Tourism pressure as a driver of social inequalities: a BSEM estimation of housing instability in European urban areas

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Abstract

There is a certain agreement in the regional economics literature on tourism development as a lever of territorial cohesion and regional convergence. Yet evidence about its impact on social cohesion within destination regions is scant. The emerging literature placing tourism development as a driver of inequality relies mostly on qualitative methods and individual case studies, thus overlooking a cross-national perspective. In this paper, we address this gap by estimating the impacts of tourism growth between 2013 and 2018 on housing instability through its effects on rents and the perceived financial burden of housing costs. Based on a combination of data sourced from Eurostat and a geo-located dataset of Airbnb listings, a Bayesian path analysis model was specified with a sample of densely populated areas in 85 European regions. Results reveal the controversial influence of tourism on urban destinations, indicating how the increase in the number of visitors may benefit mean incomes and relieve the pressure on housing costs, while at the same time driving a higher dispersion of income and residential displacement. A clear difference is established between homeowners and tenants to this regard: the former can use the opportunities of rent extraction in the platform economy to withstand the economic pressure of tourism, while the latter are more exposed to the risk of having to leave their homes.

Keywords: tourism pressure; house ownership; length of residence; residential displacement; Bayesian path analysis model.

Introduction

The aim of this study is to estimate the effects of tourism growth on a key dimension of social exclusion in urban areas, that of housing instability (Madden and Marcuse, 2016; Marcuse, 1985), controlling for other potential drivers of population change. Our hypothesis that tourism can act as a driver of housing exclusion ties into the literature on gentrification, which has gathered mixed evidence on the relationship between the arrival of new affluent neighbors and residential displacement (Brown-Saracino, 2009; Ellen and O'Regan, 2011; Freeman, 2005; Martin and Beck, 2016; McKinnish, Walsh and White, 2011; Wyly et al., 2010). A recent strand on research has engaged more directly with the central role of international tourism as a driver of social change at destinations (Wachsmuth and Weisler, 2018; Sequera and Nofre, 2018), closely enmeshed to real estate financialisation and the rise of platform hospitality (Cocola-Gant, 2019; Clancy, 2020) in what Aalbers (2019) has defined "fifth wave gentrification". However, most of this recent literature relies on case-study-based evidence and qualitative research techniques.

The research strategy in this paper fills a gap in this literature in two ways. First, we address demographic change as a consequence of tourism pressure and the increase in housing prices in one single model, as opposed to previous studies that have looked at the effect of tourism on population turnover or the housing market separately. Second, we do so at a geographical scale – that of densely populated urban areas within 85 European regions – for which, contrary to case-study level explorations, evidence is scant. Our empirical approach is based on a Bayesian path analysis model, that combines data from three different sources (EU-SILC survey, EUROSTAT's regional statistics, and the AirDNA dataset). Our results show that the pressure of tourism on the resident population has ambivalent outcomes. On one hand, the growth of tourism fosters an increase in mean incomes and may help to relieve the financial burden of housing costs, thus contributing to homeowners' ability to remain residents in a place. On the other hand, however, tourism growth is associated with a significant increase in rental fees and, indirectly, with the displacement of long-term tenants (those who have been renting the same house for at least five years). In these relationships, the role played by the growth of "mainstream" tourism in traditional forms of collective accommodation is found to be negligible when compared to the expansion of platform hospitality. At the very end, our analysis emphasizes the gap between homeowners and non-homeowners in a tourist destination, highlighting how property ownership can reduce the negative effects of tourism on the resident population while at the same time nurturing the vulnerability of renters.

The paper is organized as such: the next section situates our research on residential change and housing instability within the broader framework of the literature on the regional impacts of tourism, and revises the conclusions of previous research that tie tourism development to population change and gentrification. The third section introduces the conceptual model proposed and our methodological approach, while the fourth illustrates the results of our empirical work. The last section concludes with a discussion of the implications of our findings, relating back to the broader context and objectives of this research.

Conceptual background

Tourism development from the perspective of regional economics

The development of tourism has been traditionally treated in the regional economics literature as an engine of place prosperity, with particular value for cities and regions facing barriers to alternative options for lack of economic and human capital, or undergoing

deindustrialization (Law, 1992). The tourism industry and its sub-sectors (hospitality, restoration, entertainment and events, transport, attraction management, etc.) are generally considered providers of labor for low-skilled workers who have not been absorbed into other more specialized sectors (Roe and Urquhart, 2001). Besides, tourism development is seen to have desirable territorial effects. Building on the results of Williams and Shaw (1991), who suggested that tourism development generates a net redistribution of wealth from wealthier regions in the global and European cores to the poorer regions, Kostakis and Theodoropoulou (2017) indicate that tourism can have a positive impact on economic growth, especially in regions where income levels are at the lower end of the spectrum. From this perspective, moderate levels of investment in tourism development have been shown to have an effective and rapid effect on regional cohesion (Proença and Soukiazis, 2008). Beyond the concern for the causality of the impact of tourism on prosperity (the so-called tourism-led growth hypothesis), the promotion of tourism is thus singled out in the literature as a relatively easy way to boost the economy of regions and countries that are lagging behind but are rich in natural or cultural assets (Harb and Bassil, 2020; Katircioglu, 2009).

However, some of this literature also stresses that, if the initial impulse is successful, side effects may occur at later stages of development. In this regard, optimistic analyses have become somewhat more nuanced with the increasing academic and social concerns with sustainability (Bianchi and de Man, 2021; Robinson et al., 2019), which invite to examine to what extent the growth of tourism activity in a place can affect the resources – natural, social and cultural – that make it attractive in the first place, and thus its capacity to sustain growth and remain competitive in the long term. This approach, modelled in destination life-cycle models (Butler, 2006), has expanded from a linear baseline by which tourism growth can only happen at the expense of place competitiveness, to more complex frameworks that consider agent networks operating at multiple scales shaped by the interaction of global and local trends (Ma and Hassink, 2013; Sanz-Ibáñez and Anton-Clavé, 2014). In any case, regional economics has hardly engaged with such complex frameworks. Possible exceptions are input-output analyses that take into account environmental resources (Sun et al., 2020), labor markets (Dwyer and Forsyth, 1998), or the inter-sectorial enmeshments of tourism through Satellite System Analysis and its capacity to reduce differences in incomes (Mitchell, 2012). This strand of the literature invites to examine closely the social impact of tourism growth and its possible negative externalities that may distribute unevenly between different social groups at the destination.

