07	De Weteringschans	K47	Museumkwartier
A08	Weesperbuurt/Plantage	K48	Stadionbuurt
A09	Oostelijke Eilanden/Kadijken	K49	Apollobuurt
B10	Westelijk Havengebied	K52	Scheldebuurt
E12	Houthavens	K53	IJselbuurt
E13	Spaarndammer- en Zeeheldenbuurt	K54	Rijnbuurt
E14	Staatsliedenbuurt	K59	Prinses Irenebuurt e.o.
E15	Centrale Markt	K90	Buitenveldert-West
E16	Frederik Hendrikbuurt	K91	Buitenveldert-Oost
E17	Da Costabuurt	M27	Weesperzijde
E18	Kinkerbuurt	M28	Oosterparkbuurt
E19	Van Lennepbuurt	M29	Dapperbuurt
E20	Helmersbuurt	M30	Transvaalbuurt
E21	Overtoomse Sluis	M31	Indische Buurt West
E22	Vondelbuurt	M32	Indische Buurt Oost
E36	Sloterdijk	M33	Oostelijk Havengebied
E37	Landlust	M34	Zeeburgereiland/Nieuwe Diep
E38	Erasmuspark	M35	IJburg West
E39	De Kolenkit	M51	IJburg Zuid
E40	Geuzenbuurt	M55	Frankendael
E41	Van Galenbuurt	M56	Middenmeer
E42	Hoofdweg e.o.	M57	Betondorp
E43	Westindische Buurt	M58	Omval/Overamstel
E75	Chassébuurt	N60	Volewijck
F11	Bedrijventerrein Sloterdijk	N61	IJplein/Vogelbuurt
F76	Slotermeer-Noordoost	N62	Tuindorp Nieuwendam
F77	Slotermeer-Zuidwest	N63	Tuindorp Buiksloot
F78	Geuzenveld	N64	Nieuwendammerdijk/Buiksloterdijk
F79	Eendracht	N65	Tuindorp Oostzaan
F80	Lutkemeer/Ookmeer	N66	Oostzanerwerf
F81	Osdorp-Oost	N67	Kadoelen
F82	Osdorp-Midden	N68	Waterlandpleinbuurt
F83	De Punt	N69	Buikslotermeer
F84	Middelveldsche Akerpolder	N70	Banne Buiksloot
F85	Slotervaart Noord	N71	Noordelijke IJ-oevers West
F86	Overtoomse Veld	N72	Noordelijke IJ-oevers Oost
F87	Westlandgracht	N73	Waterland
F88	Sloter-/Riekerpolder	N74	Elzenhagen
F89	Slotervaart Zuid	T92	Amstel III/Bullewijk
		T93	Bijlmer Centrum (D,F,H)
		T94	Bijlmer Oost (E,G,K)
		T95	Nellestein
		T96	Holendrecht/Reigersbos
		T97	Gein
		T98	Driemond

Fig. 1. Districts and neighbourhoods (*wijken*) in Amsterdam.



Legend:

Table of neighbourhoods in Barcelona			
ID	**Name**	**ID**	**Name**
01	el Raval	41	la Vall d'Hebron
02	el Barri Gotic	42	la Clota
03	la Barceloneta	43	Horta
04	Sant Pere Santa Caterina i la Ribera	44	Vilapicina i la Torre Llobeta
05	el Fort Pienc	45	Porta
06	la Sagrada Familia	46	el Turo de la Peira
07	la Dreta de l'Eixample	47	Can Peguera
08	l'Antiga Esquerra de l'Eixample	48	la Guineueta
09	la Nova Esquerra de l'Eixample	49	Canyelles
10	Sant Antoni	50	les Roquetes
11	el Poble Sec	51	Verdun
12	la Marina del Prat Vermell	52	la Prosperitat
13	la Marina de Port	53	la Trinitat Nova
14	la Font de la Guatlla	54	Torre Baro
15	Hostafrancs	55	Ciutat Meridiana
16	la Bordeta	56	Vallbona
17	Sants Badal	57	la Trinitat Vella
18	Sants	58	Baro de Viver
19	les Corts	59	el Bon Pastor
20	la Maternitat i Sant Ramon	60	Sant Andreu
21	Pedralbes	61	la Sagrera
22	Vallvidrera el Tibidabo i les Planes	62	el Congres i els Indians
23	Sarria	63	Navas
24	les Tres Torres	64	el Camp de l'Arpa del Clot
25	Sant Gervasi la Bonanova	65	el Clot
26	Sant Gervasi Galvany	66	el Parc i la Llacuna del Poblenou
27	el Putxet i el Farro	67	la Vila Olimpica del Poblenou
28	Vallcarca i els Penitents	68	el Poblenou
29	el Coll	69	Diagonal Mar i el Front Maritim del Poblenou
30	la Salut		
31	la Vila de Gracia	70	el Besos i el Maresme
32	el Camp d'en Grassot i Gracia Nova	71	Provencals del Poblenou
33	el Baix Guinardo	72	Sant Marti de Provencals
34	Can Baro	73	la Verneda i la Pau
35	el Guinardo		
36	la Font d'en Fargues		
37	el Carmel		
38	la Teixonera		
39	Sant Genis dels Agudells		
40	Montbau		

