



## The effect of tourism activity on housing affordability

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### ABSTRACT

Although researchers have confirmed the impact of tourism on housing prices in many destinations affected with overtourism, they do not consider housing affordability in relation to the population's income levels. This study explores the relationship between tourism activity and housing affordability, using a sample of Croatian municipalities. Specifically, the study investigates how tourist accommodation, concentration, seasonality and overall vulnerability to tourism influence housing affordability in this emerging tourism-driven European country. The results obtained reveal tourism intensification's deteriorating effect on local residents' abilities to afford housing. The findings indicate a particularly strong tourism seasonality impact, suggesting the presence of common negative externalities, such as employment fluctuations, difficulties in maintaining economic status, and revenue instabilities, in localities prone to seasonal tourism fluctuations.

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### Introduction

In recent years, considerable attention has been devoted to the tourism-led growth hypothesis. In post-industrial advanced societies, tourism is seen as a new source of growth, while advancing countries aim to exploit the benefits of increased mobility and communication in the age of globalization. However, there is a growing concern that the positive effects of tourism, reported from many countries, come at a cost, as there are negative sociocultural and environmental impacts, and tourism-dependent areas are vulnerable to demand shocks (Ahmad et al., 2020; Canha & Thanh, 2020; Meleddu, 2014; Romao, 2020; Saenz-de-Miera & Rosselló, 2014; Tkalec & Vizek, 2016). Local residents are particularly at risk, despite their satisfaction and quality of life should be at the heart of any sustainable development strategy (UNWTO, 2018). The above concerns have been present in the tourism-related literature for some time, referred to as overtourism and tourismphobia (Milano et al., 2019), and are attracting increasing attention in the field (Mihalić, 2020; Seraphin et al., 2018; Veríssimo et al., 2020; Zerva et al., 2019).

The recent COVID-19 pandemic further exposed many tourism systems' vulnerabilities to uncontrolled or excessive tourism developments. Destinations worldwide are becoming aware of the fragility and unsustainability of overtourism that dominated their growth models in past decades (Mikulić, 2020). As such, future tourism development has called for an increased focus on

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resilience, sociospatial planning, and management to secure balanced economic developments. One of the areas in which tourism has an impact is the housing market for tourist destinations. It is a well-established fact that booming tourist activity increases housing prices (Meleddu, 2014), but whether this rise is accompanied with income growth has been investigated to a far lesser extent. For the purpose of this research, a Web of Science analysis was conducted and identified only a few quantitative studies examining the relationship between tourism measures and housing affordability. This issue is important as the rising gap between housing prices and incomes strikes at the very foundation of the tourism-led growth hypothesis, increases inequalities (Wetzstein, 2017), causes the displacement of local residents from tourism destinations (Cocola-Gant, 2018), and leads to an overall tourism-led decay of cities and municipalities (Dimelli, 2017).

Despite these concerns, the tourism literature has neglected the issue of housing affordability, likewise the housing affordability research has not paid particular attention to tourism (Yates et al., 2007). Even studies investigating the effects of tourism on housing prices do not examine individual channels, such as seasonality, intensity, or vulnerability to tourism, through which tourism effects spillover to the housing market (Biagi et al., 2015; Biagi et al., 2016; Paramati & Roca, 2019; Tsui et al., 2019). With the exception of Biagi et al. (2015), existing studies also do not pay attention to the dependence of housing prices (and incomes) on their past realizations. Furthermore, only two studies use larger samples and assessed individual countries, such as Biagi et al. (2015) for Italy and Tsui et al. (2019) for New Zealand, while other studies dealt with individual cities, such as Barcelona (Garay et al., 2020), Athens, Lisbon, Milan (Amore et al., 2020), and New Orleans (Gotham, 2005).

The housing affordability crisis is one of the most pressing urban issues with policy interventions calling for evidence-based inputs (Lord et al., 2021; Wetzstein, 2017). The problem is particularly pronounced in peripheral economies that rely heavily on tourism as a source of growth. Thus, this study investigates how tourism intensity influences housing affordability in Croatia, a tourism-driven emerging European economy characterized by the highest tourism seasonality in the Mediterranean (Kožić, 2013). Specifically, using a sample of Croatian cities and municipalities, the study explores the effects of increases in tourism accommodation, concentration, and seasonality, and a destination's overall vulnerability to tourism on housing affordability. This study is the first to explore the impact of tourism intensity on housing affordability from four different perspectives. Second, a dynamic panel methodology is employed that considers the dependence of housing affordability on its past realizations and its potential correlation with unobserved time-invariant elements. Finally, a large sample of cities and municipalities are examined to determine the commonly neglected, but potentially important negative externalities of tourism development for local communities and to provide interested policy makers with significant evidence-based inputs.

## Literature

Globalization and technological advancement have brought numerous challenges to urban and rural areas. In this context, both developing and advanced countries perceive tourism as one of the key determinants of contemporary urban development (Hillier, 2011; Timothy, 2019), involving many actors with diverse economic and social perspectives. Their interactions impact the ability of both present and future generations to meet their needs (Almeida et al., 2017; Risteski et al., 2012), and increase their vulnerability in terms of cultural identity, segregation, service accessibility, and gentrification (Gotham, 2005; Mäntyselä et al., 2015). This highlights the importance of strategic spatial planning that is capable of confronting tourism-driven challenges in an inclusive, action-oriented, and visionary manner to ensure the efficient exploitation of land resources and balanced economic development (Albrechts & Balducci, 2013; Kidd & Shaw, 2013).

Under capital circulation theory (Harvey, 1978, 1985), capital investments take place along the primary circuit (e.g., the manufacturing sector's investment processes) and secondary circuit (e.g., spillovers from the primary circuit's over accumulation into land, real estate, and housing). The latter circuit helps the economy absorb economic shocks and represents one of the pillars of capitalist development. Alternative views suggest that capital switching toward real estate investment has more to do with a proactive and conscious search by economic agents to increase profits than with corrective mechanisms to address economic crises (Aalbers, 2007; Gotham, 2009). Accordingly, the rent gap between actual and potential land rents determines the use of real estate, and its conversion from existing use into what economic agents view as highest and best use (Smith, 1979, 1987). Both theories may explain tourism-induced sociospatial restructuring, as the rise of post-industrial societies diminishes the existing uses of many land rentals, and calls for alternative opportunities with higher returns and better possible uses (Clark, 1995; Kauko, 2001).

