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Tourism activity affects house price dynamics? Evidence for countries dependent on tourism

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ABSTRACT

This study analyses the impact of tourism in house prices in eight tourism-dependent countries in terms of exports for the period from 2000 to 2018. We employ a Vector-Error Correction Model (VECM) for the empirical estimation given that house prices, tourism activity and other determinants are cointegrated. The results indicate that tourism has a significant positive impact on house prices both in the short-run and in the long-run. The Granger causality tests show that tourism activity Granger-causes house prices in the eight countries analysed. These results have important practical and political implications. There is a delicate environment and social equilibrium in tourist destinations that it is necessary to ensure. If it is true that tourism has positive effects on the economy through job creation and economic growth it is also important to internalize the negative externalities caused by tourism, through the adoption of appropriate economic instruments and policies.

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VECM method; tourism activity; housing market; externalities; Cointegration; Granger Causality

1. Introduction

In recent decades, tourism has experienced rapid growth. Tourist destinations have seen an increase in domestic and foreign investment in tourism activities as a result of an increasing demand for recreation and accommodation services, both for use and investment purpose. This is especially true in countries dependent on tourism in terms of exports, where this activity is one of the main sources of income, employment and foreign exchange in these countries. However, it seems clear that there are certain costs (negative externalities) associated with this growth. One of the negative externalities associated with the increase in the flow of tourists is the impact that tourism tends to exert on the housing market, with the increase in property prices and rents due to the transfer of properties from the residential housing market to the short-term rental market, holiday housing or second homes (e.g. Biagi et al., 2012; Horn & Merante, 2017; Sheppard & Udell, 2016). Additionally, the increase in the flow of tourists tends to cause an increase in congestion and pollution, depletion of infrastructures, an increase in waiting time for services, factors that tend to be capitalized in housing prices (e.g. Biagi et al., 2015). However, empirical studies that analyse the quantitative impact of tourism activities on housing prices are limited. According to Biagi et al. (2015, p. 502) 'these studies are mainly based on evidence from U.S. and focus on a cross-sectional rather than dynamic relationship between tourism activity and house prices'.

In the present study, we investigate the net impact of tourist activities on housing prices and the causal relationship between tourist activities and house prices in eight countries dependent on

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tourism in terms of exports – Australia, Croatia, Cyprus, Greece, Iceland, New Zealand, Portugal and Spain. In all these eight countries, in 2018, the tourism sector accounted for 15% or more of their total exports. Appendix 1 presents information on the importance of the tourism sector in each of the countries. As highlighted by Wu (2019), the degree of dependence on tourism and travel restrictions are plausible factors that have influence on the impact of tourist activities on house prices. Therefore, the eight countries have unique characteristics to perform the empirical analysis. It is also interesting to note that the few studies on the impact of tourist activities on housing prices do not investigate the causal relationship between tourist activities and house prices. This is the case of Biagi et al. (2015, 2016), Paramati and Roca (2019), Zhang and Yang (2021), Churchill et al. (2022), Mikulić et al. (2021) and Perić et al. (2022) for Italy, 20 OECD countries, Iceland, Germany, Croatia and 27 EU countries respectively. The only two studies that investigates the causal relationship between tourist activities and house prices have been performed in China by Wu (2019) and in Turkey by Yıldırım and Karul (2022). Yıldırım and Karul (2022) end their study by stressing that further studies should be carried out 'on other major tourist destination countries in assessing how tourism flows affect house prices' (p. 1045).

Our article differs from these nine studies by the fact that we simultaneously study the short-run and long-run impact of tourist activities on house prices and the Granger causality relationship between both variables in eight countries dependent on tourism in terms of exports. Thus, there is a gap in the literature that the present study intends to fill. For the first time, these two analyses – the short-run and long-run impact of tourist activities on house prices and the Granger causality relationship, are used in an empirical study for a group of countries heavily dependent on tourism in terms of exports, which are characterized by their high level of openness and lack of restrictions on travel. We employ a Vector-Error Correction Model (VECM) for the empirical estimation given that house prices, tourism activity and other determinants are cointegrated. The results indicate that tourism has a significant positive impact on house prices both in the short-run and in the long-run. The Granger causality tests show that tourism activity Granger-causes house prices in the eight countries analysed. We find a bi-directional causality in the short run between tourist activities and house prices in Australia, Iceland and Portugal, i.e. that tourist activities and housing prices Granger-cause each other. Looking at long-run causality, the results provide evidence for the feedback hypothesis (i.e. bi-directional causality) in Australia, Greece, Iceland and Portugal. Considering all these findings, we cannot exclude the thesis that tourist activities are an effective catalyst for the growth of housing prices. If it is true that tourist activities play a central role in economic growth and job creation, it is no less true that it is a catalyst for the growth of housing prices in countries dependent on tourism. The practical and political implications resulting from the increase in housing prices caused by tourism are discussed in detail in the conclusions.

The structure of the remaining paper is as follows. Section 2 provides a review of literature about causal relationship between tourism and house prices and previous studies on the subject under analysis. Data is presented in Section 3. The methodology used in the empirical analysis – Vector Error-Correction Model (VECM) and Granger Causality tests is covered and discussed in Section 4. Section 5 reports and discusses the results. Section 6 concludes the paper.

2. Literature review

2.1. Causal relationship between tourism and house prices

The role of tourism as a driver of economic growth in the short and long term is recognized in the literature. For example, Wu (2019) argues that the positive effect of tourism on economic growth is explained by the following factors: (i) tourist activities attract tourists who consume local goods and services, leading to an increase of overall economic activities; (ii) tourist activities lead companies and governments to invest in new infrastructure, accommodation and other services, stimulating all economic sectors through direct, indirect, and induced and spillover effects; and (iii) tourist activities contribute to job creation and increase disposable income. Numerous studies have studied the causal relationship between tourism and economic growth, especially after the study of Balaguer and Cantavella-Jordá (2002). There is no consensus in the literature about the direction of causality between tourism activities and economic growth (e.g. Tang & Tan, 2015). Some studies report that tourism affects economic growth (tourism-led growth hypothesis is valid) and others argue that it is economic growth that affects tourism (support of growth-led tourism hypothesis).

