EXTENDED ABSTRACT

Title: SPATIAL SPILLOVERS OF TORISM ACTIVITY ON HOUSING MARKETS: THE CASE OF CROATIA

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Several authors have stressed rising housing prices associated with intensifying tourism activity as a significant negative externality of tourism development (e.g., Mikulić, Vizek, Stojčić, Payne, Čeh Časni, & Barbić, 2021). The relationship between levels of tourism activity, typically measured in terms of arrivals and/or overnights, and housing prices has also been confirmed empirically in a number of studies (e.g., Biagi, Lambiri & Faggian, 2012; Biagi, Brandano & Caudill, 2016; Balli, Balli, Flint-Harle & Yang, 2019; Paramati & Roca, 2019, Churchill, Inekewe, & Ivanovski, 2021).

This negative side-effect of tourism development gained new momentum with the proliferation of Airbnb and other peer-to-peer platforms that initiated a structural change in accommodation capacities at many destinations, essentially by turning flats into short-term rentals (STR) aimed at tourists (Dolicar, 2019). The negative consequences of these developments are well-documented in studies set within the context of "bucket-list" destinations struck by over-tourism, like, for example, Barcelona, Dubrovnik, New York, or Venice. Even the COVID-19 pandemic, which has hit the tourism sector very hard and led to a short period of under-tourism, did not stop this trend, with some European towns like, e.g., Split and Venice again being overrun by tourists during the peak of the 2021 summer season.

Generally, besides rising housing prices, negative consequences associated with STR-induced overtourism are gentrified city centers (e.g., Wachsmut & Weisler, 2018; Ardura Urquiaga, Lorente-Riverola, & Ruiz Sanchez, 2020), crowdedness (e.g., Park & Agrusa, 2020), and increasing retail prices (e.g., Stynes, 1997, Gholipour, Tajaddini, & Andargoli, 2021), to name only some of the most significant ones. Together, these effects significantly contribute to a lowering of quality-of-life of residents in tourist destinations (Biagi, Ladu, Meleddu, & Royuela, 2020), especially for residents who do not own a property and/or have no significant benefits from the local tourism industry, either direct (e.g., via employment) or indirect ones (e.g., boosting economy).

However, what if these effects were not constrained to neighborhoods in the area or destination under investigation (e.g., Zou, 2020) but rather extended to other regions via spatial spillovers?

On the one hand, this would imply that the pressure of tourism activity on housing prices is an externality that also affects those who do not have any direct or indirect benefits from tourism activity, as described above. On the other hand, this would also imply that actions taken at the local level, like housing policies, aimed at providing relief to residents who have difficulties affording housing at popular tourist destinations, should, in fact, be developed more holistically by taking into account tourism impacts on real estate markets at a regional or supra-regional, rather than focusing only on the local level.

As described above, potential regional spillovers have not been addressed in the tourism, housing, nor regional economics literature so far, which is a research gap this study intends to fill. The empirical analysis is set within Croatia, an increasingly popular Mediterranean destination, ranked 27th according to the World Economic Forum's Travel & Tourism Competitiveness Report, putting it at a similar level like, e.g., Greece (#25) (WEF, 2019). Tourism activity in this country is densely concentrated in proximity to the sea and along the whole coast, whereas there are only a few tourist spots in the continental parts of this country. This is also reflected in a share of 97.3% of all accommodation establishments located in one of two of Croatia's NUTS-2 regions, i.e., Adriatic Croatia (as opposed to Continental Croatia), which is also ranked first among all European NUTS-2 regions according to accommodation capacity (Eurostat, 2021a). At the same time, Croatia also has the largest share of private accommodation in overall tourist capacities compared to its Mediterranean peers. For example, the percentage of holiday and other STRs in total bedplaces in pre-pandemic 2019 was 61.3% in Croatia, whereas the same share was 34.5% in Italy, 32,2% in Greece, or 24.6% in Spain (Eurostat, 2021b). Accordingly, although geographically small, Croatia is ideal for examining regional spillovers as described above because its tourism sector heavily relies on apartment houses and is highly concentrated in its coastal area.