A population's increased mobility and visitors' growing demands intensify land use and increase rent extraction possibilities, leading to the conversion of housing into rentals, lifestyle migration, or increased investments in tourism-related real estate. The evidence suggests that in the absence of strategic spatial planning, these processes may conflict with existing social structures and locals' needs (McCarthy, 2003), leading to anarchic developments and making tourism the driver of local decay (Dimelli, 2017). This decay is particularly reflected in tourism gentrification (Gotham, 2005), which causes housing affordability crises (Lord et al., 2021). Specifically, this type of sociospatial restructuring increases housing prices, affecting particularly low and middle class residents, and has severe social and spatial implications on functionality, decay, the provision of essential urban services, upward social mobility, and social harmony (Wetzstein, 2017). Affecting both urban and rural areas (Cocola-Gant, 2018; Phillips, 2002), this rent gap induced tourism gentrification appears in different parts of Europe (Amore et al., 2020; Cooper & Morpeth, 1998) and the US (Gotham, 2005).

Tourism gentrification is particularly relevant in less advanced economies that depend heavily on tourism as a source of growth (Cocola-Gant, 2018). In post-industrial society, these economies struggle to compete in the finance or information sectors, but do possess competitive advantages in attracting mass consumption and tourism (Harvey, 1989). However, many less

advanced economies lack the efficient institutional frameworks that would ensure balanced economic development and sustainable spatial planning. For this reason, the effects of gentrification in such settings are likely to be pronounced. Empirical studies approach tourism's effects on housing from different angles. One stream explores the effect of commercial tourist amenities (e.g., beaches, parks, golf courses, etc.) on housing prices (Anderson & West, 2006; Bolitzer & Netusil, 2000; Do & Grudnitski, 1995; Luttik, 2000; Nicholls & Crompton, 2007), while another examines the effects of accommodation platforms on housing and rental markets (Barron et al., 2020; Eliasson & Ragnarsson, 2018; Garcia-Lopez et al., 2020; Sheppard & Udell, 2016).

While the second stream mostly confirms the presence of increases in housing and rental prices, other researchers argue that tourism expansion has positive effects on housing prices at municipal or regional levels (Alola et al., 2020; Balli et al., 2019; Biagi et al., 2012; Biagi et al., 2015, 2016; Kavarnou & Nanda, 2018). For instance, Paramati and Roca (2019) confirm these findings through their cross-country panel of 20 OECD countries. Surprisingly, none of these studies explore the effect of tourism activity on housing affordability, despite identifying the housing affordability crisis as a pressing global issue (Lord et al., 2021; Wetzstein, 2017). Additionally, studies nested within the tourism gentrification, rent gap, and capital circulation theoretical frameworks commonly postulate that these processes result in the deterioration of housing affordability (Amore et al., 2020; Cocola-Gant, 2018; Dimelli, 2017; Gotham, 2005).

Moreover, researchers have searched for the determinants of housing affordability on the demand side, such as household size, income levels, education, and mortgage rates (Bramley, 2012; Gyourko & Linneman, 1993; Luffman, 2004), and the supply side, such as land availability, spatial planning, infrastructure and building costs, and taxes (Cruz, 2008; Nwuba et al., 2015; Yates et al., 2007). Considering these factors, this study assesses tourism's impact on housing affordability from several different perspectives. Drawing from previous studies, the analysis examines how increases in rental housing stock influence housing affordability and the effects of tourism's spatial concentration, considering that tourism has an uneven spatial distribution and produces localized impacts (Batista e Silva et al., 2018). A novel aspect of this study lies in its assessment of how tourism seasonality and vulnerability impact housing affordability. Seasonality is one of most prominent, but least researched features of tourism and has been generally ignored within the housing literature (Chung, 2009). It leads to employment rate fluctuations, making it difficult to maintain economic status, and involves high capital underutilization risks, revenue instabilities, and overpopulation (Lee et al., 2008).

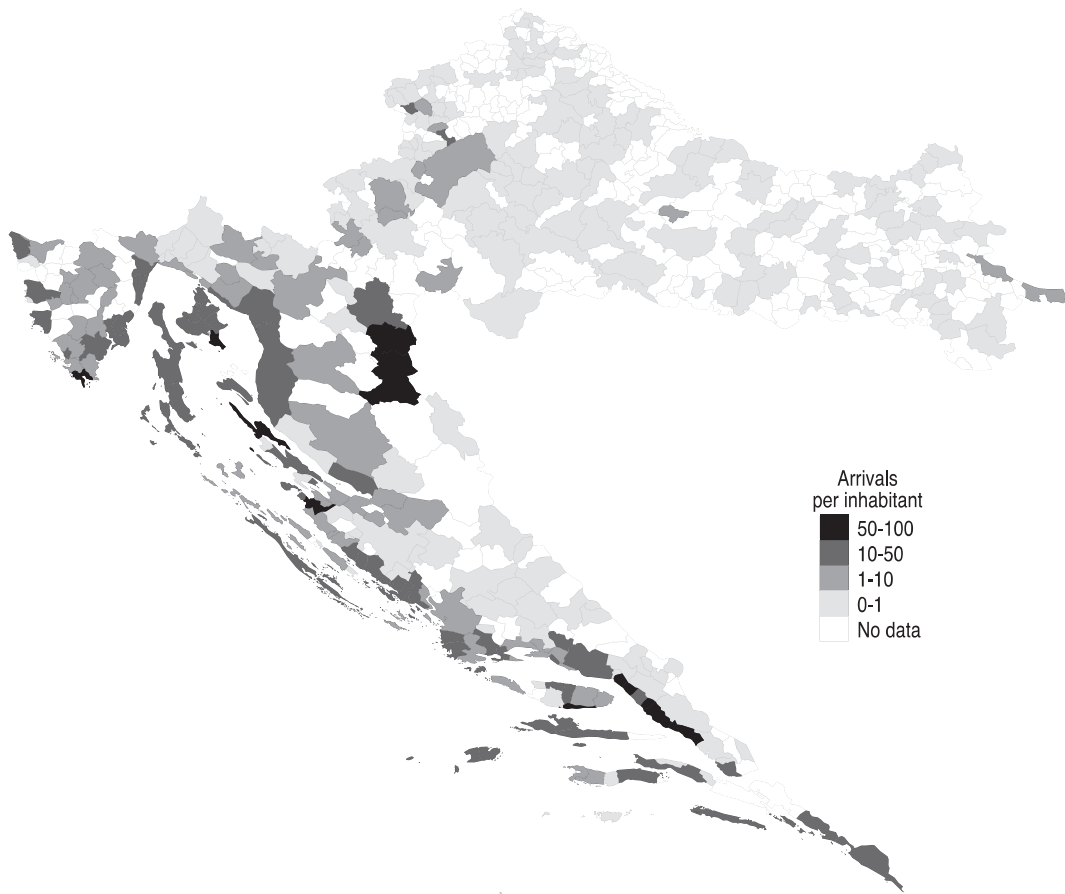
As previous studies have neglected the effect of the temporal dimensions of housing prices and resident incomes on housing affordability, this study incorporates the past realizations and the dynamics of housing prices and resident incomes as suggested by the spatial planning literature (Albrechts & Balducci, 2013). In addition, this study investigates how a destination's vulnerability to tourism impacts housing affordability using a recently developed vulnerability index that combines intensity and tourism seasonality (Batista e Silva et al., 2018). This index allows one to determine how tourism sector shocks, such as economic crises, reduced tourism demands, pandemics, terrorism, and other socioeconomic or environmental disruptions, affect housing affordability in highlighting a location's exposure to these additional risk dimensions.