Fig. 2. Districts and neighbourhoods (*barris*) in Barcelona.

consistency as possible. In the Amsterdam dataset, the dependent variable refers to the average length of residence in the same address (in number of years) in each corresponding neighbourhood (*wijken*). This is a measure computed by the local statistical department itself with no possibility of manipulation on our own. In the case of Barcelona, official statistics provide a breakdown of the resident population into four groups by year of registration to the municipal census (less than 1 year, 1–5 years, 6–15 years, and more than 15 years before the publication of the census). In line with the EU definition of permanent residence (Directive 2004/38/EC, Article 16), we calculated the percentage of those who have been living in the same area (*barris*) for 6 years or more out of the total population as a measure of the share of long-term residents in Barcelona.

Bayesian panel data analysis with non-informative prior was run to estimate the effect of STRs-related variables on these two ad hoc proxy measures of residential stability. Robustness checks using area and time-specific fixed effects panel regression with least squares dummy variables (LSDV) are available upon request. Both analytical approaches return consistent result, although the Bayesian estimator is shown to reduce small sample biases, and therefore it suits better to relatively small cross-section in our datasets. Markov Chain Monte Carlo (MCMC) sampling was conducted using 2 chains for 10,000 fixed iterations, with area-variant dummies computed on the aggregated level of 7 districts in Amsterdam, and 10 in Barcelona. To avoid model misspecification in Amsterdam, a few cases were removed corresponding to non-residential areas where no residential property transactions occurred, with missing on the dependent variable, or where a considerable number of residential dwellings were constructed in the period 2017–2019. Deleted cases (see Fig. 1) are: Westelijk Havenhebied (B10), Sloterdijk (E36), Bedrijventerrein Sloterdijk (F11), Zuidas (K23), Noordelijke IJ-oevers West (N72), Amstel III/Bullewijk (T92). As a result of this process of data cleaning, area-specific fixed effect could be computed on 7 aggregated districts (*stadsdelen*) out of a total of 8, that is, all but district B Westpoort which includes only one neighbourhood (Westelijk Havenhebied, B10). More generally, it should be acknowledged that missing values for the rent variable in Amsterdam expose the model to some uncertainties. In fact, rent values are only available in 65 and 72 *wijken*, respectively for 2017 and 2019, out of a total of 98 (see Table 1). As the Mplus software removes cases with missing on independent variables from the analysis (listwise deletion), the sample size for the Bayesian model corresponds to the sum of complete cases for rent in this city ($N = 137$). However, mediation analysis allowed to hand missing data with full information maximum likelihood (FIML), thus increasing the number of observations to 181.