Exclusionary dynamics of tourism and the issue of housing instability

Most research on the social sustainability of tourism development is naturally carried out at the destination level, or even at the finer scale of neighborhoods. It tends to be qualitative in its methodological approach and deductive, developed in disciplinary frames like cultural geography, sociology or anthropology, its main aim being to make sense of the impacts of tourism development as driver of change in the lives of individuals and specific collectives. The literature here is very broad. Some excellent examples from different periods and disciplinary perspectives include the analyses published by Jover and Díaz-Parra (2020); Novy and Colomb (2019); Arbaci and Tapada-Berteli (2012); or Quinn (2007). Yet, such works often miss the possibility to extrapolate and scale up the analysis to obtain comparative insights. Indeed, the very nature of the mechanisms by which tourism activity acts as a transformative force of place and communities makes measurement or modelling awkward. Part of this complexity is due to the fact that it is increasingly difficult to isolate tourism as an economic phenomenon and a sector of economic activity when, as theorists of the mobilities turn in the social sciences have proposed, “leisure on the move” pervades many other

dimensions of place organization, production and topography (Larsen, 2008; Urry, 1994).

A remarkable example of this blurredness is the rising number of houses that are rented on the short-term tourist market, which is one of the key analytical dimensions of this paper. When tourists only went to hotels and other forms of collective accommodation, and home stays as a form of hospitality were negligible in terms of numbers, it made sense to keep tourism growth and housing stability in separate analytical boxes and to focus just on the indirect effects of tourism growth on the distribution of rents. Yet, since a substantial share of short-term vacation rentals is subtracted from the housing stock for residents, it can be easily hypothesized that there might be a close link between the rise of the visitor economy and trends in the housing market (Mordue, 2017).

An outstanding reference to quantitative approaches towards measuring the impacts of tourism growth on the housing market of a tourist destination is the work of Biagi et al. (2012). The authors propose a conceptual framework of agents' interactions and then using a hedonic price model they assess how price inflation could revert on housing prices – and therefore social inequalities – in the case of Sardinian municipalities in Italy. Similar approaches have been developed by Wu (2019) for Chinese cities, Mikulić et al. (2021) in Croatia, Liang et al. (2021) in Hong Kong, or García-López et al. (2020). This latter work is particularly relevant for our approach, as it points to a causal relation between the growth of short-term rental apartments in Barcelona and the rise of purchase prices in zones of high intensity of offer in the 2010-2018 period.

In the light of the above, there is consistent evidence on upward trends in property and rental prices at tourist places; indirectly, as a general process of revalorization of land and estates, and directly, as an outcome of the so-called "airbnbsation of cities" (Sequera and Nofre, 2018). This points to a process of displacement of long-term residents (and vulnerable social groups in particular) from areas subject to the highest level of tourism pressure (Cocola-Gant and Gago, 2019), along with other explanatory factors linked to the discomfort of living in an overcrowded space and the worsening of the quality of life in rapidly transforming neighborhoods (Cocola-Gant et al., 2020), or the casualization of labor that is a characteristic of the platform economy (Stabrowski, 2017).

On the other hand, it is suggested that the impacts of the rise of short-term rentals might have uneven impacts across sectors of the resident population. For small proprietors, renting whole apartments or rooms on the short-term vacational market allows a certain degree of revalorization of property, sinking costs and paying mortgages (Gibbs et al., 2020), to the point of having become a sort of survival strategy in a moment of economic downturn (Semi and Tonetta, 2020). For multi-proprietors and professional speculators, it has become one of the most popular strategies to extract urban rents (Salerno and Russo, 2020) and one of the main levers of housing financialisation (Clancy, 2020). However, the other side of the coin is that these different tenurial regimes may expose tenants to the risk of being excluded to affordable housing.

Recent research on tourism-driven gentrification broadened the concern for social exclusion taking in the progressive reorientation of urban spaces to accommodate the dwelling and consumption of mobile and transient populations. Tourist consumption extends demand basins and brings about a revalorization of commodities and capital assets offered locally, which become unaffordable to the lowest-income strata of the population, as their incomes do not rise to the same degree. At the same time, tourist places become attractive for different migrations, including the rising contingents of transnational "lifestyle mobilities", such as middle-class footloose workers in the digital economy, international students, young adults in gap years in between careers, retired seniors, or persons approaching retirement

(Benson and O'Reilly, 2009; Cocola Gant and López Gay, 2020; Malet Calvo, 2018). Often, the arrival of these affluent newcomers entails a process of population turnover at the expenses of a less mobile incumbent population (Janoschka and Haas, 2014; López-Gay et al., 2021; Quaglieri-Domínguez and Scarnato, 2017).

A model of tourism pressure, economic performance, and housing instability

Hypotheses and methodological approach

In spite of the valuable contributions mentioned above, the picture of residential change in tourist destinations is generally patchy, shadowing undercurrents of stratification and exclusion. When research has found a positive relationship between the growth of tourism (or specific dimensions of it) and the growth in GDP, for instance, it is seldom made clear how population change plays out in this respect: is it because incumbent residents enjoy greater income opportunities, or because incomers are wealthier than outgoers? Even when it is possible to reconstruct a profile of incomers and outgoers from tourist places (generally at the case-study level), a full and generalized understanding of the mechanisms driving such processes – which could also shed insights on the policy approaches towards fighting social exclusion – cannot but rely on an in-deep analysis of key dimensions at play in these processes. Housing tenancy and residential change under the pull of the visitor economy and its "rooting" in real estate may well be a good way to approach this issue.

Against this background, the main goal of this research is to estimate the effect of tourism pressure (i.e., overnight stays per 100,000 inhabitants and its evolution over time) on housing instability (defined as the rate of change in ownership and tenancy of long-term residents), while considering the mediating role of economic indicators related with trends in income levels and housing prices. Of course, many other structural and contextual factors could correlate with housing instability, such as national or local property regimes, voluntary residential change at different stages of a life path, transformations of the job market, commercial and social change in a specific area, or in general the propensity for mobility of specific sectors of the population (Clark and Lisowski, 2018; Gambaro, Joshi and Lupton, 2017; Kulu and Steele, 2013). However, controlling for some of these factors through adequate proxies may reveal to what extent cities and regions that are subject to a high level of real estate revalorization related to the growth of tourism are at risk of housing exclusion, and how that plays out across regional types, as well as across the spectrum of geographical specificities. Indeed, another key contribution of this work is to perform this analysis at the wider scale of urban areas across the European territory, seeking to find significant trends beyond the evidence that has been offered by the literature examined in relation to specific case studies.