### Study setting: tourism intensity and housing affordability in Croatia

This study examines tourism development's impact on housing affordability using an unbalanced panel of annual data on 242 Croatian cities and municipalities between 2012 and 2018. Due to its late integration into global, European, and regional economic associations, stemming from the 1990 war and internal privatization problems, Croatia did not have access to the large foreign investment inflows that improved other Central and Eastern European countries' production competencies and capabilities. Therefore, the economic structure of the country underwent one of the most severe de-industrializations among emerging European economies (Stojčić & Aralica, 2018). Croatian competitiveness and economic performance eroded to the extent that the country became the second poorest Central European economy, transforming it into a peripheral economy (Stojčić et al., 2018). According to World Economic Forum Global Competitiveness Index (WEF, 2019), Croatia was ranked 63rd out of 141 countries in terms of an overall competitiveness score in 2019, thus being the lowest ranked EU country. Thereby, individual rankings related to institutions, business dynamism, labor and product markets stand out as being particularly damaging for the country's competitiveness. However, with its long coast, proximity to Western European markets, and relatively preserved tourism infrastructure, Croatia improved its competitive position, becoming one of the leading European summer destinations.

The World Bank's World Development 1995–2016 report declared that only Cyprus, Malta, and Montenegro had higher shares of tourism receipts in GDP. The Croatian National Bank's publicly available 2000–2018 data also revealed that about 82% of FDI inflows went into the trade and service sectors. All this progress occurred during a turbulent time, when proper institutional frameworks were still emerging, and appropriate tourism management and spatial planning mechanisms were missing. Moreover, seasonality and small private rental capacities have dominated Croatian tourism for most of its existence. For example, in 2018, small private rental accommodations accounted for 63% of all tourism capacities, while in 1980 and 2010 it accounted for 28.3 and 47.1%, respectively (Ministry of Tourism of the Republic of Croatia, 2018). Thus, Croatia is an ideal candidate for analyzing tourism's impact on housing affordability. As a peripheral economy, the country uses tourism as its main source of growth, with its activities being centered around the summer months and spatially concentrated near the coast, main metropolitan areas, and municipalities surrounding national parks (Fig. 1). Also, tourist accommodation is heavily skewed toward small private rental capacities. As such, tourism is expected to significantly influence housing affordability.

During the period analyzed (2012–2018), the Croatian economy experienced a recession (2012 to 2014) and subsequent expansion (2014 to 2018). As shown in Table 1, a strong growth in tourist arrivals, accommodations, and receipts characterized this period. When compared to other Mediterranean destinations within the EU, Croatia recorded the largest increase in tourist



**Fig. 1.** Tourist arrivals per inhabitant in 2018.  
Source: Authors calculations based on Croatian Bureau of Statistics data.

accommodations and the second largest in arrivals. However, these were not followed with an equally strong growth in tourism receipts, largely due to the lower level of tourist expenditures per capita (Orsini & Ostojić, 2018). Table 1 also shows that Croatia outperforms other Mediterranean countries in terms of tourist arrivals and bed places per inhabitant. Croatia also surpasses EU countries with regard to its dependency on tourism, with tourist receipts amounting to 18.3 and 21% of GDP in 2018 and 2019, respectively. According to UNWTO (2020), the tourism sector's direct contribution to the gross value added for Croatia is the second highest in the world, behind Macau. Hence, the combination of very high tourism intensity and notable regional heterogeneity of tourism activity makes Croatia an excellent case study.