The research question we are addressing in this paper should also be placed in the context of the ever-increasing global tourism demand. International tourism receipts increased 4.9 percent in real terms to reach US$ 1.34 trillion in 2017, whereas tourist arrivals amounted to 1.336 billion in the same year (UNWTO, 2018). In addition, international tourist arrivals worldwide are expected to increase by 3.3% annually to reach 1.8 billion by 2030 (UNWTO, 2017), which suggests popular destinations already overwhelmed with tourists will start to experience more negative externalities of tourism activity, including the degradation of sociocultural and environmental conditions and the rise of house prices and rents coupled with declining housing affordability. In geographically smaller or island countries which depend more on tourism receipts, the emergence of over-tourism could potentially be more damaging to the local housing markets due to limited availability of building plots, higher population density, and often rigid urban zoning rules. In such countries, house price hikes taking place in a very popular tourist destination (local government units - LGUs) could easily spillover to neighbouring LGUs, then regions and eventually the entire country. For this reason we study local/regional house price spillovers which are due to tourism activity in Croatian LGUs.

In order to understand the spillover process better, we will use spatial panel data estimators to model house prices and its determinants, which in turn will enable us to detect the main spillover characteristics and modalities. To the best of our knowledge, this would be the first study of its kind in the literature. The only other study addressing this issue is Kavarnou and Nanda (2018) who use dummies for neighboring regions as controls for spatial spillover effects, which is a static and rather limited way of addressing this issue.

The empirical part of our analysis relies on techniques from the family of spatial panel estimators. We use the Durbin spatial panel autoregression technique (DSM) (LeSage and Pace, 2009; Elhorst, 2013). This technique enables us to establish a direct relationship between the dependent variable and its effects in other spatial units (cities or regions), spatial effects of independent variables such as measures of tourism activity and unobserved spatially correlated heterogeneity. Moreover, we employ different types of spatially weighted matrices, symmetric matrices that define relationships between units in space. To this end, we explore whether spatial effects are limited to neighboring municipalities and cities or do they exert wider scale. Another advantage of spatial econometric analysis is the ability to estimate direct and indirect effects of the observed process. The change in individual city or region generates two types of impacts. A direct impact on itself and an indirect impact that goes first to other spatial units and partially returns through feedback loops (LeSage and Pace, 2009). These feedback loops arise because each spatial unit is considered a neighbor to its neighbors so the impact passing through neighboring units will create a feedback impact on the initial unit itself. There is reason to expect such feedback loops will arise with changes in tourism activity and dynamics of the housing market. To the best of our knowledge, such analysis has not been performed in context of tourism sector or its relationship with the housing market in general.

Our dataset 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. We use five different proxies for tourism activity and intensity: number of nights spend per inhabitant, number of arrivals per inhabitant, the share of private accommodation in total tourism accommodation, the share of rental housing in total housing stock and the length of stay of tourists.

This database is supplemented with datasets obtained from the Ministry of Finance, i.e. its Tax Office from which Property income and Average wage data come from. Finally, the Institute of Economics Zagreb (EIZ) provides the data on housing transactions and housing and construction land prices from their annual reports on real estate trends prepared for the Croatian Ministry of Construction. The analysis covers the 2012-2019 period and contains 556 Croatian cities and municipalities in which real estate transactions took place over the years analyzed. Table 1 provides the description of the variables used in the model.

Table 2 presents baseline random effects panel data model without the spatial effects for five tourism activity proxies. All five tourism proxies are highly significant and affect the median apartment price, whereby the share of rental housing in total tourism accommodation exhibits much higher effect on median prices when compared to other four measures. As the share of rental housing to total accommodation corresponds to the share of short-term rentals to total accommodation, one can conclude that among five tourism proxies, it is the prevalence of short-term rentals that contributes the most to apartment price formation.

As far as other covariates are concerned, higher immigrant share of population, higher average wage, higher property income and higher vitality index all increases the prices. In addition, two variables representing the state of the real estate markets, i.e., the number of apartment purchases and the value of construction land also positively affect the median apartment prices in individual LGUs. LGUs located on the islands on average also record higher median apartment prices.

Table 1. Description of variables

Apartment price (dependent variable)	Median price of apartment / mean of median price of apartment in year (index in 100)
Stays	Number of nights spend per inhabitant
Arrivals	Number of arrivals per inhabitant
Private accommodation	Share of private accommodation (beds) in total tourism accommodation (beds) in %
Rental housing	Share of rental housing in total housing stock in %
Length of stay	(Stays/arrivals in city)/mean (Stays/arrivals in city in year)
Immigrant share	Share of immigrants in total population in %
Average wage	Average wage in city / mean average wage in year (index in 100)
Marriages	Number of marriages in city / mean number of marriages in year (index in 100)
Density	Population/area
Property income	Share of property income in total income of city in %
Vitality index	Newborn/deceased
Transactions	Number of transactions of apartment purchase / mean number of transactions of apartment purchase in year (index in 100)
Construction land	Median price of construction land / mean of median price of construction land in year (index in 100)
Island	Categorical – 1 if city on island
Metro	Categorical – 1 if city one of 4 metro areas
Year	Year dummies