The restricted model is composed of eight independent variables, which definition is to a large extent comparable in the two cities. These can be grouped into four analytical dimensions. First, the pressure exerted by STRs on the residential housing stock, operationalized as the rate per 1000 dwellings of Airbnb listings (houses or rooms). Second, an economic dimension encompassing three variables associated with the mean disposable household income, and the inflation-adjusted values (base 2015 = 100) of house prices per m^2 and the monthly rental fees, this latter variable being a self-reported measure in Amsterdam. Third, a demographic dimension with the total resident population, plus two indicators of residential mobility to control our results for the rate per 1000 inhabitants of new residents moving in from another city, and the rate per 1000 inhabitants of internal changes of residence (to a different house within the neighbourhood). Fourth, a survey-based measure of satisfaction with the neighbourhood (i.e., *How satisfied are you with your neighbourhood?*) expressed in both cases on a 10-point scale where a high score means a positive assessment, a low score is a negative assessment. This information was respectively retrieved from the bi-annual *Wonen in Amsterdam* survey, and the 2017 and 2019 editions of the Barcelona City Council's Municipal Services Survey. A description of the data is provided in Table 1. Population data refer to the 1st of January of each corresponding year, while data on short-term rentals and residential mobility provide a snapshot for the whole year of reference.

As a result of the above, the fixed-effect equation looks as follows:

$$Y_{it} = \beta_{0t} + \beta_1 A_{it} + \beta_2 R_{it} + \beta_3 H_{it} + \beta_4 I_{it} + \beta_5 N_{it} + \beta_6 C_{it} + \beta_7 P_{it} + \beta_8 S_{it} + \alpha_i + \delta_i + u_{it}$$

where:

Y_{it} = residential stability at time t and neighbourhood i

β_{0t} = intercept term

$\beta_1 A_{it}$ = Airbnb per 1000 dwellings at time t and neighbourhood i

$\beta_2 R_{it}$ = inflation-adjusted values of monthly rental fees at time t and neighbourhood i

$\beta_3 H_{it}$ = inflation-adjusted values of house prices per m^2 at time t and neighbourhood i

$\beta_4 I_{it}$ = mean disposable household income at time t and neighbourhood i

$\beta_5 N_{it}$ = rate of newcomers per 1000 inhabitants at time t and neighbourhood i

$\beta_6 C_{it}$ = rate of internal changes of residence per 1000 inhabitants at time t and neighbourhood i

$\beta_7 P_{it}$ = total resident population at time t and neighbourhood i

$\beta_8 S_{it}$ = neighbourhood satisfaction at time t and neighbourhood i

α_i = neighbourhood-specific time-invariant characteristics

Table 1
Data description.

Variables	Year	Amsterdam					Barcelona				
		N	$\bar{x}$	Min	Max	SD	N	$\bar{x}$	Min	Max	SD
DV (length of residence; % of long-term residents)	2017	92	8.8	1.4	15.6	2.4	73	73.2	48.6	85.8	6.5
	2019	92	8.9	1.5	14.5	2.4	73	72.3	49.9	84.9	6.5
Airbnb listings (per 1000 houses)	2017	92	75.1	1.0	251.0	55.5	73	60.4	4.1	528.8	82.9
	2019	92	69.1	8.0	222.0	45.7	73	53.2	3.1	523.1	80.6
Rent (monthly fees in euro)	2017	65	633	491	948	99.7	72	796	409	1748	250.3
	2019	72	702	501	1264	122.3	73	848	356	1772	252.3
House price (per m^2 in euro)	2017	92	3316	1452	5358	1001	72	2841	1037	5931	1047
	2019	92	3755	1857	5576	1029	72	2814	960	5276	891
Household income (euros)	2017	92	42,272	27,500	107,500	14,774	73	19,780	10,554	38,449	6167
	2019	92	45,940	29,900	121,400	16,101	73	20,357	11,363	38,270	5871
Newcomers (per 1000 inhabitants)	2017	92	89.5	21.2	387.5	61.7	73	56.5	20.4	165.4	22.6
	2019	92	95.4	16.4	545.6	70.4	73	67.1	23.1	307.3	35.8
Internal change of residence (per 1000 inhabitants)	2017	91	15.1	0.6	75.0	10.6	73	14.2	4.9	51.1	8.1
	2019	92	12.8	2.9	36.7	6.5	73	14.3	4.2	44.7	6.7
Resident population	2017	92	9134	867	28,491	5383	73	22,262	611	58,315	14,664
	2019	92	9309	1129	29,481	5399	73	22,429	686	58,642	14,712
Satisfaction with the neighbourhood (1–10 scale)	2017	91	7.5	6.3	8.8	0.5	73	7.9	5.9	9.0	0.5
	2019	91	7.5	6.3	8.7	0.6	73	8.1	6.8	8.9	0.4