Specifically, the model proposed (see Figure 1) encompasses two outcomes. On one hand, according to the literature on regional economies discussed above (Harb and Bassil, 2020; Katircioglu, 2009; Kostakis and Theodoropoulou, 2017; Proença and Soukiazis, 2008), the increase in tourism activity, signaled by rising numbers of stays in any type of accommodation structure, is supposed to be associated with higher mean incomes and a relief of the financial burden of housing costs. On the other hand, however, the economic pressure of the visitor economy is also assumed to have a negative side effect on the destination's real-estate market in terms of housing affordability. Based on the literature on tourism gentrification (Cocola-Gant, 2019; Cocola-Gant et al., 2020; García-López et al., 2020), we anticipate a direct relationship between tourism growth and the increase in rental prices, which in turn could push the most vulnerable sectors of the resident population to move out from their homes. The consistency of the model is tested by means of a path analysis

including 10 observed variables, the specifics of which are detailed below. All these variables express the rate of change between 2013 and 2018 for the corresponding indicator, except for the growth rate of Airbnb overnight stays, which is calculated for 2017-2019 due to the lack of a longer time series.

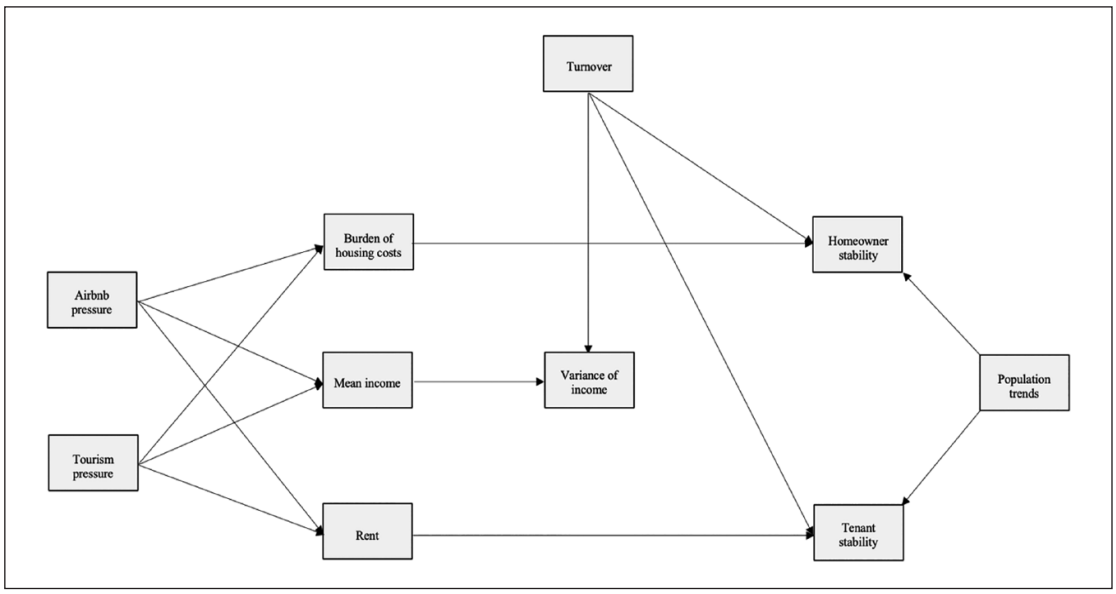

Figure 1. Proposed model.

Data sources and geographical coverage

The analysis in this paper is based on data drawn from three sources: the European Union Statistics on Income and Living Conditions (EU-SILC), Eurostat's regional statistics, and AirDNA, a specialized provider of Airbnb-scraped data.

According to the methodological guidelines provided by Eurostat (2019a), EU-SILC gathers micro-data on incomes, poverty, social exclusion and living conditions across EU Member States. Its database is made up of survey- and register-based data collected at both the household level and the personal levels on an annual basis since 2004. For the purposes of this study, we used the 2013 and 2018 editions to compute the rates of change of a subset of variables within a five-year time frame, namely total disposable household incomes, the year of contracting, purchasing or installation, the tenurial status, the current rent for the occupied dwelling, and the perceived financial burden of the total housing costs. On the basis of these variables, we derived additional variables in order to test the influence of the intensification of tourism activity on social indicators. Our dataset combines regional data at NUTS1 and NUTS2 regions (acronym for *Nomenclature of Territorial Units for Statistics*), depending on the sampling design of each country participating in the EU-SILC project. Our focus is on respondents which household is located in densely populated areas (hereinafter referred to as cities), defined as "contiguous grid cells of 1 km^2 with a density of at least 1,500 inhabitants per km^2 and a minimum population of 50,000" (Eurostat, 2019b: 30). Therefore, the analysis excludes rural areas and small urban areas falling below this threshold. As an example, the urban areas selected within the NUTS2 region of the Community of Madrid can be visualized in Figure 2. The sample size of persons aged sixteen or over living in these urban areas was of

206,949 in 2013 and of 208,101 in 2018. Micro-data were aggregated to the corresponding NUTS of the household by using weighting coefficients to reproduce the characteristics of the sample population.

Data on visitors' overnights stays in cities at the NUTS2 level were retrieved from the Eurostat web portal. This information was key to accounting for tourism pressure on local destinations. The number of the overnights stays was added to the dataset derived from EU-SILC and adjusted to the size of the corresponding geographical unit. To include NUTS1 based data, we aggregated the data from the lower level 2.