The focus of this study on housing affordability can be observed through purchasing, repayment, and income dimensions. The former two are related to buyers' abilities to borrow funds and service their mortgage repayments, while the latter reflects the relationship between housing prices and income levels (Gan & Hill, 2009). The analysis focuses on income housing affordability, measured as a ratio of the median apartment price per square meter to the average net monthly income per capita. Hulchanski

**Table 1**  
Main tourism indicators: Croatia and peer-EU countries. Source: Eurostat.

Country	Tourist arrivals			Tourist accommodation (bed places)			Tourism receipts		
	2018 (mil.)	2018/12 (% change)	Per capita	2018 (mil.)	2018/12 (% change)	Per capita	2018 (bil. EUR)	2018/12 (% change)	2018 (% GDP)
<b>Croatia</b>	<b>18.6</b>	<b>61.6</b>	<b>4.5</b>	<b>1.12</b>	<b>39.6</b>	<b>0.27</b>	<b>9.5</b>	<b>38.7</b>	<b>18.3</b>
France	171.5	15.2	2.6	5.11	2.0	0.08	55.5	32.8	2.3
Greece	28.7	57.7	2.7	1.34	11.3	0.12	16.1	54.0	9.0
Italy	128.1	23.5	2.1	5.11	7.4	0.08	41.7	30.1	2.4
Malta	2.0	46.8	4.2	0.05	11.8	0.10	1.6	58.7	12.6
Portugal	25.9	76.6	2.5	0.65	33.3	0.06	16.8	95.7	8.2
Spain	130.8	30.3	2.8	3.60	5.4	0.08	69.0	40.1	5.7

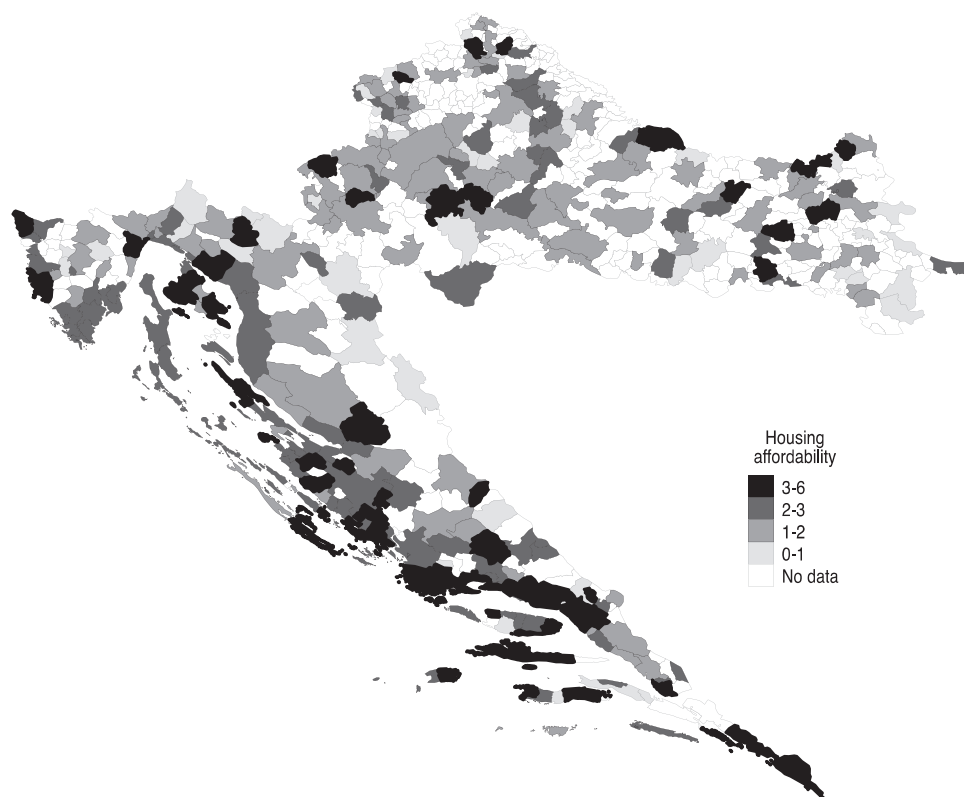
(1995) analyzes the significance and reliability of this measure, noting that it is particularly valid and helpful for assessing household housing expenditure patterns. This measure can also help identify societal trends and dynamics when assembled with certain data that allows for the identification and interpretation of relationships and conclusions.

The examination of income housing affordability seems particularly relevant, as it determines whether tourism contributes to improvements in housing affordability and living standards, specifically regarding the dynamics of a socioeconomic transition to tourism-led growth. It also does not suffer from other market trend interferences (e.g., financial) that may influence purchasing and repayment affordability. The literature suggests that income affordability is a theoretically different concept that does not consider such issues (Gan & Hill, 2009; Hulchanski, 1995). However, some interpretative caution is required. Income housing affordability is incapable of measuring the subjective distinction between societal and individual conceptions of affordability, and it may be sensitive to institutional settings, buyers' life-cycle economic capacity, and real estate purchase decisions (Ying et al., 2013). As such, the findings are interpreted with these aspects in mind. Fig. 2 displays the housing affordability data for Croatian cities and municipalities, which indicates lower housing affordability in tourism intensive coastal and island destinations than in continental municipalities.

### Data, model, and methodology

As noted by Hulchanski (1995), household affordability ratios require assembling data that allows for the identification and interpretation of relationships before drawing conclusions. Taking this into account, a quantitative model is developed that combines variables constructed from several reliable data sources. Most of the variables, including the tourism related measures, come from the National Statistical Office of Croatia, the official focal point for statistical data collection. This database is supplemented with datasets obtained from two Croatian ministries, namely the Ministry of Finance (its Tax Office) and the Ministry of Regional Development and European Funds. Finally, the Institute of Economics Zagreb (EIZ) provides the data on housing transactions and prices from their annual reports on real estate trends prepared for the Croatian Ministry of Construction. The analysis covers the 2012–2018 period, and contains 242 out of 556 Croatian cities and municipalities in which real estate transactions took place over the years analyzed. Given that for some localities housing transactions only occurred in one year or have missing observations for some independent variables, the dataset is unbalanced.

The housing affordability index is defined as the ratio of the median apartment price to the average net monthly income per capita at the city or municipality level. As noted previously, this measure reflects income housing affordability (Gan & Hill, 2009),



**Fig. 2.** Housing affordability in 2018. Note: Higher housing affordability index values denote lower affordability, as experienced by local residents. Source: Authors' calculations based on data provided by the Ministry of Finance, Tax Office, and the Institute of Economics, Zagreb (2020).



and is valid and helpful for assessing household expenditure patterns on housing, and identifying societal trends and dynamics, such as the ones in our analysis (Hulchanski, 1995). Note that higher values of this measure signal lower housing income affordability. Thus, a positive relationship between tourism measures and the housing affordability measure is expected. The model assumes that a given location's housing affordability is not determined in a single time frame, but evolves over time and depends on its past realizations (André et al., 2014; Biagi et al., 2015; Tsui et al., 2019). For this reason, the lagged value of the dependent variable is included in the analysis.