δ_t = year fixed effects
u_{it} = unobservable individual (cross-section) and time heterogeneity

5. Results

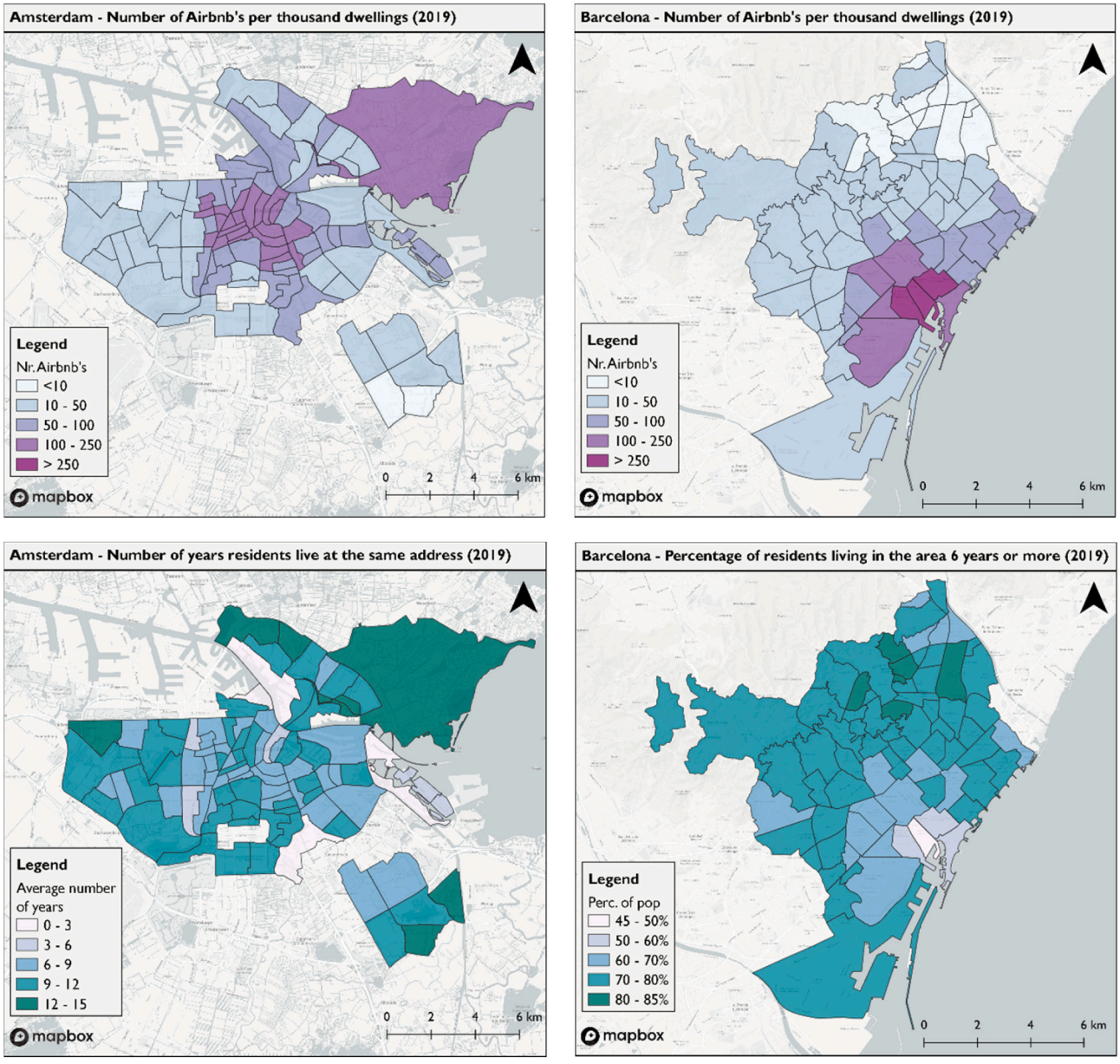
5.1. Spatial distribution of Airbnb per 1000 dwellings and the two measures of residential stability