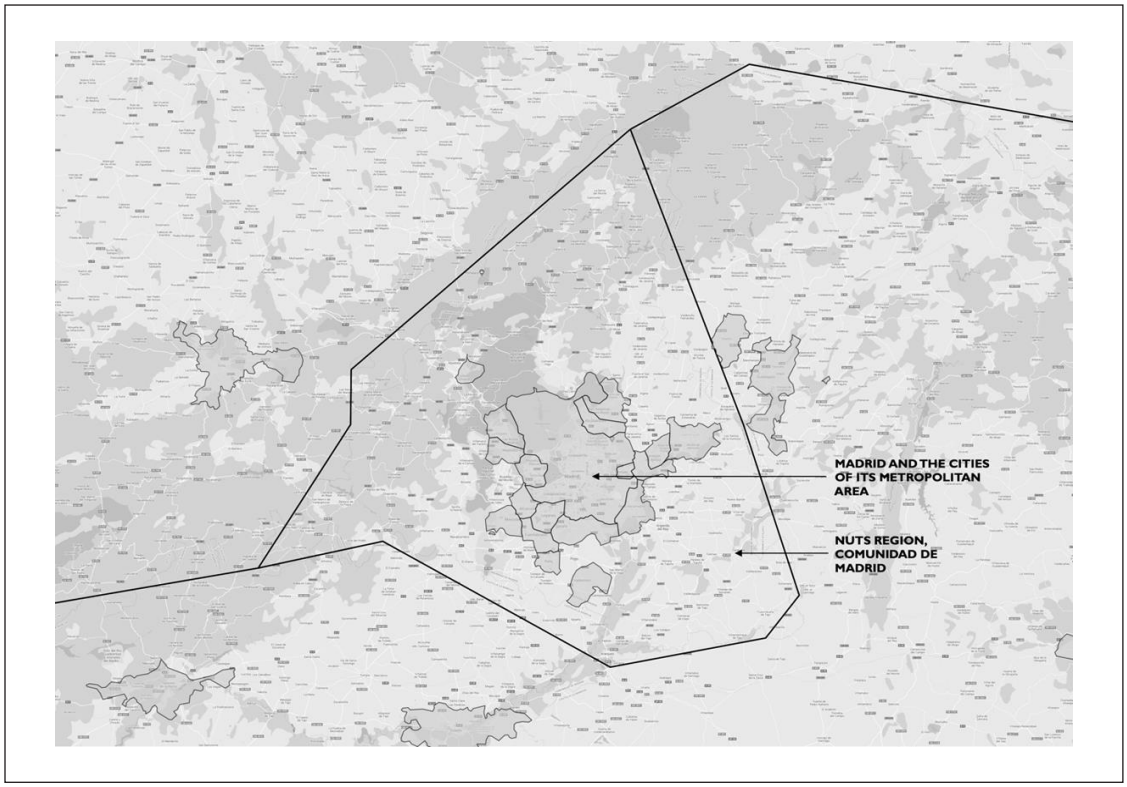

Figure 2. Cities within the NUTS2 region of the Community of Madrid.

Finally, data on Airbnb short-term rental accommodations were provided by AirDNA. From the variety of information available in the AirDNA dataset, we focused on the number of Airbnb active listings in cities, which are located at latitudes and longitudes in a random point within a 200-meters radius from the provided location (Doboosere et al., 2019), as well as the number of the overnights stays. Again, to reduce the number of missing, NUTS1 data were computed by aggregating the absolute valuesfrom the lower-level NUTS2. As a result of these pre-processing operations, our final dataset included information on the cities of 85 NUTS regions distributed across 16 countries (see Table 1).

Table 1. Geographical area of the analysis.

Countries	NUTS1/NUTS2 regions (name and ID)	Number of cities	Percentage of total population living in cities
Austria	Ostösterreich (AT1); Südösterreich (AT2); Westösterreich (AT3)	8	28.7
Belgium	Région de Bruxelles-Capitale/ Brussels Hoofdstedelijk Gewest (BE10); Vlaams Gewest (BE20); Región Wallone (BE30)	65	50.1
Bulgaria	Северна и Югоизточна България (BG3), Югозападна и Южна централна България (BG4)	18	51.2
Croatia	Hrvatska (HR0)	5	32.5
Czech Republic	Praha (CZ01); Střední Čechy (CZ02); Jihozápad (CZ03); Severozápad (CZ04); Severovýchod (CZ05); Jihovýchod (CZ06); Střední Morava (CZ07); Moravskoslezsko (CZ08)	19	30.6
France	Ile-de-France (FR10); Centre-Val de Loire (FRB0); Bourgogne (FRC1); Franche-Comté (FRC2); Basse-Normandie (FRD1); Haute-Normandie (FRD2); Nord-Pas de Calais (FRE1); Picardie (FRE2); Alsace (FRF1); Champagne-Ardenne (FRF2); Lorraine (FRF3); Pays de la Loire (FRG0); Bretagne (FRH0); Aquitaine (FRI1); Limousin (FRI2); Poitou-Charentes (FRI3); Languedoc-Roussillon (FRJ1); Midi-Pyrénées (FRJ2); Auvergne (FRK1); Rhône-Alpes (FRK2)	72 8	36.6
Hungary	Közép-Magyarország (HU1); Dunántúl (HU2); Alföld és Észak (HU3)	18	36.5
Italy	Nord-Ovest (ITC); Sud (ITF); Isole (ITG); Nord-Est (ITH); Centro (ITI)	25 0	34.3
Luxembourg	Luxembourg (LU0)	1	19.4
Malta	Malta (MT0)	27	49.2
Poland	Makroregion Południowy (PL2); Makroregion Północno- Zachodni (PL4); Makroregion Południowo-Zachodni (PL5); Makroregion Północny (PL6)	56	33.8
Romania	Macroregiunea unu (RO1); Macroregiunea doi (RO2); Macroregiunea trei (RO3); Macroregiunea patru (RO4)	35	35.3
Slovakia Republic	Slovenko (SK0)	44	20.4
Spain	Galicia (ES11); Principado de Asturias (ES12); Cantabria (ES13); País Vasco (ES21); Comunidad Foral de Navarra (ES22); La Rioja (ES13); Aragón (ES24); Comunidad de Madrid (ES30); Castilla y León (ES41); Castilla-La Mancha (ES42); Cataluña (ES51); Comunidad Valenciana (ES52); Illes Balears (ES53); Andalucía (ES61); Región de Murcia (ES62); Canarias (ES70)	19 7	53.6
Sweden	Östra Sverige (SE1); Södra Sverige (SE2); Norra Sverige (SE3)	22	33.4
The United Kingdom	North-East England (UKC); North-West England (UKD); Yorkshire and the Humber (UKE); East Midlands (UKF); East of England (UKH); London (UKI); South-East England (UKJ); South-West England (UKK); Wales (UKL); Northern Ireland (UKN)	13 7	36.2

Measures, model specification and estimation technique

The two dependent variables of the proposed model are homeowner stability and tenant stability, treated here as two complementary facets of the same phenomenon of housing stability. Homeowner stability was defined as the share of residents who are classified in the EU-SILC survey as "outright owner" or "owner paying mortgage" and who have been living in their houses for five years or more at the time of the survey. Therefore, the variable labelled as *homeowner stability* identifies the percentage change of long-term owners out of the total population over the five years being considered (2013-2018).

In a similar vein, the variable defined as *tenant stability* focuses on residents who have signed a rental contract five or more years before answering the EU-SILC questionnaire, and on the change of their proportional weight in the population between the reference years covered by the analysis. These definitions are in line with previous research agreeing on two structural elements that are inherent in housing stability: length of residence, and/or home ownership, which are thought to represent proxy measures of investment in the community (Keene, Bader and Ailshire, 2013; Leviten-Reid and Matthew, 2018). As a result, the main difference between homeowner stability and tenant stability resides in the tenure status: ownership in the former case, as opposed to tenancy (i.e., paying a rent) in the latter.