Unlike previous studies, this study approaches the issue by centering on four dimensions of tourism activity. The first is *tourist accommodation*, defined as the share of rental and vacation housing stocks in the city or municipality's total housing stock. As noted above, higher rent opportunities in tourism may induce the conversion of existing properties and the building of new rental housing premises, ultimately reducing the residential housing supply and increasing housing prices (Amore et al., 2020; Clark, 1995; Cooper & Morpeth, 1998; Gotham, 2005; Kauko, 2001). As such, tourist accommodation is expected to have a positive effect on the housing affordability index (i.e., lower affordability). The second dimension is *tourist concentration* or the location quotient of tourist stays, measured as the share of overnight tourist stays per capita in a municipality in relation to the entire country. Originally taken from Batista e Silva et al. (2018), this variable controls for the overcrowding and overpopulation effects identified in the earlier literature that can potentially drive housing prices upward and reduce housing affordability (Cooper & Morpeth, 1998; Dimelli, 2017). Thus, tourist concentration is expected to have a positive relationship with the dependent variable in places with higher tourism concentration.

The remaining two dimensions, seasonality and a destination's overall vulnerability to tourism, are assessed for the first time within the housing-related literature. *Tourism seasonality* is defined as the variation coefficient of a city or municipality's average daily number of overnight tourists on a monthly basis. Employment fluctuations, capital underutilization risks, revenue instabilities, and overpopulation are the most common side effects of tourism seasonality, all of which the housing literature has recognized as potential detriments to housing affordability (Chung, 2009; Lee et al., 2008). Similar to the previous measures, tourism seasonality is expected to have a positive relationship with the dependent variable. Finally, we introduce the *composite index of tourism vulnerability* to external shocks, such as socioeconomic, environmental, health-related, or terrorism. Originally created by Batista e Silva et al. (2018), this index is a product of the previously defined tourism concentration and seasonality measures. Higher index values reflect a location's higher vulnerability to tourism shocks. Once more, the composite index of tourism vulnerability is expected to have a positive relationship with the dependent variable.

While previous studies employed single tourism indicators, such as tourist arrivals, receipts, or investments, the approach undertaken in this study attempts to capture tourism's multidimensional characteristics (Alola et al., 2020; Balli et al., 2019; Gu et al., 2017; Paramati & Roca, 2019; Tsai et al., 2016; Wu et al., 2021). It also differs from studies using composite indices, such as Van der Waerden ranking scores (Biagi et al., 2012, 2015) or those obtained through factor analyses (Biagi et al., 2016; Kavarnou & Nanda, 2018), because of their interpretative challenges. Instead, this study considers the geographical concentration of tourism demand over time, tourism intensity and seasonality, and vulnerability to shocks. As a robustness check to our analysis, the single tourism indicator, tourist accommodation, is used to address the supply side of tourism.

Besides these main variables, the model includes several control variables recognized in the literature. For instance, *migrant share* measures whether a city or municipality records a net increase or decrease of residents due to migration. In the period analyzed, Croatia lost 4% of its population from emigration to other EU member states. A negative net migration share is expected to decrease the affordability index value, thereby increasing housing affordability for residents. On the other hand, *property income* approximates the present cash flow (income from rent) from the available housing stock in a city or municipality. Increases in property income are expected to increase the affordability index value for a city or municipality through its positive effect on the median apartment price. *Unemployment rate* represents local labor market conditions in a particular location. A rise in unemployment should decrease both housing prices and income. However, with the presence of persistence in housing prices, a decrease in income due to unemployment is expected to be greater than a decrease in housing prices, whereby the affordability index increases (i.e., less affordable).

*Distance* and *density* involve a city or municipality's distance from the county administrative center and the number of inhabitants per km<sup>2</sup>, respectively. The greater the distance from the administrative center, the lower the housing prices, resulting in a lower value for the affordability index. Density should exhibit the opposite effect on the affordability index. Moreover, *transrel* represents the relative volume of housing market transactions. An increase indicates that the housing market is expanding, or possibly overheating, which in turn suggests housing prices should also rise, creating the housing price and income gap, and increasing the affordability index value. The *development index* is introduced in the model as a control for a city or municipality's overall level of economic development. People residing in more developed municipalities are generally faced with lower housing affordability, due to faster average municipal housing price growth when compared to income growth (Vizek, 2009). Finally, *coast*, *island*, and *metro* are controls for coastal municipalities, island municipalities, and large metropolitan areas, respectively. These municipalities should on average exhibit a higher value for the housing affordability index. Table 2 overviews the variable definitions and data sources, while Table 3 illustrates their descriptive statistics.

Fig. 3A and B represents the *vulnerability to tourism index* for Croatian cities and municipalities in 2012 and 2018, respectively. After comparing the two maps, it is clear that in 2018, compared to 2012, tourism impacted a far greater number of cities and municipalities. In 2012, the greatest vulnerability to tourism emerged in coastal areas, particularly in central Istria (north western coastal region), in a few islands, and in continental municipalities in central and northern Dalmatia (south and south eastern coastal regions). The majority of these regions remained most vulnerable to tourism in 2018, despite the increase in the sample due to additional data availability for several northern cities and municipalities.