Data for 2019 show that STRs are concentrated in the city centres, a spatial pattern that is consistent in both contexts. A few areas in Amsterdam behave as outliers due to their predominant non-residential land use, which decreases the denominator in our measure of STRs spread. A reverse similar pattern can be found with regard to the dependent variable in Barcelona. The percentage of residents living in the same area for 6 years or more is lower in city centre neighbourhoods. In Amsterdam, the pattern is more dispersed (Figs. 3–6).

Spatial descriptive statistics provide preliminary support to the hypothesis of a negative correlation between STRs and residential stability. A more structured hypothesis test is presented below.

5.2. Model output

The posterior predictive *p*-value indicates good fit with default priors, with values approaching the optimal cut-off of 0.5. The interpretation of the Bayesian estimation of standardized coefficients (Table 2) suggests that the pressure exerted by Airbnb on the housing stock is associated with lower levels of residential stability both in Amsterdam ($\beta = -0.18; p \leq .05$), and in Barcelona ($\beta = -0.31; p \leq .01$). Further consistencies in the two models refer to the protective role played by residents' satisfaction level with their neighbourhood, especially in Amsterdam ($\beta = 0.41; p \leq .001$), and the statistically significant and negative relationship between the rate of newcomers and the dependent variables. Also, the rate of internal change of residence correlates negatively with residential stability, which might appear controversial because, if people stay within the neighbourhood, the average length of residence should increase. However, this negative



Figs. 3–6. From top-left to bottom-right: the spread of STRs in Amsterdam and Barcelona, and spatial distribution of measures of residential stability in the two respective contexts.

Table 2
Modelling residential stability in Amsterdam (DV = average length of residence), and Barcelona (DV = % of long-term residents), stdz. coefficients.

Case Study 1 – Amsterdam	Bayesian model (N = 137)	Mediation analysis (*N* = 181)	Case Study 2 – Barcelona	Bayesian model (*N* = 143)	Mediation analysis (*N* = 146)
Unstandardized intercept	5.4**	3.49	Unstandardized intercept	62.7***	68.4***
	(1.95)	(2.36)		(6.5)	(6.1)
Airbnb per 1000 dwellings	−0.18*	−0.02	Airbnb per 1000 dwellings	−0.31***	−0.25***
	(0.08)	(0.08)		(0.09)	(0.08)
Rent	−0.17**	−0.23*	Rent	−0.17	−0.13
	(0.07)	(0.09)		(0.13)	(0.11)
House price	−0.14	0.06	House price	−0.21***	−0.19**
	(0.13)	(0.14)		(0.06)	(0.06)
Household income	0.01	−0.06	Household income	0.38**	0.31*
	(0.07)	(0.07)		(0.15)	(0.13)
Newcomers	−0.58***	−0.49***	Newcomers	−0.15*	−0.18**
	(0.05)	(0.05)		(0.07)	(0.06)
Internal change of residence	−0.13**	−0.13**	Internal change of residence	−0.24***	−0.23***
	(0.05)	(0.04)		(0.05)	(0.05)
Resident population	−0.17***	−0.09*	Resident population	0.08*	0.07*
	(0.05)	(0.04)		(0.04)	(0.04)
Satisfaction with the neighbourhood	0.41***	0.36***	Satisfaction with the neighbourhood	0.10*	0.06
	(0.07)	(0.07)		(0.05)	(0.04)
Year 2019	0.10*	0.06	Year 2019	−0.06*	−0.04
	(0.05)	(0.05)		(0.03)	(0.03)
B Westpoort	–	–	Eixample	0.04	0.03
				(0.08)	(0.07)
E West	−0.30***	−0.27***	Sants-Montjuïc	0.09	0.08
	(0.06)	(0.06)		(0.09)	(0.09)
F Nieuw-West	−0.14	0.06	Les Corts	0.04	0.04
	(0.09)	(0.09)		(0.07)	(0.07)
K Zuid	−0.15**	−0.09	Sarrià-S. Gervasi	0.08	0.08
	(0.06)	(0.06)		(0.10)	(0.09)
M Oost	−0.34***	−0.23***	Gràcia	0.10	0.09
	(0.06)	(0.06)		(0.08)	(0.08)
N Noord	−0.10	0.07	Horta-Guinardó	0.26*	0.23*
	(0.08)	(0.09)		(0.12)	(0.11)
T Zuidoost	−0.01	0.12	Nou Barris	0.24*	0.21*
	(0.07)	(0.08)		(0.15)	(0.12)
			Sant Andreu	0.26**	0.22**
				(0.10)	(0.09)
			Sant Martí	0.24*	21*
				(0.10)	(0.09)
Airbnb → rent		0.26***	Airbnb → rent		0.23**
		(0.08)			(0.07)
Airbnb → housing		0.71***	Airbnb → housing		0.34***
		(0.03)			(0.07)
Airbnb → rent → DV		−0.05*	Airbnb → rent → DV		−0.02
		(0.03)			(0.03)
Airbnb → housing → DV		0.05	Airbnb → housing → DV		−0.06**
		(0.10)			(0.02)
R^2	0.79	0.74	R^2	0.83	0.86