Table 2. Random effects estimations

Variables/Specification	(1)	(2)	(3)	(4)	(5)
Stays	0.0002*** (0.0003)	-	-	-	-
Arrivals	-	0.001*** (0.0002)	-	-	-
Rental housing	-	-	5.03*** (0.416)	-	-
Private accommodation	-	-	-	0.18*** (0.045)	-
Length of stay	-	-	-	-	0.13*** (0.015)
Immigrant share	0.67*** (0.167)	0.65*** (0.168)	0.80*** (0.162)	0.88*** (0.166)	0.77*** (0.165)
Average wage	1.70*** (0.161)	1.67*** (0.161)	1.83*** (0.156)	1.54*** (0.164)	1.46*** (0.161)
Marriages	-0.004 (0.007)	-0.004 (0.007)	-0.005 (0.007)	-0.004 (0.007)	-0.004 (0.007)
Density	0.44* (0.232)	0.42* (0.232)	-0.17 (0.22)	0.12 (0.232)	-0.001 (0.228)
Property income	7.70*** (1.565)	7.93*** (1.565)	8.27*** (1.555)	7.47*** (1.574)	7.13*** (1.567)
Vitality index	0.22*** (0.052)	0.22*** (0.052)	0.20*** (0.051)	0.23*** (0.052)	0.23*** (0.052)
Transactions	0.02*** (0.002)	0.02*** (0.002)	0.02*** (0.002)	0.02*** (0.002)	0.02*** (0.002)
Construction land	0.29*** (0.011)	0.29*** (0.011)	0.27*** (0.011)	0.30*** (0.011)	0.29*** (0.011)
Island	36.98*** (9.378)	38.32*** (9.346)	-7.42 (10.145)	49.40*** (9.318)	33.42*** (9.357)
Metro	-43.53 (40.616)	-43.35 (40.620)	-37.40 (39.060)	-43.44 (41.098)	-38.25 (40.146)

Constant	-137.05*** (16.45)	-134.42*** (16.45)	-152.99*** (16.016)	-127.12*** (16.672)	-122.49*** (16.366)
Observations	4.448	4.448	4.448	4.448	4.448
Groups	556	556	556	556	556
Wald	1668***	1667***	1851***	1586***	1702***
Breusch-Pagan	1344***	1339***	1171***	1358***	1259***

***,** and * denote significance at 1%, 5% and 10% levels. Standard errors in parentheses. Year dummy variables included.

Table 3 presents the results of Moran test for spatial correlation for each benchmark random effects model for all years under analysis. The results suggest that spatial correlation exists in all five benchmark models for all years, with the year 2018 exhibiting somewhat weaker evidence of spatial correlation.

Table 4 presents the results of Durbin spatial panel autoregression for all five benchmark models whereby we outlined direct and indirect effects. As a baseline for the spatial model we apply inverse distance contiguity spatial weights matrix. Here spatial correlation is limited to neighboring LGUs and expressed in terms of distance between the centers of neighboring LGUs. As in the random effects model estimations, here also we see that the share of rental housing to total tourism accommodation exhibits the greatest effect on apartment prices, whereby both the direct effects (i.e. the effects taking place within the LGS) and the indirect effects (the special effects due to relationship between two neighboring LGUs) recording the highest magnitude of influence over apartment prices. The increase of tourism activity proxied by other four tourism indicators also stems apartment prices, both directly within individual LGUs, but also as a result of spatial spillovers between two neighboring LGUs (with the exception of the length of stay variable where only direct effects are significant). In that context it is interesting to note that Tourism stays and arrivals have the same magnitude of direct and indirect effects, while the indirect effect of private accommodation is negative suggesting feedback loop between two average neighboring LGUs with regards to the influence of private accommodation to apartment prices can reduce the median apartment prices in those LGUs. Moreover, basic findings on the influence of other covariates on median prices are also preserved. All of them (immigrant share, average wage, property income, vitality index, property transaction number, construction land prices and island dummy) exhibit significant direct and indirect (spatial) effects on apartment prices. The highest direct and spatial effects are recorded by the variable representing income (average wage) and by the property income variable which designates the average income earned from renting out properties in any given LGU.