If it is true that the relationship between tourism and economic growth has been properly studied, the same cannot be said for the relationship between tourism and housing prices. As stated by Wu (2019, p. 491) 'there is an unverified question of whether tourism development actually causes housing economic growth or, alternatively, whether housing economic expansion substantially contributes to the growth in tourism'. As we think we know, the causal relationship between tourism and housing prices was studied only by Wu (2019) for China's 31 major regions for the period from 2000 to 2016 and Yıldırım and Karul (2022) for Turkey, for the period between January 2010 to March 2020. Yıldırım and Karul (2022) show that international tourism activities have a substantial role in the increase of house prices in Turkey. The causality tests reveal a unilateral causal linkage from tourism to house prices. Wu (2019) finds three distinct results for the Granger causality test in the 31 Chinese regions. He finds empirical evidence for the tourism-leading hypothesis for Beijing, Liaoning and Zhejiang regions and one-way Granger causality running from the housing prices to real international tourism receipts in Shanghai. However, most of the regions analysed (23 regions) seem to support the neutrality hypothesis, implying that neither real international tourism receipts nor housing prices is sensitive to the other. Finally, in none of the regions studied there is empirical support for the feedback hypothesis (a bi-directional causal relationship between both variables). However, it should be noted that the author does not control a set of factors that tend to determine the direction of causality between the two variables. Wu (2019) says that the size of a region's economy, the regional level of openness, the level of travel restrictions and the degree of dependence on tourism are plausible factors that should be considered as additional determinants. In the present study, we control the impact of these determinants, since they are included in the Vector Error-Correction Model (VECM) and the VEC Granger Causality test is used to analyse the direction of causality between the variables. In addition, the condition of dependence on tourism mentioned by the author is verified, given that we only analyse countries whose economic structure is strongly dependent on the dynamics of tourism.

The recognition of a causal relationship between tourist activities and housing prices is extremely important. If there is a reciprocal causal relationship between the two variables, an appropriate allocation of planning resources is important and necessary for the travel and tourism industry and other industries. Arrived here, it should be asked if it is plausible the existence of a bi-directional causal relationship between the two variables. As mentioned by Biagi et al. (2015), several empirical studies both in the field of tourism economics and in housing studies have shown that tourism activities can directly and indirectly affect the housing market.

Tourist activities affect the housing market directly through the 'external' demand generated by tourists that 'competes' with local residents for land and housing in tourist destinations. Some recent studies show the important role that tourism revenues have as determining factor of residential foreign investment (e.g. Gholipour et al., 2010; Jiménez, 2002; Şit & Karadağ, 2018). As explained by Biagi et al. (2015), in recent years there has been an increase in the demand for holiday housing as a result of socio-economic changes, such as the accumulation of wealth, increase of permanent income, increasing value attributed to leisure and rising number of retirees with disposable time and income (e.g. Montezuma & McGarrigle, 2019; Norris & Winston, 2010; Pickering et al., 2019; Williams et al., 2000). Additionally, and in the particular case of international tourism, this process has benefited largely from improvements in access to communication and transportation (e.g. Gustafson, 2002; Williams et al., 2000) as well as the emergence of a globalized real estate market by facilitating the process of acquiring properties abroad (e.g. Rogers et al., 2015; Williams et al., 1997). In several cases, the existence of tax benefits (for example, preserving asset value 'relocating' to a tax haven) and weak currency in the host country (e.g. Hines, 2001; Montezuma & McGarrigle, 2019; Short, 2016) have also played an important role in the increase in demand for holiday housing or second homes. Additionally, Short (2016) argues that transnational elites tend to protect their assets through 'migration' to politically safe haven countries with a rule of law to ensure that their wealth/property is not easily appropriated. Similarly, Paris (2013) states that the second home is often an investment for seasonal use, for laundering money, parking assets or as a bolthole in the event of unrest in the owners' countries. So, it is not surprising that in Spain around 1 in 10 houses built has been acquired by foreigners (Rodríguez & Bustillo, 2010). The authors show that in Spain, and probably in other countries with the same level of tourism attractiveness, the bulk of foreign real estate investment flows might include mainly the investment of foreign tourists in real properties. All these factors explain the growing flow of international recreation capital as the result of an increase in demand for recreation services and holiday accommodations, both for use and investment purposes (Wu, 2019). As a direct consequence of this flow of international capital, there will be an insufficient number of accommodations facilities for tourists, which will then increase accommodation prices (e.g. Biagi et al., 2016; Paramati & Roca, 2019). Paramati and Roca (2019) highlight a second possibility that tourism activities positively affect housing prices, which results from the fact that wealthier tourists buy their homes in their favourite tourist destinations, leading to an increase in housing prices in these destinations for the local community.

Biagi et al. (2012; 2015) refer that tourist activities also tend to affect housing prices indirectly via the capitalization of tourism-related amenities and disamenities in the market price and value of housing. With regard to the impact of short-term rentals provided via Airbnb on house prices, Sheppard and Udell (2016) argue that property values may increase both because of increased demand for commercial (non-residential) space, as well as localized provision of amenities for visitors. However, it is not clear that an increase in tourist activities will cause housing prices to rise as a result of increased demand. As explained by Biagi et al. (2016) and Sheppard and Udell (2016), increases in tourism may cause negative externalities (such as pollution, congestion, strain on infrastructures and safety concerns) that make life unpleasant in places with a high concentration of tourist activities. Thus, the net impact of tourism on housing prices is an open empirical question and deserves further study.

The house prices leading hypothesis (house prices increase the demand for tourism) cannot be dismissed outright in the countries analysed, since the foreign real estate investment is influenced mainly by factors like housing prices, GDP per capita and the number of tourists (e.g. Rodríguez & Bustillo, 2010). The authors refer that the profile of foreign real estate investment in Spain points towards 'an individual investor who has been previously a tourist visitor coming from a high-income country, who, taking account the current price of houses, seeks to obtain future return for his investment too' (p. 366). In addition, as pointed out by Füller and Michel (2014), real estate is frequently regarded as a safe investment due to the recent financial crisis. Given that the investment in recreation services and holiday accommodation has the characteristic of being able to serve purposes of use but also of investment, we cannot rule out the existence of speculative purchase of residential property in anticipation of subsequent capital gains (e.g. Rodríguez & Bustillo, 2010; Sheppard & Udell, 2016). As a result, investment in recreation services and holiday accommodation is influenced by the dynamics of real estate prices, in which investment tends to increase when there are expectations of an increase in real estate prices that will make it possible to obtain capital gains.