*** ($p \leq .001$).
** ($p \leq .01$).
* ($p \leq .05$).

correlation could be a consequence of how residential stability is defined in our model. In fact, it might well be the case that the model's output is retracing greater instability than our dependent variables can disclose, by pointing to a broader process of population turnover both inside and outside the administrative boundaries of a neighbourhood.

A few relevant differences also emerge, for example, with regard to the negative effects of rent and house rising prices. In line with the very nature of the housing market in the two contexts (a substantial rental market in Amsterdam vs. owner-occupancy rates among the highest in Europe), residential stability significantly correlates with rent increases in Amsterdam ($\beta = -0.17$; $p \leq .01$), while it is associated with changes of house prices in Barcelona ($\beta = -0.21$; $p \leq .001$). This difference is confirmed when testing for the mediation of rent and housing prices in the relationship between Airbnb pressure and the dependent variables. While Airbnb drove rent and house prices up during 2017–2019 in both cities, residential stability is a function of the indirect effect of the Airbnb pressure mediated by rent increase in Amsterdam ($\beta_{ind} = -0.05$; $p \leq .05$), and by changes in house values in Barcelona ($\beta_{ind} = -0.06$; $p \leq .01$). When missing data are handled with full information maximum likelihood in the mediation model, the direct path between the Airbnb variable and the average length of residence in Amsterdam is still in the expected direction, but not statistically significant anymore. On the contrary, the level of significance remains unchanged in Barcelona. This is possibly due to the mismatch between sample sizes in the baseline and the mediation models in Amsterdam. However, it is also reasonable to assume that it might be linked to a different nature of the problem in the two cities. In fact, negative externalities of Airbnb in Amsterdam seem to be mostly conveyed by a spill-over effect on housing market prices, while in Barcelona there might be additional (non-economic) factors behind residential stability, possibly connected to declining quality of life in the neighbourhood. Yet, at this stage of the analysis this is just speculation that would need additional testing.

Further dissimilarities refer to the weight of the economic dimension within the model, which is higher in Barcelona than in Amsterdam. This is due to the positive and statistically significant role of the household income in the former ($\beta = 0.38$; $p \leq .01$), which is absent in the latter.

This result, coupled with the negative relationship between house values and the dependent variable, suggests that any increase in the difference between income levels and prices in the housing market is likely to correlate with residential stability patterns in Barcelona.

The relationship between the total number of residents and the dependent variables is also dissimilar in the two cities. In Amsterdam, the coefficient is of negative sign ($\beta = -0.17$; $p \leq .001$) indicating that areas with lower average length of residence also have less residents. In Barcelona, the coefficient is of positive sign ($\beta = 0.08$; $p \leq .05$), which might be related to a process of substitution of long-term residents with newcomers. Finally, looking at temporal and spatial variances, the model output in Amsterdam discloses an upward trend in residential stability in 2019 compared to 2017 ($\beta = 0.10$; $p \leq .05$), while the opposite applies for Barcelona ($\beta = -0.06$; $p \leq .05$). As for spatial heterogeneity, residential stability seems to be lower in the immediate surroundings of the city centre in Amsterdam, while in Barcelona it increases as the distance from the inner-city district also does.