**Table 2**  
Variable definitions.

	Descriptions	Sources
<i>Dependent variables</i>		
Housing Affordability Index	The median price of a m <sup>2</sup> for an apartment divided by the average net monthly total income per capita at the city or municipality level.	Ministry of construction/EIZ (median apartment price) Ministry of Finance Tax Office (net monthly income)
<i>Controls</i>		
Migrant share	Share of net migrating residents within a city or municipality's total population in a given year (%).	Croatian Bureau of Statistics
Property income	Share of property income in a city or municipality divided by the average value of the same variable at the country/year level.	Ministry of Finance Tax Office
Unemployment rate	Share of unemployed persons in a city within a year (%).	Croatian Bureau of Statistics
Distance	Distance of a city/municipality from the county administrative center (km).	Google maps
Density	Number of citizens per area of a city/municipality (km <sup>2</sup> ).	Croatian Bureau of Statistics
Transrel	Number of real estate (apartment) transactions in a city or municipality/average number of transactions in the county.	Ministry of construction/EIZ
Development index	Official development index value of a city or municipality.	Ministry of Regional Development and European Funds
Coast	Categorical – 1 if on coast.	Authors' calculations
Island	Categorical – 1 if on island.	Authors' calculations
Metro	Categorical – 1 if one of the four metropolitan areas (Zagreb, Split, Rijeka, or Osijek).	Authors' calculations
<i>Tourism controls</i>		
Accommodation	Share of housing stock (m <sup>2</sup> ) for rental and vacation/total m <sup>2</sup> of housing stock in city or municipality (%).	Authors' calculations based on the Croatian Bureau of Statistics
Concentration	Tourism location quotient: Average daily number of overnight tourist stays over the year (number of nights/365/city population)/ Average daily number of overnight tourist stays over the year/population in the country (%).	Authors' calculations based on the Croatian Bureau of Statistics
Seasonality	Variation coefficient representing a city's monthly series of average daily overnight tourist stays.	Authors' calculations based on the Croatian Bureau of Statistics and visitor data
Vulnerability index	Tourist concentration * tourism seasonality.	Authors' calculations based on the Croatian Bureau of Statistics

The panel nature of the dataset and the previously suggested dependency of housing affordability on its past realizations make the dynamic panel system estimation technique a logical choice (Arellano & Bover, 1995; Blundell & Bond, 1998). Based on the generalized method of moments (GMM), this technique does not require traditional assumptions of normality or homoscedasticity. Rather, GMM relies on moment conditions, a set of restrictions on the covariance between the independent variable and the error term, to produce unbiased and consistent coefficient estimates. The method utilizes instruments found within systems (lagged levels and differences of potentially endogenous or predetermined variables), which are uncorrelated with the error term to produce unbiased and consistent estimates. For city *i* in period *t*, our model can be expressed as:

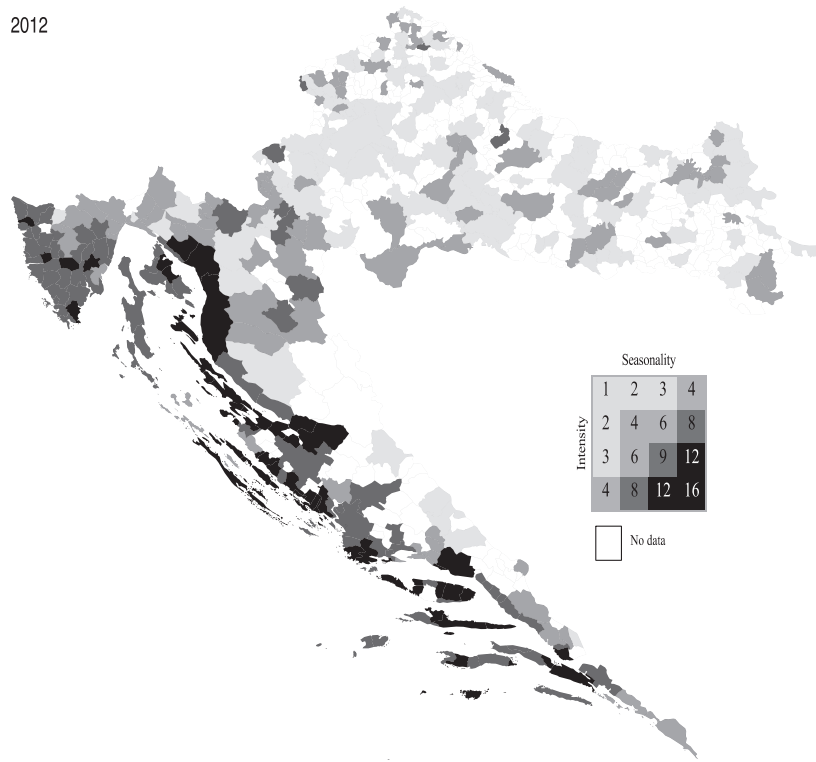
$$affordability_{it} = \beta_0 + \beta_1 affordability_{it-1} + \beta_2 X_{it} + \eta_i + v_{it} \tag{1}$$

**Table 3**  
Descriptive statistics.

Variables	Obs.	Mean	Std. dev.	Min	Max
Housing affordability index	957	2.98	1.51	0.01	9.38
Migrant share	957	-0.55	1.85	-12.64	6.63
Property income	957	1.00	2.39	0	54.74
Unemployment rate	957	20.86	12.46	2.09	76.22
Distance	957	39.40	32.21	1	207
Density	957	2112	12,165	3.35	128,774
Transrel	957	1.02	2.70	0	33.76
Development index	957	58.56	52.50	0	117.8
Coast	957	0.37	0.48	0	1
Island	957	0.19	0.40	0	1
Metro	957	0.02	0.14	0	1
Tourist accommodation	957	24.27	22.98	0.001	85.34
Tourist concentration index	957	4.63	8.71	0	91.37
Tourism seasonality	957	1.17	0.57	0.10	3.46
Vulnerability to tourism	957	6.92	12.75	0	136.51