2.2. Previous studies on tourism and housing prices

According to Biagi et al. (2012), studies in the area of tourism that investigate the impact of tourist activities on the housing market are very limited both in number and scope and can be classified into two main strands: (i) hedonic price and (ii) holiday homes.

The first strand of literature concerns the hedonic pricing methodology. This strand is mainly composed of studies of 'microeconomic' nature, which investigate the impact of tourist activities on the housing market by regressing individual property prices (or rents) on a series of explanatory variables including housing characteristics in terms of size, composition and location and, most importantly, tourism amenities. An example is the growing literature on the impact of home-sharing platforms (for example the Airbnb) on housing prices. The empirical studies carried out by Sheppard and Udell (2016), Horn and Merante (2017), Barron et al. (2021), Franco et al. (2021), Garcia-López et al. (2020), Wyman et al. (2020) and Zou (2020), in New York, Boston, U.S., Portugal, Barcelona, City of Isle of Palms and Washington, respectively, regarding the impact of Airbnb on the housing market, all of them reveal that this platform is responsible for increases in house prices and/or rents.

The second strand is represented by the holiday homes literature. We are especially interested in empirical studies that analyse the impact of this type of accommodation on the local housing market. According to Biagi et al. (2012) is relatively scarce the literature exploring in depth the relationship between local housing markets and holiday homes. The reason is due to the lack of consistency in data collection methods, since it is very difficult to know the purpose of additional owned properties. It is for this reason that the impact of holiday homes on local housing markets is often inferred rather than analysed. Even so, the few existing studies seem to demonstrate that the increase in demand for holiday homes in tourism destinations puts pressure on local housing markets and it is a source of conflict between permanent residents and tourists, with the first unable to live in places of greater tourist attractiveness due to rising housing prices and property taxes (e.g. Casado-Diaz, 1999; Marjavaara & Müller, 2007). Lastly, Gallent and Tewdwr-Jones (2001) show that housing policies do not often have a direct or restrictive capacity in relation to second homes, given that tax increase are not enough to counterbalance the potential investment returns resulting from the expected increase in property prices.

Of all the above studies, it is worth mentioning the nine empirical studies that address the issue of the impact of tourist activities in the housing price in a way very similar to that we will develop in this study. Biagi et al. (2015) using a GMM system approach for 103 Italian cities over the period 1996–2007, demonstrate that tourism activity positively affects house prices and that the relationship between the two variables might not be the same for all types of cities. Additionally, their findings state that this positive association provides an opportunity to increase the economic capacity of the urban cities by creating a positive externality of tourism. To overcome the heterogeneity problems in cities and tourism movements, Biagi et al. (2016) evaluate the impact of tourism on house prices for the same 103 Italian cities using a latent class approach. Despite the positive impact of tourist activities on housing prices, this effect is not seen in all cities. In cities where maritime tourism predominates, there is a negative impact. Paramati and Roca (2019) employ an augmented mean estimator to study the impact of tourism on house prices on a panel of 20 OECD countries for the period between 1995 and 2014. They show that tourism has a significant positive impact on house prices in the OECD. Zhang and Yang (2021) investigate the relationship between inbound tourism and the housing market along the recent boom in Icelandic real estate sector. They construct a small open economy dynamic stochastic general equilibrium model enclosing a tourism sector and a housing market with owner-occupied and rental sections. Their results show that the higher inbound tourism demand raises both houses' prices and rental prices. Churchill et al. (2022) using a historical data set, they investigate the time-varying effect of tourism flows on house prices in Germany over nearly 150 years (period between 1870 and 2016). Their results show evidence of a time-varying impact of tourism flows on house prices, although with mixed impacts. In the pre-World War II, the results show both positive and negative time-varying effects of tourism flows on house prices. Although changes in tourist flows have contributed to the increase in housing prices over the post-1950 period, this proved to be short-lived, with the effect declining until the mid-1990s. The strong positive effect of tourism flows on house prices appears after 2000. Mikulić et al. (2021) study the relationship between tourism activity and housing affordability, using a sample of Croatian municipalities. The results provide robust evidence of tourism's negative effects on housing affordability in Croatia. Perić et al. (2022) investigate the influence of tourism and hotel accommodation on housing prices in 27 EU countries over the period from 2008 to 2018. Their results empirically confirm that tourism significantly increases housing prices.

It should be noted that none of the seven empirical studies above investigates the causal relationship between tourist activities and house prices. The only two studies that investigates the causal relationship between tourist activities and house prices were conducted by Wu (2019) and Yıldırım and Karul (2022). Yıldırım and Karul (2022) analyse the impact of tourism activities on house prices in Turkey from 2010 to 2020, using a cointegration model and causality tests. Their empirical findings show that international tourism activities have a substantial role in the increase of house prices in Turkey. The causality tests reveal a unilateral causal linkage from tourism to house prices. This result shows that the tourism sector plays a key role in the stabilization of house prices as a policy implication. Wu (2019) uses a multivariate panel Granger causality test to study the causal relationship between the two variables in China's major regions for the period between 2000 and 2016. In 23 of the 31 Chinese regions, the results seem to support the neutrality hypothesis indicating neither tourist activities nor house prices are sensitive to the other. In none of the regions, there is empirical evidence of a bi-directional causal relationship between the two variables. As mentioned by the author, the non-consideration of factors such as size of region's economy, level of openness, level of travel restrictions and degree of tourism dependence, may have influenced the results and explain the support of neutrality causality hypothesis found in most Chinese regions. The author states that its non-inclusion in the model 'may result in misleading inferences in terms of the nature of causality' between the two variables (p. 499).

In the present study, we control the effect of these determinants in the direction of causality between the two variables, since these factors are included in the VECM model together with the variables related to tourism activities and housing prices. It is our expectation that in this way, the results will not present misleading conclusions as to the true direction of the causal relationship between the two variables.