6. Conclusions

Housing availability and affordability are among the most pressing issues for contemporary cities (Wetzstein, 2017), and the uncontrolled growth of the tourism industry has been found in the literature to be a consistent predictor of housing shortage (Grisdale, 2021; Simcock, 2021; Wachsmuth & Weisler, 2018). Amsterdam and Barcelona make no exception to this trend as rent and housing prices continued to rise over the last few years. Rising prices in the housing market are per se an indicator of the potential burden on households, especially if not accompanied by a corresponding increase in income levels. However, the actual extent of the consequences of tourism pressure on neighbourhoods and its residents is still to be fully understood. The literature on tourism gentrification, defined as a sub-genre of gentrification that involves net population decline (Cocola-Gant, 2018), has proposed conclusive arguments in support of the hypothesis that tourism pressure on the housing stock would eventually push low-income residents to move out. At our end, we looked at one of the facets of tourism-led gentrification by estimating demographic and socio-economic correlates of residential stability, defined as the average length of residence in Amsterdam, and the share of long-term residents in Barcelona, thus offering a novel contribution in the European context. In this regard, we assumed that lower levels of stability and greater population turnover in these two cities might partly reflect a process of unwanted residential displacement due to the pressure on the housing stock and the perceived degradation of the quality of life in tourism-ridden neighbourhoods.

We found that the negative externalities of Airbnb for residential stability are consistent in both cities. However, mechanisms through which this happens take different nuances in the two cities. The negative effects of Airbnb on residential stability are triggered by rent hike in Amsterdam, and by rising property values in Barcelona, which is in line with their dissimilar housing ecosystems, with a substantial rental market in the first case, and a market dominated by homeowners in the second case. In Amsterdam the proportional weight of the Airbnb variable is lower than in Barcelona and, as we have seen, its effect on the dependent variable is not statistically significant when missing data are handled with full information maximum likelihood. As for the Catalan capital, the model output suggests that income levels might represent a protective factor for long-term residents, which aligns with the sustained divergence between income and housing price levels (Blanco-Romero et al., 2018). The significant association between the inflow of newcomers and lower levels of residential stability in both cities provides some support to the conclusions of previous studies about the combined influence of classical and tourism gentrification on neighbourhood change. In fact, the average length of residence may well correlate with an increase of temporary and highly mobile populations including international students, expats, and digital nomads (Cocola-Gant, 2018; López-Gay et al., 2020).

As for spatial heterogeneity, there is a clear pattern in Barcelona suggesting that factors of residential instability decay as a function of the distance from the inner-city district. In Amsterdam, this pattern is less evident despite descriptive statistics suggesting otherwise. Therefore, we might suppose that residents in central Amsterdam might concentrate resources that help them to stay put. Or that negative externalities of tourism pressure are extending outside the city centre (van Haaren et al., 2021). At the same time, spatial differences, both between and within these two cities, could be interpreted along the same lines of Wachsmuth and Weisler (2018), who have shown that, in the case of New York City, the growth of Airbnb might be compatible with residential stability. In fact, residents might opt for renting out their properties while out of town, or rather advertise only part of their house. On the opposite, one can expect greater instability in conjunction with more structural land use change from residential to tourist. The actual scope of this distance decay function deserves to be explored further, for instance, by focusing on finer geographies that could account for the role of natural and physical barriers, or the spatial distribution of land uses across the municipal landscape.