As for tourism pressure, this was conceptualized as a two-fold empirical dimension in our model. First, we computed the number of nights spent by visitors at tourist accommodation establishments (hotels, holiday and other short-stay accommodation, camping grounds, recreational vehicle parks and trailer parks) per 100,000 inhabitants. Second, a measure of the spread of Airbnb accommodations was defined as the rate of overnight stays in this type of structures per 100,000 inhabitants and its evolution over time. Specifically, the product of reserved days and maximum guests has been calculated for each property, and then aggregated at the corresponding NUTS level.

In line with the model's specification, four mediators intervene in the relationship between tourism pressure and the dependent variables. Firstly, it was hypothesized that the intensification of tourism at destinations could lead to a rise in housing rents, because of which tenants would consider moving out their place of residence. To test this hypothesis, the percentage change between 2013 and 2018 of the monthly rental fees related to the occupied dwelling was included in the model. Secondly, we explored the indirect effect of tourism pressure on homeowner stability. In this case, the contrasting conclusions in the previous literature do not allow any explicit relationship to be anticipated. However, we assumed that homeowners' decisions to stay or alternatively to move out their houses are likely to depend, at least in part, on the perceived burden of housing costs. To this end, we retrieved from the EU-SILC dataset the variable enabling an assessment of respondents' feelings about the extent to which housing costs (mortgage payments, including instalment and interests, cost of utilities, regular maintenance and repairs, services and charges, and taxes on dwellings) are a heavy financial burden on the household. Thirdly, we explored the possible link between income dispersion and the two variables of housing stability. Specifically, the model encompasses a direct path between the spread of tourism and the trends in mean incomes over time, as well as a possible indirect relationship between the former and the variance of income, the latter being a measure of the distribution of incomes within the resident population and a predictor of housing instability in our model.

Finally, the model also includes two control variables, which were labelled *population trends* and *turnover*. The variation in the total population between 2013 and 2018 may have altered the proportion of long-term residents. Accordingly, if independent variables remain statistically significant after controlling for population trends, we might conclude that housing

stability cannot be simply reduced to a demographic phenomenon. The variable turnover was treated as a proxy measure of gentrification, defined as the difference in the average level of the total disposable household incomes of newcomers (i.e., those who have arrived in the area during the last five years) compared to the incomes of long-term residents who have lived in the area for more than five years. If the percentage difference is positive, then newcomers have higher incomes than those at the disposal of long-term residents, thus identifying one of the building blocks of the gentrification process (Glass, 1964; Smith, 1996). Descriptive statistics are provided in Table 2. All variables were standardized prior to running the model.

Table 2. Descriptive statistics.

	Description	Source	Min	Max	Mean	Standard deviation
Homeowner stability	Percentage change of long-term owners (2013–2018)	EU-SILC	–60.1	36.9	–0.2	15.6
Tenant stability	Percentage change of long-term tenants (2013–2018)	EU-SILC	–77.8	153.8	16.3	108.2
Airbnb pressure	Change rate of overnight stays per 100,000 (2017–2019)	AirDNA	–28.1	192.7	85.2	41.7
Tourism pressure	Change rate of overnight stays per 100,000 (2013–2018)	Eurostat	–37.0	287.7	21.1	38.3
Rent	Percentage change of monthly rental fees (2013–2018)	EU-SILC	–58.4	110.5	9.1	29.9
Burden of housing costs	Percentage change of perceived burden of housing costs (2013–2018)	EU-SILC	–67.3	127.3	–23.1	29.4
Mean income	Percentage change of mean income (2013–2018)	EU-SILC	–25.6	90.0	12.8	18.8
Variance of income	Percentage change of variance of income (2013–2018)	EU-SILC	–91.2	602.1	44.2	100.8
Population trends	Percentage change of the total population (2013–2018)	EU-SILC	–42.3	170.2	–2.2	26.1
Turnover	Percentage difference in income levels between newcomers and outgoers (2013–2018)	EU-SILC	–52.8	28.1	–11.5	15.8

EUSILC: European Union Statistics on Income and Living Conditions.

In order to test our hypotheses, a Bayesian analysis was applied to a mediation model using the *Mplus 8.4* statistical modelling program. Bayesian estimation makes use of Markov chain Monte Carlo (MCMC) algorithms to iteratively draw random samples from the posterior distribution of the model parameters. Applying the Bayes estimator and Gibbs algorithm, two independent MCMC chains with 10,000 fixed iterations were used to describe the posterior distribution. Listwise deletion was used to deal with missing data. Robustness tests involved alternative specifications of the model, which was first executed with default priors ($\mu_\beta=0$; $\sigma_\beta^2=10^{10}$), and subsequently repeated with informative priors derived from a baseline test with maximum likelihood (ML) estimation.

Results

Table 3 below provides an overview of parameter estimates respectively with the baseline model (ML estimation), Bayes estimations with default priors and informative priors, respectively. The interpretation of model outputs points to satisfactory fit in all the three

cases. The x^2 test for baseline model run with ML estimation is not significant (x^2=27.3; df=22; p=.19), and the fit indices are all in line with the recommended thresholds (CFI=.95; TLI=.91; RMSEA=.05). As for Bayesian estimations, the posterior predictive p-value indicates good fit both with default priors (PPP=.500), and informative priors (PPP=.443). Overall, the parameter estimates are quite stable across the three different attempts, thus suggesting that these are not too sensitive to the specification of prior distributions. The main difference would be the non-significant indirect path that link Airbnb pressure to homeowner stability in the model estimated with ML. However, based on the conclusion of the specialized literature (Muthén and Asparouhov, 2012), we might lean towards Bayesian estimation as it usually outperforms ML in small sample studies like ours.

Table 3. Model output.