3. Data

To study the relationship between tourist activities and house prices, we collect annual data from 2000 to 2018 for eight countries heavily dependent on tourism in terms of exports – Australia, Croatia, Cyprus, Greece, Iceland, New Zealand, Portugal and Spain. The sample period has been decided purely by data availability on the measures for house prices, tourism activity and control variables. In all these countries, the tourism sector in 2018 had a weight equal to or greater than 15% of total exports (tourism receipts in percentage of total exports), according to data extracted from World Development Indicators (https://databank.worldbank.org/). There are a number of countries or regions where the tourism receipts in percentage of total exports exceeds 60% in 2018 and that were not analysed in this study because there are no long series for house prices and some of the control variables. It is the case of Macau (88.7%), Palau (86.3%), Antigua and Barbuda (84.3%), Grenada (84.3%), Maldives (82.7%), St. Lucia (81.3%), Aruba (75.2%), Dominica (68.5%), Vanuatu (62.8%) and Samoa (62.6%). The option for choosing countries dependent on tourism to analyse the relationship between the two variables, is due to the fact that Wu (2019) points out that among other factors, the degree of dependence on tourism, the lack of travel restrictions and the level of openness of the economy can affect the direction of causality between the two variables. The consequence according to the author is the possibility of misleading inferences in terms of the nature of causality. We believe that in the case of the eight selected countries, those conditions are guaranteed and consequently the validity of the inferences in terms of the nature of the causal relationships.

With regard to the control variables used in the present study, these were selected based on empirical studies previously carried out on the relationship between tourist activity and housing prices. So, in addition to the dependent variables related to tourist activity – real international tourism receipts (in US$)(***TOUR***) and housing prices (***HP***), we consider five control variables: (i) GDP per capita (constant 2010 US$) (***GDP***); (ii) banking credit (***CRED***), which is the domestic credit provided by financial sector as a % of GDP; (iii) Trade (% of GDP) (***TRD***); (iv) an Institutional Quality Index, which is proxied by the Economic Freedom of the World Index[1] (EFW index) (***EF***) and (v) a financial crisis dummy (***EC_D***), in order to capture the potential impact of the financial crisis in tourist activities and in house prices.

GDP per capita variable has been used as a control variable in the nine main studies mentioned in section 2.2. In addition to this control variable, Paramati and Roca (2019) use banking credit and an institutional quality index. According to the authors, it is expected that GDP per capita and banking credit have a positive and significant impact both on housing prices and on the development of tourism activities, given the increase in demand in these two variables, caused by those two control variables. In relation to institutional quality index, Paramati and Roca (2019) refer that a better institutional context will tend to decrease the risk of investment in housing, which will lead to an increase in housing from locals and foreign real estate investment, which will cause an increase in the supply of housing and a decrease in prices. The volume of trade as a percentage of GDP is used as a control variable, since Wu (2019) argues that regional level of openness can have an influence in the direction of causality between housing prices and tourist activities. In this regard, Santana-Gallego et al. (2011) find that international flow of goods requires and may encourage tourist arrivals and departures. The authors have obtained statistical support for the presence of business opportunities due to the potential complementary relationship between tourism and trade. The degree of openness of the economy to the outside is also a necessary condition for attracting foreign real estate investment, which in turn tends to affect housing prices (e.g. Rodríguez & Bustillo, 2010; Short, 2016). Lastly, we also control the potential impact of the financial crisis in tourist activities and house prices, by adding a dummy variable to the model that takes a value equal to one for the years of the financial crisis.

Real international tourism receipts (in US$) (***TOUR***) variable was collected from the World Development Indicators. With regard to house prices (***HP***), their series were obtained from two sources – Housing Prices OECD data (https://data.oecd.org/price/housing-prices.htm) or Residential Property Price Statistics of Bank for International Settlements (BIS) (https://www.bis.org/statistics/pp_selected.htm). The first three control variables (***GDP***, ***CRED*** and ***TRD***) were collected from World Development Indicators. The EFW index was obtained from Fraser Institute (https://www.fraserinstitute.org/studies/economic-freedom). With the exception of the dummy variable, all other variables are used in their natural log form. A similar procedure was adopted by Wu (2019).

In the following section, the methodology used in the empirical analysis is explained in detail.

4. Methodology

Non-stationary data, as a rule, are unpredictable and should not be modelled or forecasted (e.g. Engle & Granger, 1987). According to the authors, results obtained using non-stationary time series may be spurious, as they may indicate a relationship between two variables, for example between tourism activity and housing prices, where one does not exist. In order to receive consistent, reliable results, the non-stationary data needs to be transformed into stationary data. If a certain linear combination of these time series is stationary, it is possible to say that the non-stationary time series has a cointegration relation. Therefore, in this section, we first check if there is a unit root in the time series and then we investigate the presence of cointegration relationships. After these procedures, we will be able to conclude if the variables are cointegrated or not. If variables are cointegrated, it is possible to estimate their long-run relationship. In order to investigate the Granger causality relationship between tourist activities and house prices, we may either use the first difference Vector Autoregression (VAR) Model or the Vector Error-

Correction Model (VECM). We employ a Vector-Error Correction Model (VECM) for the empirical estimation given that house prices, tourism activity and the control variables are cointegrated. As noted by Granger (1988), if variables are cointegrated, we should use the VECM, given that this model takes into account the short-run and long-run elements.

4.1. Unit root tests

Testing stationarity is equivalent to examining whether there is a unit root in the time series. In order to investigate the order of integration of the data series, we use two different tests for the presence of a unit root in time series: (i) Augmented Dickey-Fuller test (ADF) (Dickey & Fuller, 1979) and (ii) Phillips-Perron test (PP) (Phillips & Perron, 1988). Table 1 presents the results of unit root tests for house prices, tourist activities and control variables. The results show that the six variables have a non-stationary nature in the eight countries analysed. The results show that those time series can be transformed into a stationary one after the first difference.

4.2. Johansen cointegration test

The main objective of the cointegration test is to examine if a group of non-stationary series are cointegrated or not. As mentioned below, the presence of a cointegration relation forms the basis of the VEC specification. The lag length and the deterministic components (i.e. trend and constant) in the VAR model should be correctly determined, since statistical inferences of Johansen cointegration test are very sensitive to these two issues (e.g. Johansen, 1995). We employ the Schwartz Information Criterion (SIC) to determine the optimal length lag. EViews implements VAR-based cointegration tests using the methodology developed by Johansen (1991, 1995).