Our findings have considerable significance for urban policy and planning. First, this study points to the need for fairer and more inclusive housing policies, especially in Barcelona, beginning with an extension and consolidation of measures such as rent control and the suspension of evictions, even beyond the state of emergency provoked by the pandemic. Second, as housing costs are rapidly outpacing the growth of wages, social policies are called in question to support stable residence, a key dimension of social cohesion. Looking at the heterogenous factors associated with residential stability in our model, STRs regulations alone are unlikely to be effective if not accompanied by more comprehensive policies averting the negative impacts of place change and gentrification (Furukawa & Onuki, 2019). For instance, it has been proposed by social stakeholders audited in the research process on which this paper is based, that adjusting salaries for inflation (galloping both in Spain and in The Netherlands in the recent months) might be a way to support access to affordable housing. Third, the COVID-19 pandemic has proved to be an opportunity to reconsider the role of STRs in tourism cities, and more widely the vulnerability of places where key assets such housing are exposed to the extremely unsettling power of tourism mobilities. While STRs represent a possible source of additional income for homeowners, it is unlikely that they can improve housing affordability for most vulnerable tenants. Therefore, it seems key "to revise zoning and residential development controls to distinguish between different forms of short-term accommodation listings" (Gurran & Phibbs, 2017: 81). Experiences with other commercial collaborative hospitality platforms, like Fairbnb (https://fairbnb.coop/how-it-works/), which relies on a strict ethics code in relation to tenancy and data transparency, suggest that they can tame those negative impacts (Arias-Sans et al., 2022). They however still need adequate regulations to operate, and possibly a promotional effort in order to compete with the most established platforms like Airbnb (Martin, 2016). Overall, the impression is that the pandemic opened an opportunity to embrace policy turns in multiple domains. While our conclusions relate only to Amsterdam and Barcelona, their implications expand to other cities that have been exposed to tourism pressure over the past years.

The limitations of this study refer to the very definition of residential stability, a concept whose operationalization could have benefited from the inclusion of data on the proportional share of housing tenure at the neighbourhood level, and its limited time-frame. At the same time, residential stability might also be interpreted as the result of structural constraints on the capability to migrate. On occasion, stability is rather a synonym for "immobility" (Salazar, 2020). In the case of Amsterdam, for example, there might even be some incentives to stay put considering that rental contracts are regulated and cannot grow more than a certain threshold each year. This however does not apply to new contracts, meaning that people who are in the same address for many years are likely to be paying much less than the current market value. It should be

also noted that Airbnb regulations implemented in the two cities over the last few years might have affected our measure of tourism pressure, especially in Amsterdam where municipal authorities limited Airbnb rentals to 30 days per year starting from January 2019. We were not able to control for these policy impacts, but we have no evidence of model misspecification either. Finally, possible bias due to the use of non-informative priors with relatively small sample size should be considered (Zonder van-Zwijnenburg et al., 2017). These weaknesses call for further investigation. Future studies are also needed to address socio-cultural and environmental externalities of tourism, or to identify diverging patterns of residential stability between homeowners and tenants. According to Martin and Beck (2018), gentrification displaces renters, but not homeowners, and it seems relevant to verify under what circumstances ownership functions as protective factor for displacement in over-touristed neighbourhoods.

In spite of these limitations, the novelty in our approach resides in its attempt to tackle comprehensively the associations between tourism growth, rising housing prices, and their consequences for long-term residents, whose displacement may undermine neighbourhood social cohesion (Leviten-Reid & Matthew, 2018; Yang et al., 2019). Therefore, the significant relationship between the spread of STRs and the patterns of long-term residence showcased in our models adds an additional layer of complexity to the analysis of the economic effects of tourism as it points to a gradual process of social disinvestment in urban destinations such as Amsterdam and Barcelona before the outbreak of the pandemic.

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Authors' statement

All authors have participated in conception and design, or analysis and interpretation of the data; drafting the article or revising it critically; and approval of the final version. This manuscript has not been submitted to, nor is under review at, another journal or other publishing venue.

CRediT authorship contribution statement

Valente Riccardo: Conceptualization, Methodology, Data curation, Software, Writing-Original draft preparation.

Anna Bornioli: Conceptualization, Validation, Writing-Original draft preparation.

Susan Vermeulen: Validation, Visualization, Writing-Review & Editing.

Antonio Paolo Russo: Conceptualization, Funding acquisition, Writing-Original draft preparation.

Declaration of competing interest

The authors have no affiliation with any organization with a direct or indirect financial interest in the subject matter discussed in the manuscript.

Data availability

Our analysis is based on publicly available secondary data.

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