Table 3. Moran tests of spatial correlation in median apartment price and tourism variables

Specification	Stays	Arrivals	Private share	Rental share	Length of stay
2012	31.07***	29.92***	39.69***	34.57***	39.15***
2013	45.62***	44.79***	73.42***	74.96***	42.81***
2014	37.23***	36.62***	56.10***	45.10***	69.51***
2015	30.37***	29.98***	50.13***	37.05***	42.09***
2016	30.54***	32.29***	66.41***	37.19***	35.22***
2017	45.79***	45.43***	48.23***	36.69***	47.73***
2018	3.65*	3.29*	3.02*	3.01*	3.24*
2019	72.04***	69.79***	138.18***	100.19***	59.41***

***,** and * denote significance at 1%, 5% and 10% levels.

Table 4. Spatial Durbin estimations

Variables/Specification	(1)	(2)	(3)	(4)	(5)
Stays – direct	0.0002*** (0.00003)	-	-	-	-
Stays – indirect	0.0002*** (0.0001)	-	-	-	-
Arrivals – direct	-	0.001*** (0.0002)	-	-	-
Arrivals - indirect	-	0.001*** (0.0004)	-	-	-
Rental housing – direct	-	-	4.78*** (0.456)	-	-
Rental housing – indirect	-	-	1.70* (0.895)	-	-
Private accommodation - direct	-	-	-	0.20*** (0.046)	-
Private accommodation – indirect	-	-	-	-0.18** (0.079)	-
Length of stay – direct	-	-	-	-	0.13*** (0.017)
Length of stay – indirect	-	-	-	-	-0.04 (0.028)
Immigrant share – direct	0.54*** (0.170)	0.52*** (0.171)	0.70*** (0.167)	0.75*** (0.171)	0.68*** (0.168)
Immigrant share- indirect	0.08*** (0.027)	0.07*** (0.027)	0.10*** (0.029)	0.13*** (0.034)	0.11*** (0.032)
Average wage – direct	1.52*** (0.167)	1.49*** (0.166)	1.65*** (0.162)	1.46*** (0.176)	1.35*** (0.168)
Average wage – indirect	0.21*** (0.041)	0.21*** (0.041)	0.24*** (0.044)	0.25*** (0.046)	0.22*** (0.042)
Marriages - direct	-0.001 (0.008)	-0.001 (0.008)	-0.002 (0.007)	-0.002 (0.008)	-0.002 (0.008)
Marriages – indirect	-0.0002 (0.001)	-0.0002 (0.001)	-0.0003 (0.001)	-0.0004 (0.001)	-0.0003 (0.001)
Density – direct	0.33 (0.244)	0.30 (0.243)	-0.18 (0.231)	0.10 (0.244)	0.001 (0.237)
Density - indirect	0.05 (0.035)	0.04 (0.035)	-0.03 (0.033)	0.02 (0.042)	0.0001 (0.039)
Property inc - direct	7.56*** (1.552)	7.51*** (1.552)	7.90*** (1.54)	7.40*** (1.562)	6.98*** (1.555)
Property inc – indirect	1.05*** (0.279)	1.05*** (0.279)	1.13*** (0.289)	1.28*** (0.326)	1.14*** (0.306)
Vitality index - direct	0.20*** (0.052)	0.20*** (0.052)	0.19*** (0.051)	0.21*** (0.053)	0.22*** (0.052)
Vitality index – indirect	0.03*** (0.009)	0.028*** (0.009)	0.03*** (0.009)	0.04*** (0.010)	0.04*** (0.010)
Transactions – direct	0.02*** (0.003)	0.02*** (0.002)	0.02*** (0.002)	0.02*** (0.002)	0.02*** (0.002)
Transactions – indirect	0.003*** (0.001)	0.003*** (0.001)	0.003*** (0.001)	0.004*** (0.001)	0.003*** (0.001)
Construction land – direct	0.27*** (0.011)	0.27*** (0.011)	0.26*** (0.011)	0.28*** (0.011)	0.28*** (0.011)
Construction land – indirect	0.04*** (0.006)	0.04*** (0.007)	0.04*** (0.006)	0.05*** (0.007)	0.05*** (0.007)
Island – direct	42.36*** (9.761)	43.37*** (9.689)	-2.18 (10.532)	52.88*** (9.895)	37.90*** (9.843)
Island – indirect	5.88*** (1.752)	6.05*** (1.764)	-0.31 (1.500)	9.13*** (2.216)	6.20*** (1.909)
Metro – direct	-61.41 (42.487)	-63.26 (42.286)	-56.90 (40.659)	-57.50 (43.89)	-54.73 (42.19)
Metro indirect	-8.53 (6.182)	-8.83 (6.195)	-8.12 (6.063)	-9.92 (7.794)	-8.95 (7.112)
Observations	4488	4488	4488	4488	4488
Cities/groups	556	556	556	556	556
Wald test H_o: (wX's=0)	7.72***	8.91***	1.17	6.82***	4.40*
Wald test H_o: ($\theta = -\beta\rho$)	11.24***	12.51***	3.56*	5.05**	2.03