We estimate the following model:

$$\Delta Y_t = \theta D + \pi Y_{t-1} + \sum_{i=1}^{k-1} \tau_i \Delta W_{t-i} + v_t \tag{1}$$

where Y_t is a vector of six variables, namely, $In\ HP_t$, $In\ TOUR_t$, $In\ GDP_t$, $In\ CRED_t$, $In\ E.F._{\cdot t}$, $In\ TRD_t$ and EC_D_t. D is a vector of deterministic components. Then, θ, π and τ are the 6 * 6 matrices of unknown parameters to be estimated and v_t is the error term. The matrix π has information about the long-run relationship among the Y_t series in the vector. To investigate the existence of cointegrating relationships, we employ the trace test LR and the maximum eigen-value test as suggested by Johansen (1991, 1995). To determine the number of cointegrating relations r, we must proceed sequentially from $r = 0$ to $r = k$-1 until we fail to reject. When the trace test LR statistic is higher than the critical value, it means that the null hypothesis of no cointegration can be rejected. Table 2 presents the results of Johansen (1991, 1995) cointegration test. The results reject the null hypothesis of no cointegration for the eight countries analysed. Regarding the number of cointegration relationships (r), the results reveal the existence of a single cointegration relationship between the variables, in the eight countries analysed.

4.3. Granger causality tests

As explained below, in order to analyse the Granger causality relationship between tourism activity and house prices, we can employ the first difference Vector Autoregression (VAR) Model or the Vector Error-Correction Model (VECM). Giving that the variables are cointegrated, the direction of causal relationship between tourism activity and house prices can be tested through the estimation

Table 1. Unit root tests results.

Variable		Ln HP		Ln TOUR		Ln GDP		Ln CRED		Ln E.F.		Ln TRD	
Country	Test	Level	1st Difference	Level	1st Difference	Level	1st Difference	Level	1st Difference	Level	1st Difference	Level	1st Difference
AUS	ADF	−2.772	−3.986***	−2.685	−3.641**	−2.001	−3.392**	−1.332	−3.178**	−1.969	−6.368***	−2.941	−5.373***
	PP	−2.065	−3.153**	−2.146	−3.656**	−2.717	−3.391**	−1.327	−3.135**	−1.969	−7.008***	−2.942	−5.441***
CRO	ADF	−1.743	−4.099***	−2.994	−3.583**	−1.489	−4.340***	−1.645	−3.356**	−1.782	−4.335***	−0.441	−3.566**
	PP	−2.097	−3.743**	−2.456	−6.798***	−2.334	−4.692***	−2.066	−3.170**	−1.688	−5.581***	−0.441	−3.551**
CYP	ADF	−1.959	−4.693***	−1.617	−4.069***	−1.679	−3.713**	−1.039	−3.681**	−2.912	−4.996***	−0.566	−3.830**
	PP	−1.821	−3.974***	−1.240	−4.990***	−1.862	−3.656**	−1.278	−3.714**	−2.860	−4.982***	−0.975	−3.720**
GRE	ADF	−1.729	−3.606**	−1.213	−4.381***	−2.563	−3.340**	−0.996	−4.439***	−2.007	−5.615***	−0.800	−3.761**
	PP	−1.636	−3.613**	−1.113	−4.496***	−1.311	−3.342**	−1.174	−5.839***	−2.204	−5.475***	−0.812	−3.839**
ICE	ADF	−0.521	−4.233***	−0.581	−4.662***	−1.235	−4.432***	−2.443	−3.819**	−1.814	−3.784**	−1.115	−3.408**
	PP	−0.299	−4.346***	−0.486	−7.681***	−0.982	−6.445***	−1.383	−3.819**	−1.396	−3.795**	−1.152	−3.426**
NZ	ADF	−2.136	−3.687**	−2.390	−3.058**	−1.069	−4.018***	−1.202	−4.217***	−2.270	−4.470***	−2.237	−5.876***
	PP	−1.096	−3.722**	−2.395	−3.082**	−1.665	−4.027***	−1.197	−4.227***	−2.235	−4.357***	−2.201	−6.066***
POR	ADF	−1.565	−4.085***	−1.569	−4.727***	−2.597	−3.216**	−1.104	−3.335**	−1.699	−3.657**	−0.362	−4.498***
	PP	−1.087	−4.571***	−0.399	−4.959***	−0.722	−8.446***	−1.396	−3.349**	−1.817	−3.657**	−0.191	−5.156***
SPA	ADF	−1.427	−4.692***	−1.762	−3.792**	−1.882	−3.963***	−0.767	−3.580**	−2.339	−4.379***	−1.020	−3.694**
	PP	−2.440	−3.767**	−1.715	−3.157**	−1.628	−4.195***	−1.693	−4.414***	−2.210	−3.210**	−1.166	−3.832**

Notes: This table presents the results of unit root tests in level and first difference. We use Augmented Dickey-Fuller test (ADF) and Phillips-Perron test (PP) to test the presence of a unit root in the time series. In both tests, the null hypothesis is that the time series is non-stationary (time series has a unit root), against the hypothesis H1 of (trend-)stationary series. The values presented are those of the test statistic output and respective level of statistical significance. *** and ** denote statistical significance at 1% and 5%, respectively.

Table 2. Johansen cointegration test results.

Countries	Null Hypothesis	Trace Test	Maximum Eigenvalue Test
Australia	r = 0	23.505***	21.454***
	r = 1	2.051	2.051
Croatia	r = 0	26.392***	26.391***
	r = 1	0.001	0.001
Cyprus	r = 0	21.718***	21.630***
	r = 1	2.967	2.903
Greece	r = 0	21.324***	20.759***
	r = 1	0.565	0.565
Iceland	r = 0	25.855***	25.315***
	r = 1	3.181	3.140
New Zealand	r = 0	29.213***	19.467***
	r = 1	3.025	3.002
Portugal	r = 0	27.185***	26.414***
	r = 1	2.769	2.699
Spain	r = 0	23.553***	22.382***
	r = 1	1.170	1.170

Notes: This table presents the results of VAR-based cointegration test using the methodology of Johansen (1991, 1995). Two types of test statistics are reported – trace statistics and maximum eigenvalue statistics. The first column is the number of cointegrating relations under the null hypothesis that the variables are not cointegrated. The critical values obtained from MacKinnon et al. (1999) are used to test for cointegration. *** and ** denote statistical significance at 1% and 5%, respectively.