Parameters	ML estimation	Bayes with default priors	Bayes with priors derived from ML
Direct paths			
Airbnb pressure → burden of housing costs	–0.23*	–0.24*	–0.23**
Airbnb pressure → rent	0.31**	0.32***	0.31***
Airbnb pressure → mean income	0.35***	0.37***	0.35***
Tourism pressure → burden of housing costs	0.01	0.01	0.01
Tourism pressure → rent	–0.12	–0.09	–0.12
Tourism pressure → mean income	0.11	0.11	0.11
Mean income → variance of income	0.47***	0.48***	0.47***
Turnover → variance of income	–0.04	–0.04	–0.04
Burden of housing costs → homeowner stability	–0.22*	–0.21***	–0.23**
Turnover → homeowner stability	–0.35***	–0.36***	–0.34***
Variance of income → homeowner stability	0.09	0.10	0.09
Population trend → homeowner stability	0.04	0.05	0.04
Rent → tenant stability	–0.25*	–0.26***	–0.21***
Turnover → tenant stability	0.11	0.10	0.07
Variance of income → tenant stability	0.04	0.03	0.04
Population trend → tenant stability	0.59***	0.57***	0.66***
Indirect paths			
Airbnb pressure → burden of housing costs → homeowner stability	0.05	0.05*	0.05*
Tourism pressure → burden of housing costs → homeowner stability	–0.01	–0.01	–0.01
Airbnb pressure → rent → tenant stability	–0.08*	–0.07***	–0.06***
Tourism pressure → rent → tenant stability	0.03	0.02	0.02

*$p \leqslant .05$; **$p \leqslant .01$; ***$p \leqslant .001$.

In what follows, the Bayesian model with informative priors is discussed (fourth column in Table 3). Given the lack of quantitative studies depicted in the literature review, prior probability distribution was derived from the confidence intervals of the baseline ML model, which was run with the same variables to compute the mean and variance of regression parameters.

The output of the model corroborates a statistically significant and positive relationship between the Airbnb variable and the evolution of rental prices in European cities. Specifically, the results point to the increase in the price of monthly rental fees because of the increase in the number of overnight stays in Airbnb accommodations per 100,000 inhabitants (β=.31; $p \leq .001$). The effect of the Airbnb variable on the perceived financial burden of housing costs is also statistically significant but of negative sign (β=−.23; $p \leq .01$). Therefore, it is conceivable that the benefits derived from short-term rentals might have

relieved the pressure on the charges associated with the maintenance of the dwelling. Finally, the rise in the overnight stays in Airbnb accommodations also benefits the mean income of the resident population (β=.35; $p\leq$.001). Conversely, the impact of mainstream tourism is not significant in any of these three cases.

Homeowner stability is negatively associated with the financial burden of the total housing cost (β=−.23; $p\leq$.01): that is, if the perception of a financial burden has increased, the share of long-term house owners over the total population fell between 2013 and 2018. At the same time, there is a significant and inverse relationship between our proxy measure of gentrification and the homeowner stability (β=−.34; $p\leq$.001), a finding that points to a process of population change with new residents with higher incomes taking over residence to the detriment of long-term homeowners. As for tenant stability, this is affected by rental prices. That is, tenant stability falls as rents continue to rise (β=−.21; $p\leq$.001). The effect of gentrification on tenant stability is not significant (β=.07; p=.14).

The indirect relationship between the Airbnb variable and the variance of the income is statistically significant (β_{ind}=.16; $p\leq$.001), suggesting therefore that the intensification of Airbnb may lead to an increased dispersion of the income. On the other hand, income dispersion does not significantly correlate with the two dependent variables of housing stability. Finally, the interpretation of direct paths within the model indicates that the influence of population trends is statistically significant in its relationship with tenant stability (β=.66; $p\leq$.001), but not with homeowner stability (β=.04; p=.30).

As for indirect relationships between the two tourism-related variables and the measures of housing stability reported in Table 3, the impact on housing stability in European cities seems to be specific to Airbnb, since no statistically significant relationship was found between the spread of mainstream tourism and the dependent variables. The interpretation of the indirect paths reveals a discrepancy with regard to the effect of tourism pressure on the housing stability in European urban areas, depending on whether residents own their houses or not. In fact, when the focus is on the impact of Airbnb-driven tourism on rent and, indirectly, on tenant stability, a negative effect was found. In other words, in those cities where the rate of overnight stays per 100,000 inhabitants has increased, there is a trend towards the displacement of long-term tenants. Likewise, the model suggests that, for those urban dwellers who own their houses, the opportunity to let out a room for rent has reduced their housing costs and increased theirability to stay in their place of residence.

As a final step in the analysis, four indicators are mapped in Figures 3a to 3d to visualize the underlying spatial patterns in the studied relationships. We first show the evolution of Airbnb pressure between 2017 and 2019 (Figure 3a), as opposed to level of penetration of short-term rentals in 2019 (Figure 3b). Then, Figures 2c and 3d allow for the visualization of the trend in homeowner and tenant stability, respectively.