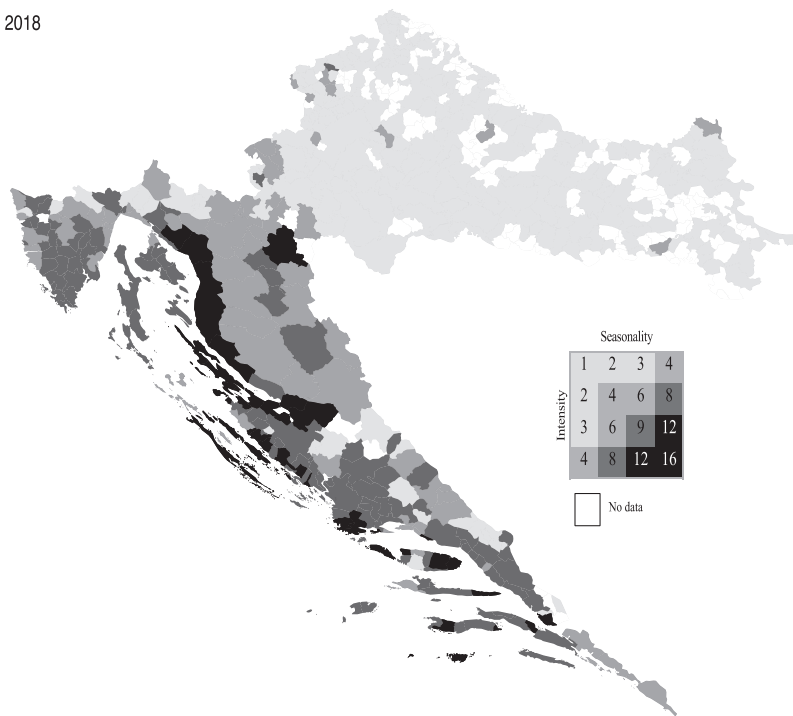
**A**

2012



**B**

2018



**Fig. 3.** A. Vulnerability to tourism in Croatian cities and municipalities in 2012. B. Vulnerability to tourism in Croatian cities and municipalities in 2018.



Here,  $affordability_{it-1}$  is the lagged dependent variable (i.e., ratio of an apartment's median price to the average net monthly income per capita at the city or municipality level in a year).  $X_{it}$  denotes the vector of control variables described in Table 2,  $\eta_i$  captures the individual time invariant effects, and  $v_{it}$  represents the idiosyncratic errors. All relevant model diagnostics provide support for our estimation. The values of the Hansen test for over-identifying restrictions lie between 0.158 and 0.258, indicating the validity of the instruments. The null hypothesis of no first order autocorrelation in the m1/m2 test is rejected, but there is insufficient evidence to reject the hypothesis with respect to second-order autocorrelation.

### Empirical results and discussion

Starting with the lagged dependent variable, the results show positive and statistically significant coefficient estimates between 0.25 and 0.26 in magnitude across all estimated models in Table 4. This not only confirms the dependence of housing affordability on its past realizations, as Biagi et al. (2015) and Tsui et al. (2019) argue, but also the robustness of our model to the use of different tourism intensity measures. A higher share of tourism accommodation properties in the total housing stock also decreases housing affordability (i.e. higher affordability index), but its effect is the smallest among the four tourism measures. Positive and statistically significant effects are also found for the remaining three tourism intensity variables. It is worth noting that the coefficient estimate on tourism seasonality is nearly 10 times greater than that of the other tourism measures, indicating the importance of tourism seasonality in driving the affordability index.

These results indicate that the affordability index is higher (i.e., lower affordability) in cities and municipalities where the share of rental housing within the total housing stock is higher, in addition to high tourist concentrations and vulnerability to tourism. However, tourism's greatest influence on affordability comes from its seasonality, which reaches its peak during the summer months when the number of tourists increases dramatically. As a result, the housing supply is relatively price inelastic and the increasing demands are driving prices upward. Thus, it is not the locational concentration of tourism, but the concentration within a narrow time frame (i.e., seasonality) that is the principal driver of decreasing affordability.

As noted previously, seasonality has not been examined within the housing literature, but it has been associated with employment rate fluctuations, difficulties in the maintenance of economic status, capital underutilization risks, revenue instabilities, and overpopulation (Chung, 2009; Lee et al., 2008). As Croatia has the highest rate of tourism seasonality in the Mediterranean (Kozić, 2013), these mechanisms are most likely behind our findings.

Among the control variables, the results reveal a positive and statistically significant coefficient estimate for migration, indicating that an increase in the net share of migrants, within a city or municipality's total population, increases the housing affordability index (i.e., lower housing affordability). In models (2) and (4), a positive and statistically significant coefficient estimate for the unemployment rate is observed. Thus, as the unemployment rate increases, the housing affordability index rises (i.e., less

**Table 4**  
Estimation results.

Model/variables	Model 1	Model 2	Model 3	Model 4
Lagged dependent variable	0.267*** (0.098)	0.256*** (0.099)	0.250** (0.101)	0.254*** (0.100)
<b>Accommodation</b> (t – 1)	0.014*** (0.003)	–	–	–
<b>Concentration</b> (t – 1)	–	0.031*** (0.009)	–	–
<b>Seasonality</b> (t – 1)	–	–	0.215*** (0.112)	–
<b>Vulnerability to tourism</b> (t – 1)	–	–	–	0.022*** (0.006)
Migration (t)	0.039* (0.022)	0.058** (0.024)	0.058** (0.023)	0.056** (0.024)
Property income (t)	0.013 (0.009)	0.012 (0.010)	0.011 (0.009)	0.013 (0.010)
Unemployment rate (t)	0.005 (0.004)	0.010** (0.004)	0.004 (0.286)	0.010** (0.004)
Distance (t)	0.003 (0.002)	0.003 (0.002)	0.004* (0.002)	0.003 (0.002)
Density (t)	–0.00001 (0.000)	–0.00001** (0.000)	–0.00001 (0.000)	–0.00001** (0.00001)
Transrel (t)	–0.004 (0.009)	–0.005 (0.009)	–0.008 (0.009)	–0.005 (0.009)
Development index (t)	0.063*** (0.012)	0.059*** (0.012)	0.068*** (0.012)	0.059*** (0.012)
Coast	0.544*** (0.137)	0.593*** (0.150)	0.619*** (0.161)	0.592*** (0.150)
Island	0.526*** (0.190)	0.854*** (0.218)	0.814*** (0.221)	0.837*** (0.216)
Metro	0.428** (0.210)	0.342* (0.202)	0.358* (0.199)	0.343* (0.204)
Year dummies	Yes	Yes	Yes	Yes
Arellano Bond m(1)	–4.37	–4.29	–4.21	–4.28
p-Value	0.000	0.000	0.000	0.000
Arellano Bond m(2)	1.40	1.25	1.16	1.26
p-Value	0.162	0.211	0.246	0.207
Hansen test	1.82	1.99	1.28	1.97
p-Value	0.177	0.158	0.258	0.160
Number of instruments	18	18	18	18
Number of groups	242	242	242	242
Number of observations	957	957	957	957

Note: All estimated empirical models are dynamic panel-data, two-step system GMM models, and include a constant term and time dummies. The Windmeijer-corrected cluster-robust errors are given in parenthesis.