of the following bivariate regressions:

$$\begin{aligned}&\Delta \ln HP_t = \\ &\alpha_0 + \beta_0 EC\_D + \\ &\sum_{j=1}^{k} \gamma_j \Delta \ln HP_{t-j} + \sum_{j=0}^{k} \delta_j \Delta \ln TOUR_{t-j} + \sum_{j=0}^{k} \theta_j \Delta \ln GDP_{t-j} + \\ &\sum_{j=0}^{k} \lambda_j \Delta \ln CRED_{t-j} + \sum_{j=0}^{k} \tau_j \Delta \ln E.F._{t-j} + \sum_{j=0}^{k} \omega_j \Delta \ln TRD_{t-j} + \pi_1 \varepsilon_{t-1} + \mu_{1t}\end{aligned} \tag{2}$$

$$\begin{aligned}&\Delta \ln TOUR_t = \\ &\alpha_0 + \beta_0 EC\_D + \\ &\sum_{j=1}^{k} \gamma_j \Delta \ln TOUR_{t-j} + \sum_{j=0}^{k} \delta_j \Delta \ln HP_{t-j} + \sum_{j=0}^{k} \theta_j \Delta \ln GDP_{t-j} + \\ &\sum_{j=0}^{k} \lambda_j \Delta \ln CRED_{t-j} + \sum_{j=0}^{k} \tau_j \Delta \ln E.F._{t-j} + \sum_{j=0}^{k} \omega_j \Delta \ln TRD_{t-j} + \pi_2 \varepsilon_{t-1} + \mu_{2t}\end{aligned} \tag{3}$$

where Δ is the first difference operator, ε_{t-1} is the one-period-lagged error-correction term obtained from the long-run equation, and μ_{it}'s are the white-noise disturbances. In order to analyse the long-run Granger causality, we should test the significance of the one period lagged error-correction term. The statistical significance of one-period-lagged error-correction term confirms the existence of long-run Granger causality. In Equation (2), $\pi_1 \neq 0$ means that there is long-run Granger causality from tourism activity to house prices, whereas $\pi_2 = 0$ in Equation (3) implies that house price does not Granger-cause the tourism activity in the long-run. With regard to short-term Granger causality, we estimate both equations and we test the null hypothesis applying the Likelihood Ratio (LR) test. In Equation (2), if null hypothesis is rejected, this means that tourism activity Granger-causes house prices in the short-run. Similarly, to test that house prices does not Granger-cause tourism activity, we estimate Equation (3) and we test the H_0 using the LR test. If the hypotheses H_0 are rejected in both equations, we say there is 'bi-directional Granger causality' between *HP* and *TOUR* variables. It is said that *HP* and *TOUR* variables are independent, if none of the two hypotheses H_0 is rejected.

5. Empirical results

In the previous section, we concluded that the series are cointegrated, so in this section, we start by estimating for the eight countries analysed, the long-run relationship between housing prices and its determinants, using for this purpose the Ordinary Least Squares (OLS) estimator, since it has superior performance in small samples (Abeysinghe & Boon, 1999). On the other hand, Stock (1987) highlights that when the series are cointegrated, the long-run coefficients estimation by OLS are shown super-consistent and highly efficient. For this reason, the OLS estimator is suitable for our study given the small sample size. Table 3 shows the estimation results of long-term coefficients for housing prices in the eight countries analysed.

As expected, the results show a positive and statistically significant effect of tourist activities, GDP per capita and banking credit in the long run for the eight countries analysed. In the case of Economic Freedom index and Trade variables, there are few countries in which there are statistically significant impacts. Finally, the dummy variable that captures the effects of the financial crisis on house prices has a negative and statistically significant impact in all the countries analysed, except for Cyprus and Greece.

Regarding short-term impacts, Table 4 shows once again that tourist activities, GDP per capita and banking credit variables have a positive and statistically significant impact on house prices. Economic Freedom index and Trade variables show statistical significance only for a small number of countries. As in the short-term estimation, the dummy variable that captures the financial crisis shows a negative and statistically significant sign for most of the countries, except for Greece and Iceland, where there is no impact on prices. The reliability of statistical inference resulting from the VECM was verified by performing some diagnostic tests.[2] The results obtained for these diagnostic tests reveal that our estimation model is correctly specified and reliable.

Of the two analyses presented it is possible to conclude that tourist activities have a positive impact on house prices in both long-run and short-run. A 10 percent increase in real international tourism receipts, on average, would increase house prices between 3.75 percent (in Portugal) and 1.97 percent (in Croatia) in the long-run and between 3.23 percent (in Portugal) and 1.31 percent (in Spain) in the short-run. These results seem to support the thesis that the growth of tourist activities contributes to the increase in the prices of housing and allows to base some of the recent restrictive policies adopted by some of these countries, such as restrictions on the purchase of housing by non-residents,[3] limitations on the maximum number of tourists per day[4] or imposition of restrictions to obtain 'golden visas' through the acquisition of housing by non-residents.[5]

Finally, we investigate the direction of causality between tourist activities and house prices, using for this purpose the Granger causality test. Given that in the previous section the results show that variables are cointegrated, the Granger causality test is performed in a VECM framework to capture both short-run and long-run causalities. Table 5 presents the results of the Granger causality test. The Likelihood Ratio (LR) test statistic rejects the null hypothesis that tourist activities do not Granger-cause house prices in the eight countries and also the null hypothesis that house price does not Granger-cause tourist activities in Australia, Iceland and Portugal. These results thus indicate a bi-directional causality in the short run between tourist activities and house prices in Australia, Iceland and Portugal, i.e. that tourist activities and housing prices Granger-cause each other. For the remaining five countries, the results provide evidence for the tourism-leading hypothesis, i.e. that only tourist activities Granger-cause house prices. Looking at long-run causality, the results provide evidence for the feedback hypothesis (i.e. bi-directional causality) in Australia, Greece, Iceland and Portugal. In the case of Croatia, Cyprus, New Zealand and Spain, our results seem to support the tourism-leading hypothesis, i.e. that only tourist activities Granger-cause house prices. In light of all these findings, we cannot exclude the thesis that tourist activities are an effective catalyst for the growth of housing prices. We employ two additional Granger causality tests to examine the robustness of the results: (i) Toda and Yamamoto (1995) and the bootstrap causality test developed by Hacker and Hatemi-J (2006). The results obtained for both tests and

Table 3. House Prices Long-Run Relationship Using Ordinary Least Squares (OLS).