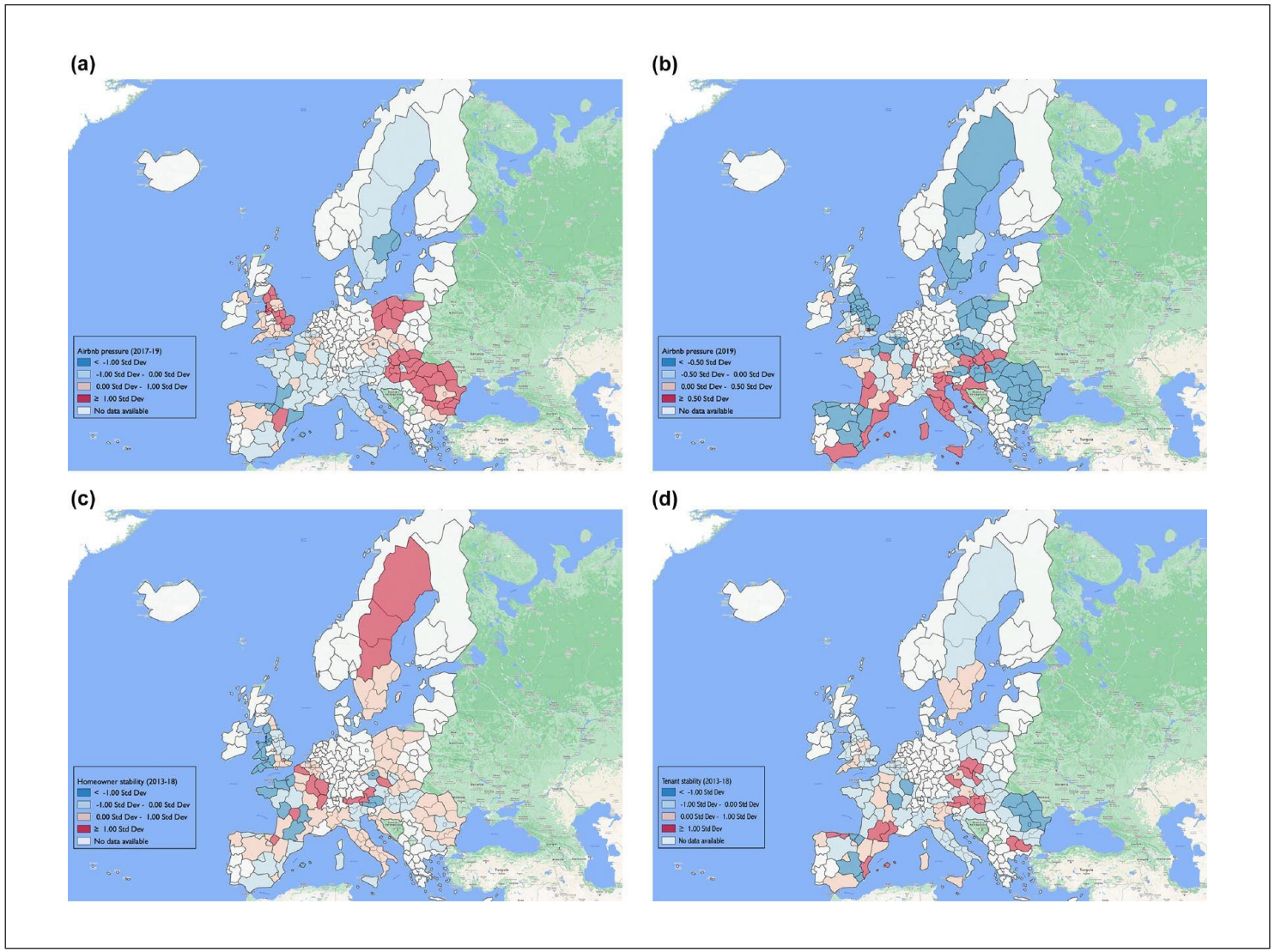

Figure 3. (a) Airbnb pressure (2017–2019). (b) Airbnb spread in 2019. (c) Homeowner stability (2013–2018). (d) Tenant stability (2013–2018).

A few considerations arise. On one hand, comparing trends in Figures 3a and 3b we can conclude that the cities that are recording the highest growth of Airbnb pressure between 2017 and 2019 are not necessarily those who have the highest levels of Airbnb penetration in 2019. As an example, although Airbnb pressure is steadily increasing in cities located in eastern Europe NUTS regions, their level of Airbnb penetration in 2019 does not compare with their western counterparts. A similar trend can be retraced in England (but the London region), southern Italy, as well as in a subset of regions in Spain and France. However, if we run an alternative model where the growth rate of Airbnb overnight stays is replaced by the Airbnb penetration in 2019 only (results available upon request), the Airbnb-related variable loses all its predictive power within the model. This seems to suggest that Airbnb spread is particularly disruptive for host communities in its initial stages of expansion.

As for the two dependent variables in our model, homeowner stability is growing above the mean in red colored areas in the choropleth map in Figure 3c, while tenant stability shows a decreasing trend in blue colored areas in Figure 3d. A cluster of 25 NUTS regions (see Figure 4, and Table 4) can be identified across Europe where these two contrasting patterns overlap spatially.

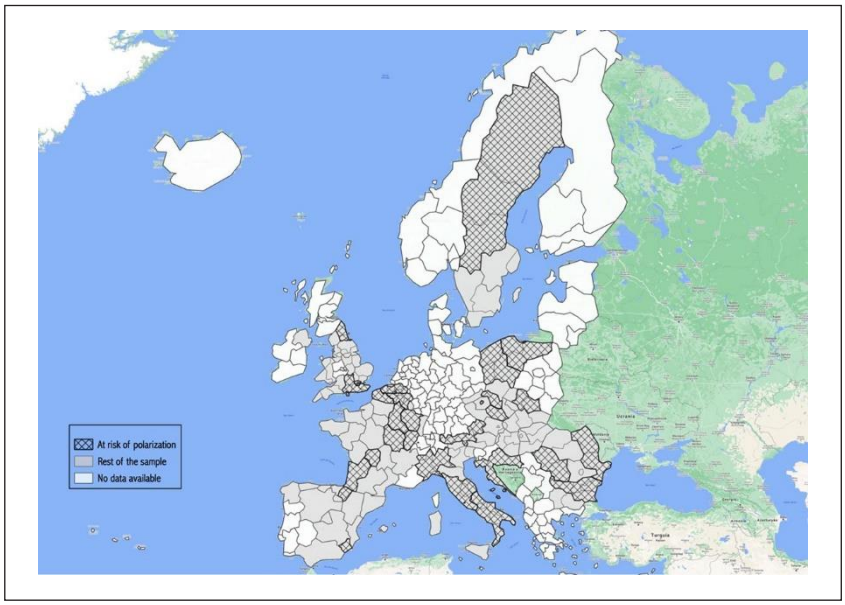

Figure 4. Possible patterns of polarization in tourist cities.

Therefore, in the subset of cities located in these 25 regions, our results point to the uneven impact of the Airbnb's pressure, the extent of which depends to a large extent on whether or not urban dwellers can count on the safe-haven asset of their own homes. The implications of these findings are discussed in the concluding section of this paper.

Table 4. NUTS regions where cities at risk of polarization are located.

ID	NUTS name	Country code	Airbnb pressure (2017–2019)	Homeowner stability (2013–2018)	Tenant stability (2013–2018)	Biggest cities in the area
AT3	Westösterreich	AT	66.1	19.5	–12.0	Graz, Innsbruck
BE2	Vlaams Gewest	BE	69.1	8.6	–7.2	Bruges, Ghent, Antwerp
BE3	Región Wallone	BE	103.4	11.3	–7.9	Charleroi, Namur
BG3	Северна и Югоизточна България	BG	184.1	9.2	–21.7	Varna, Burgas
CZ01	Praha	CZ	34.1	8.9	–11.9	Prague
CZ06	Jihovýchod	CZ	82.5	21.3	–3.5	Brno
ES22	Comunidad Foral de Navarra	ES	43.1	22.5	–55.2	Pamplona
ES62	Región de Murcia	ES	110.1	13.9	–35.7	Murcia
FRC1	Bourgogne	FR	60.4	6.8	–50.3	Dijon
FRC2	Franche-Comté	FR	74.9	27.1	–2.4	Besançon, Montbéliard, Belfort
FRE1	Nord-Pas de Calais	FR	55.0	29.0	–10.3	Lille, Calais, Dunkerque
FRF3	Lorraine	FR	61.0	27.0	–47.5	Nancy, Metz
FRI1	Aquitaine	FR	28.7	1.6	–23.6	Biarritz, Bordeaux
HR0	Hrvatska	HR	71.5	5.2	–5.8	Grand Zagreb, Rijeka, Split
ITC	Nord-Ovest	IT	71.4	1.7	–6.7	Milano, Como, Torino, Genova, La Spezia
ITF	Sud	IT	110.4	3.4	–21.0	Napoli, Caserta, Salerno, Sorrento, Bari, Reggio Calabria
ITI	Centro	IT	49.7	12.6	–4.1	Roma, Firenze, Pisa, Livorno, Perugia
PL2	Makroregion Południowy	PL	97.7	12.4	–25.6	Krakow
PL6	Makroregion Północny	PL	148.0	12.4	–12.6	Gdańsk, Bydgoszcz
RO2	Macroregiunea doi	RO	192.7	2.2	–77.8	Constanța
RO4	Macroregiunea patru	RO	161.2	4.3	–29.7	Timișoara, Craiova
SE3	Norra Sverige	SE	69.1	30.6	–32.1	Umeå
UKC	North-East England	UK	130.7	10.0	–21.4	Newcastle upon Tyne, Durham
UKI	London	UK	49.39	10.6	–9.5	Greater London (London and its boroughs)