***,** and * denote significance at 1%, 5% and 10% levels. Standard errors in parentheses. Year dummy variables included. Inverse distance contiguity spatial weights matrix applied.

Table 5. presents the sensitivity analysis where we are comparing the results of the random effects model, our baseline spatial model (inverse distance contiguity spatial weights matrix), a spatial model with contiguity matrix, and a spatial model with full inverse distance matrix. The results are presented for all five models, where we report only the estimates of direct and spatial effects for tourism indicators.

As evident from the Table, applying the contiguity matrix instead of inverse distance contiguity matrix does not change the results from our baseline spatial model. The differences arise when the full inverse distance matrix is applied which allows for the spillover effects among all LGUs within Croatia. In that case we can detect almost times stronger spatial spillover effects of tourism stays and arrivals on median apartment prices, and even more then ten times spatial spillover effects of increases in the share of rental housing and private accommodation in total tourism accommodation. Such results strongly suggest that the effects of tourism activity on apartment prices are not contained on only neighboring municipalities, but spread further across the country strongly affecting apartment prices in the entire country. In addition, one has to note that the sign of the share of private accommodation variable has changed from negative to positive in full inverse distance matrix model, suggesting that rising share of private tourism accommodation exhibits strong positive impact on apartment prices that far exceed the administrative borders of neighboring LGUs.

Table 5: Sensitivity analysis

Variables/Specification	Random effects	Baseline spatial	Contiguity	Inverse distance, full
Stays – direct	0.0002*** (0.00003)	0.0002*** (0.00003)	0.0002*** (0.00003)	0.0002*** (0.00003)
Stays – indirect	-	0.0002*** (0.0001)	0.0002*** (0.0001)	0.002*** (0.0001)
Wald test H_o: (wX’s=0)	-	7.72***	15.97***	7.49***
Wald test H_o: ($\theta = -\beta\rho$)	-	11.24***	22.05***	11.98***
Arrivals – direct	0.001*** (0.0002)	0.001*** (0.0002)	0.001*** (0.0002)	0.001*** (0.0002)
Arrivals - indirect	-	0.001*** (0.0004)	0.002*** (0.0003)	0.012*** (0.004)
Wald test H_o: (wX’s=0)	-	8.91***	15.94***	5.46**
Wald test H_o: ($\theta = -\beta\rho$)	-	12.51***	21.99***	9.51***
Rental housing – direct	5.03*** (0.416)	4.78*** (0.458)	4.39*** (0.487)	4.47*** (0.465)
Rental housing – indirect	-	1.70* (0.894)	1.36* (0.675)	23.74*** (7.522)
Wald test H_o: (wX’s=0)	-	1.17	0.61	5.03**
Wald test H_o: ($\theta = -\beta\rho$)	-	3.56	4.05	13.00***
Private accommodation - direct	0.18*** (0.045)	0.20*** (0.046)	0.16*** (0.045)	0.17*** (0.046)
Private accommodation – indirect	-	-0.18** (0.079)	0.02 (0.089)	2.88*** (0.741)
Wald test H_o: (wX’s=0)	-	6.82***	0.01	30.33***
Wald test H_o: ($\theta = -\beta\rho$)	-	5.05**	0.06	23.94***
Length of stay – direct	0.13*** (0.015)	0.13*** (0.017)	0.11*** (0.017)	0.11*** (0.017)
Length of stay – indirect	-	-0.04 (0.028)	0.05 (0.029)	0.28 (0.267)
Wald test H_o: (wX’s=0)	-	4.40**	0.78	0.02
Wald test H_o: ($\theta = -\beta\rho$)	-	2.03	2.66	1.07

***,** and * denote significance at 1%, 5% and 10% levels. Standard errors in parentheses. Year dummy variables included.

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