Countries/Variables	Australia		Croatia		Cyprus		Greece		Iceland		New Zealand		Portugal		Spain	
	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.
Constant	−36.10*	−2.050	−14.07**	−2.339	−31.88**	−2.592	−15.14**	−2.364	−9.96	−1.425	−41.48**	−2.599	−13.11**	−2.141	−34.22**	−2.376
lnTOUR	0.304**	2.722	0.197**	2.549	0.367**	2.660	0.350**	2.419	0.307**	2.552	0.298**	2.376	0.375***	2.923	0.291**	2.301
lnGDP	4.398**	2.578	2.039***	6.394	2.438***	3.081	1.561***	3.966	2.945**	2.278	3.201***	3.858	2.093***	7.379	3.472***	5.478
lnCRED	0.590*	2.030	0.206**	2.582	0.802***	5.353	0.515***	3.244	0.561**	2.608	0.302*	1.963	0.237**	2.500	0.569***	3.554
LnE.F.	−2.350	−1.173	0.915***	3.954	−0.092	−0.123	0.610	0.814	0.248	0.504	1.471	1.318	1.099**	2.683	0.243	0.240
lnTRD	−0.582	−1.241	0.987***	5.853	−0.191	−0.776	−0.141	−0.524	0.440	1.675	0.238	0.791	0.349***	3.391	1.266***	4.842
EC_D	−0.096*	−1.967	−0.080**	−2.593	0.031	0.441	0.042	0.621	−0.072*	−1.725	−0.102**	−2.245	−0.051**	−2.492	−0.088**	−2.451
#Observations	19		19		19		19		19		19		19		19	
Adj. R^2 (%)	96.75		97.81		93.26		89.57		97.84		98.74		95.43		95.07	
F-statistic and *p*-value	90.359 (0.000)		134.97 (0.000)		42.52 (0.000)		26.77 (0.000)		137.35 (0.000)		237.46 (0.000)		60.23 (0.000)		58.87 (0.000)	

Notes: This table reports the estimation results for the long-run relationship between house prices (dependent variable) and its determinants for the eight countries analysed, using the Ordinary Least Squares (OLS) estimator. ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively.

Table 4. Vector Error-Correction Model (VECM) – results for house price variable.

Countries/ Variables	Australia		Croatia		Cyprus		Greece		Iceland		New Zealand		Portugal		Spain	
	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.
Constant	4.891	0.310	1.584	0.754	2.468	0.230	5.357	0.924	3.133	1.456	4.322	1.567	2.790	0.517	3.265	0.650
ΔlnTOUR	0.315**	2.107	0.212***	2.940	0.305**	2.310	0.139**	2.380	0.194**	2.617	0.234**	2.304	0.323***	3.230	0.131**	2.302
ΔlnGDP	1.095***	2.807	1.439***	2.965	2.256***	5.800	1.045***	4.146	1.224**	2.500	1.623**	2.338	1.725***	4.002	0.835***	2.741
ΔlnCRED	0.335**	2.468	0.249**	2.466	0.254*	1.985	0.161*	1.784	1.051**	2.301	1.191**	2.567	0.527***	6.901	0.413***	3.277
ΔLnE.F.	2.857**	2.497	2.052***	3.053	0.987*	1.885	−0.275	−0.600	−0.002	−0.004	−1.081	−1.323	1.969***	3.786	1.743**	2.152
ΔlnTRD	0.190	0.756	0.547**	2.435	−0.156	−1.363	0.081	0.724	0.207	0.892	0.714*	1.823	−0.118	−1.042	−0.110	−0.629
EC_D	−0.017*	1.913	−0.066*	−1.879	−0.108***	−2.998	−0.013	−0.400	−0.026	−0.648	−0.050**	−2.181	−0.046**	−2.432	−0.074*	−1.804
EC term	−0.120**	−2.210	−0.210**	−2.343	−0.082**	−2.486	−0.351***	−3.542	−0.027**	−2.201	−0.212***	−5.634	−0.042***	−2.942	−0.060**	−2.467
χ^2_{NORMAL}	0.383 (0.825)		0.558 (0.756)		0.372 (0.829)		0.574 (0.750)		0.455 (0.796)		2.589 (0.274)		0.928 (0.629)		0.535 (0.765)	
χ^2_{SERIAL}	1.885 (0.189)		0.505 (0.617)		1.935 (0.175)		1.174 (0.381)		1.918 (0.159)		0.817 (0.532)		1.902 (0.150)		2.217 (0.113)	
χ^2_{ARCH}	0.596 (0.430)		0.136 (0.988)		1.003 (0.400)		1.151 (0.373)		1.527 (0.248)		0.421 (0.667)		1.181 (0.356)		1.104 (0.414)	
χ^2_{RESET}	0.220 (0.829)		0.069 (0.945)		0.538 (0.601)		0.518 (0.615)		0.529 (0.608)		0.623 (0.545)		0.630 (0.540)		0.605 (0.557)	
CUSUM	Stable†		Stable†		Stable†		Stable†		Stable†		Stable†		Stable†		Stable†	
CUSUMSQ	Stable†		Stable†		Stable†		Stable†		Stable†		Stable†		Stable†		Stable†	

Notes: This table reports the estimation results for the short-run relationship between house prices (dependent variable) and its determinants for the eight countries analysed, through the Vector Error-Correction Model (VECM). EC term is the error-correction term. We also present the results of the various diagnostic tests that have been applied to verify the reliability of statistical inferences derived from the model: (i) Jarque-Bera test (χ^2_{NORMAL}); (ii) Breuch-Godfrey LM test (χ^2_{SERIAL}); (iii) the autoregressive conditional heteroskedasticity (ARCH) LM test (χ^2_{ARCH}); (*iv*) Remsey RESET test (χ^2_{RESET}) and (*v*) CUSUM and CUSUMSQ test. The *p-value* of each test comes in brackets. ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively. † means coefficient stability at the 5 per cent significance level.