UKJ	South-East England	UK	88.95	1.0	–17.9	Southampton, Portsmouth, Oxford, Reading

Conclusions

This study has analyzed how tourism growth in densely populated areas of 85 European regions may have affected housing instability of urban dwellers between 2013 and 2018. In specifying our analytical model, we distinguished the effect of two variables of tourism growth (short-term rentals or traditional tourism accommodations) on the stability of tenancies in rented houses and of landownership, respectively. The model's output pointed to an additional driver of inequality which is boosted by the visitor economy, namely housing property. Specifically, the results provide evidence for the impact of Airbnb on rents and, indirectly, on the displacement of long-term tenants. However, they also show how renting accommodation out to Airbnb clients may alleviate the pressure on one's housing costs and reduce the likelihood that a long-term homeowner will move out. In this regard, being able to rely on the ownership of a private property or not makes a huge difference to residents in tourist destinations.

All in all, the proposed model shows that tourism is indeed a disruptive force that is altering the demographic and socio-economic structure of urban areas, along with other processes linked, for example, to traditional gentrification or population decline. Also, the impact of short-term rentals promoted via Airbnb was found to be particularly disruptive in its initial stages of expansion. On the other hand, the role of mainstream tourism in our model is negligible. One possible explanation could depend on the very definition of traditional tourism and, more precisely, on the fact that Eurostat data on visitors' overnights stays in cities may include Airbnb listings as well, at least in some NUTS regions. If this is the case, the effect of this variable may have been partially "absorbed" by the Airbnb variable.

Focusing on the direct paths of Airbnb on the economic variables in our model, it was found that it may have a positive effect on the mean incomes in the resident population, thus identifying one of the facets discussed in the literature on tourism development and economic prosperity (Harb and Bassil, 2020). However, the rise in the mean incomes in 2013-2018 also correlates with a corresponding increase of the variance of the income. Accordingly, the results indicate that the spread of short-term rentals like Airbnb may provide benefits in terms of higher incomes, but at the expense of increasing the gap between upper and lower incomes.

Airbnb's controversial role was further corroborated when we examined its relationship with rents, on the one hand, and the perceived financial burden of housing costs, on the other. In areas with higher growth rates for short-term rentals, rents have increased, but the perceived financial burden of housing costs have decreased significantly as well. As a result, given that housing and rental costs both significantly affect housing stability, the diffusion of Airbnb arises as a key factor in the decision of whether or not to stay in one's own home. For homeowners, this opens the possibility of renting out rooms or second homes, thus relieving the pressure of housing costs and, therefore, providing additional economic resources to help them consolidate their positions in their places of residence. For tenants, in the absence of the economic support that can be derived from private properties, rising rents are likely to motivate the decision to leave home in search of more affordable housing elsewhere. As such, the analysis sheds new light on the precarious equilibrium between the economic benefits that could be derived from investing in the visitor economy and the social costs for the most vulnerable sectors of the population.

Indeed, the interpretation of the model's output also suggests that the housing stability of urban dwellers is linked to demographic processes (population decline, for instance) and that, for homeowners, the arrival of new residents with higher incomes increases their chances of residential displacement. This latter finding introduces a nuance into the argument of Martin and Beck (2016), who did not find any evidence of homeowners being displaced in

gentrifying neighborhoods in the US, but rather the opposite, indicating that gentrification directly displaces renters. However, these authors have used longitudinal census data and measures of gentrification that differ from our own, which may explain these divergent results. At the same time, gentrification in European cities may depend on slightly different dynamics than in the US. In this regard, our model endorses Cocola-Gant's interpretation (2019) of tourism growth and gentrification as two phenomena that intersect in multiple ways. Finally, the effect of gentrification on tenant stability might be diluted outside the time frame considered, supposing that population turnover takes some time to exert a significant impact on tenants' residential choices.

As for the limitations of this research, consideration of additional motivations for staying or moving out would have definitely enriched the scope of our analysis. In fact, residential displacement is often related to the individual's life histories and family-formation, as shown by studies within the framework of life course theory (Clark and Lisowksi, 2018; Kulu and Steele, 2013; Mulder, 2006). More generally, some of the variables included in the model would require a process of fine-tuning. For instance, our proxy measure of gentrification is narrowed to only one of the facets of this phenomena (i.e., the substitution of former residents with new affluent ones) and therefore may have overlooked other possible explanatory factors linked to the rate of natural increase. Also, patterns of housing ownership diverge significantly between one country to another in Europe due to socio-historical and cultural factors that we could not account in our model. On the other hand, from a geographical perspective, it was not feasible to establish a differentiation between urban areas within a NUTS region, or within cities, which is likely to have hidden the actual reach of housing stability patterns given that we were not in the condition of retracing possible changes of residence within urban areas.

At the very end, the aim of the proposed analysis was to provide a consistent base of evidence for the ties between the growth in tourism and social exclusion on local (specifically urban) scales, which may inform a reformulation of urban policy agendas both locally and internationally. The transits and dwellings of tourists resituate resident populations through negotiations that are played out in spheres that are economic (hosts-guests or supply-demand relationships), physical (in terms of the occupation of space and its transformation) and socio-cultural (as adaptations of individual and collective lives to a landscape increasingly populated and signified by such transits). Resilient places should be able to accommodate these negotiations and transformations without systematically excluding the most vulnerable sectors of the population, who lack of sufficient social, economic, and cognitive resources to cope with such changes (Nikolaeva et al., 2019). In the tourist domain, this means that the increasing mobilization of tourism places should not lead to the erosion of the demographic and socio-economic specificities of the host communities.

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