\*\*\* 1% significance level.  
 \*\* 5% significance level.  
 \* 10% significance level.

affordable). Among the other characteristics, the development index has a positive and statistically significant impact on the housing affordability index. The coefficient estimates representing the control variables of coastal areas, islands, and metropolitan areas are all positive and statistically significant. This result is not surprising given that these regions are major tourist hubs. Regarding property income and the volume of real estate transactions (*transrel*), both variables are statistically insignificant. Finally, the distance and density findings yield mixed results, as the coefficient estimate for density is positive and statistically significant in model (3), but in the case of distance is negative and statistically significant only for models (2) and (4).

Though the findings are not directly comparable to other studies, some comparisons can be made with those examining housing prices or affordability through other tourism measures. In terms of the lagged dependent variable, Biagi et al. (2015) report a positive and statistically significant coefficient for past housing price values per square meter in Italy, and Tsui et al. (2019) share the same results for New Zealand. Based on these studies, our findings appear to be consistent. Furthermore, Biagi et al. (2015) show that the composite tourism index has a positive effect on housing prices, but insignificant effects for the variables that measure accommodation capacities and nights of stay. Gu et al. (2017) report that higher revenues from casino-related tourism accentuate the housing bubble and reduce housing affordability in Macao, while Tsui et al. (2019) find higher housing prices in New Zealand's major tourist centers. Thus, the findings of certain elements of this study are comparable with previous literature.

## Conclusion

Housing affordability is a pressing global issue, with tourism intensity having a significant impact on local residents' ability to purchase real estate (Lord et al., 2021; Wetzstein, 2017). This study investigates how different tourism channels (seasonality, intensity, vulnerability, and accommodation) influence housing affordability in Croatia. The results provide robust evidence of tourism's negative effects on housing affordability in Croatia, with particularly strong effects emerging through tourism seasonality. The common negative externalities, such as employment rate fluctuations, difficulties in the maintenance of economic status, capital underutilization risks, revenue instabilities, and overpopulation present challenges for local residents to afford real estate. Moreover, the findings complement anecdotal evidence from worldwide media coverage regarding the conversion of homes into rentals and residents' inability to buy or rent housing, due to overtourism. In fact, the effect of tourism seasonality is about 10 times stronger, compared to tourism concentration, in reducing affordability, pushing residents out of the housing market, or forcing them to choose more affordable locations situated further from the destination's center, or even relocated to another municipality.

Overall, the results reveal two paradoxical outcomes from a tourism development perspective. First, tourist destinations and their gentrified centers, in particular, lose their authenticity and appeal that contributed to their image that attracted visitors in the first place. Second, when residents must move because of rising tourism activity and housing affordability issues, tourism development becomes counterproductive. Furthermore, two potential factors can explain the strong impact of tourism seasonality on housing affordability in Croatia. First, cities and municipalities with stronger tourism seasonality generally tend to have very few upscale hotels or collective accommodation facilities, compared to private rentals, which are unable to support a tourism season beyond the two warmest summer months. On average, private rentals account for two-thirds of all tourist accommodations in Croatia, but in locations with stronger tourism seasonality, this share is probably even higher, making their housing supply more price inelastic when compared to destinations holding more collective accommodation facilities. Under such conditions, the increasing tourism-led demand will result in larger housing price increases than at destinations with shorter tourist seasons, subsequently increasing housing affordability issues in these areas.

Second, shorter tourist seasons may dampen the ability of local residents and businesses to generate tourism-related income, further widening the gap between housing prices and income, and reducing their capacities to afford housing. Locally, this may further exacerbate the inequalities between those who own real estate and those who do not, potentially leading to *tourism-led decay*, rather than tourism-led growth. For example, the middle-class residents in Split and Dubrovnik can no longer afford average properties, due to insufficient income levels, with houses and apartments being less affordable than in Hong Kong (Bošković, 2017). This tourism-led decay has also emerged in other Mediterranean destinations, such as Greece (Dimelli, 2017). Thus, a location-specific policy mix is needed to simultaneously increase the resilience of a destination's overall tourism system and address the negative externalities of tourism development vis-à-vis the housing market. Destination management policies should optimize the structure of tourism accommodation capacities and extend tourism seasons to increase resilience and ameliorate tourism's negative impact on housing affordability. Spatial planning and housing policies should focus on increasing a destination's housing stock and affordable housing. Other viable measures could also curb the proliferation of short-term rentals with tax disincentives or supply limitations.

As this study comes at a time of worldwide undertourism, due to COVID-19, some might question its relevance. However, our tourism vulnerability index assesses how socioeconomic, environmental, and medical disruptions to tourism, such as pandemics, affect housing affordability. Also, UNWTO (2020) predicts the return of pre-pandemic tourism levels by 2023–2024, and past crises have shown that tourism activity recovers quickly once the danger has passed and/or travel restrictions are lifted (e.g., SARS, MERS, 9/11, Tunisia and Egypt's terror attacks, etc.). Across the world and particularly in Mediterranean destinations overcrowded with tourism, there is a need for new and sustainable tourism in the post-pandemic period. Thus, the findings may assist policymakers in planning more resilient and sustainable economic development. Finally, this study has a few limitations. Given the focus of the analysis rests with a single country, cross-country investigations would strengthen the robustness of the findings. In addition, due to the lack of data, the incorporation of other housing affordability indicators, such as housing purchase and repayment affordability data in the modeling framework is worth considering. Also, the changes in the structure of tourism

accommodation in municipalities are not taken into account specifically in this study, even though these changes may influence both housing prices and housing affordability. Furthermore, another limitation of the study is an analysis of the spatial distribution within a specific municipality or city. Future studies of the spatial aspects of housing affordability, especially for key tourism destinations on the coast are recommended.

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