Table 5. Granger Causality Test Results: VEC and LR Granger Causality Tests.

			VEC Granger Causality test		LR Granger Causality test	
Countries	Null Hypotheses	Lags	Chi-sq statistics	*p*-values	LR-statistics	*p*-values
Australia	ΔlnTOUR. 0= → 0/ΔlnHP	3	20.224***	0.000	14.239***	0.000
	ΔlnHP 0= → 0/ΔlnTOUR		30.844***	0.000	6.591**	0.011
Croatia	ΔlnTOUR. 0= → 0/ΔlnHP	2	13.813***	0.001	4.981**	0.026
	ΔlnHP 0= → 0/ΔlnTOUR		3.344	0.188	0.5200	0.679
Cyprus	ΔlnTOUR. 0= → 0/ΔlnHP	2	7.414**	0.024	6.627**	0.021
	ΔlnHP 0= → 0/ΔlnTOUR		0.079	0.961	1.761	0.224
Greece	ΔlnTOUR. 0= → 0/ΔlnHP	3	17.713***	0.001	11.120***	0.004
	ΔlnHP 0= → 0/ΔlnTOUR		10.773**	0.013	0.117	0.737
Iceland	ΔlnTOUR. 0= → 0/ΔlnHP	3	24.183***	0.000	5.933**	0.028
	ΔlnHP 0= → 0/ΔlnTOUR		16.268***	0.001	5.842**	0.029
New Zealand	ΔlnTOUR. 0= → 0/ΔlnHP	3	7.556***	0.006	5.829**	0.017
	ΔlnHP 0= → 0/ΔlnTOUR		0.005	0.944	2.966	0.089
Portugal	ΔlnTOUR. 0= → 0/ΔlnHP	3	50.259***	0.000	18.352***	0.000
	ΔlnHP 0= → 0/ΔlnTOUR		21.717***	0.000	11.649***	0.004
Spain	ΔlnTOUR. 0= → 0/ΔlnHP	3	26.933***	0.000	18.351**	0.019
	ΔlnHP 0= → 0/ΔlnTOUR		6.336	0.096	1.793	0.335

Notes: This table presents the results of VEC Granger Causality test (to test long-run Granger causality) and Likelihood Ratio (LR) Granger Causality test (to test short-run Granger causality) between the tourism receipt and house price series. 0= → 0/ denotes 'does not Granger-cause'. The column 'Lags' indicates the optimal length for the Granger Causality tests as determined by Schwarz Information Criterion (SIC). *** and ** denote statistical significance at 1% and 5% levels, respectively.

Table 6. Granger Causality Test Results: Toda and Yamamoto (1995) and Bootstrap Causality Tests.

			Toda and Yamamoto (1995) Granger Causality test		Bootstrap Granger Causality test	
Countries	Null Hypotheses	Lags	Wald (X^2)	*p*-values	MWALD test	*p*-values
Australia	ΔlnTOUR. 0= → 0/ΔlnHP	3	4.717**	0.029	4.639**	0.030
	ΔlnHP 0= → 0/ΔlnTOUR		9.135***	0.003	9.087**	0.003
Croatia	ΔlnTOUR. 0= → 0/ΔlnHP	2	3.241*	0.072	3.190**	0.074
	ΔlnHP 0= → 0/ΔlnTOUR		0.432	0.511	0.476	0.504
Cyprus	ΔlnTOUR. 0= → 0/ΔlnHP	2	4.414**	0.034	4.385**	0.036
	ΔlnHP 0= → 0/ΔlnTOUR		0.464	0.496	0.501	0.476
Greece	ΔlnTOUR. 0= → 0/ΔlnHP	3	5.668**	0.017	5.545**	0.018
	ΔlnHP 0= → 0/ΔlnTOUR		4.695**	0.030	4.601**	0.032
Iceland	ΔlnTOUR. 0= → 0/ΔlnHP	3	8.183***	0.004	8.088***	0.005
	ΔlnHP 0= → 0/ΔlnTOUR		7.268***	0.007	7.183***	0.007
New Zealand	ΔlnTOUR. 0= → 0/ΔlnHP	3	7.011***	0.008	6.934***	0.009
	ΔlnHP 0= → 0/ΔlnTOUR		0.011	0.933	0.085	0.910
Portugal	ΔlnTOUR. 0= → 0/ΔlnHP	3	10.438***	0.001	10.385***	0.001
	ΔlnHP 0= → 0/ΔlnTOUR		8.969***	0.003	8.911***	0.003
Spain	ΔlnTOUR. 0= → 0/ΔlnHP	3	9.310***	0.002	9.275***	0.003
	ΔlnHP 0= → 0/ΔlnTOUR		2.120	0.198	2.134	0.190

Notes: This table presents the results of Toda and Yamamoto (1995) Granger causality test and Bootstrap causality test developed by Hacker and Hatemi-J (2006) between the tourism receipt and house price series. 0= → 0/ denotes 'does not Granger-cause'. The column 'Lags' indicates the optimal length for the Granger Causality tests as determined by Schwarz Information Criterion (SIC). *** and ** denote statistical significance at 1% and 5% levels, respectively.

presented in Table 6 confirm the conclusions obtained previously. The negative consequences resulting from the increase in housing prices caused by tourism are discussed in more detail in the next section.

6. Conclusion

The aim of our study is to investigate the impact of tourist activities in house prices, for the period 2000-2018, in eight tourism-dependent countries in terms of exports. A Vector-Error Correction Model (VECM) is applied in our empirical estimation given that all variables used in the estimation model are non-stationary, but cointegrated.

We conclude that tourist activities have a significant positive impact on house prices both in the short-run and in the long-run. The results also show a positive and statistically significant effect of GDP per capita and banking credit in house prices in the short-run and in the long run, for the eight countries analysed. With regard to tourism activities, it is possible to conclude that a 10 percent increase in real international tourism receipts, on average, would increase house prices between 3.75 percent (in Portugal) and 1.97 percent (in Croatia) in the long-run and between 3.23 percent (in Portugal) and 1.31 percent (in Spain) in the short-run. Finally, the Granger causality tests show both in the short-run and in the long-run that tourist activities Granger cause house prices in the eight countries analysed. As for the causal relationship caused by housing prices in tourist activities, the results show that house prices Granger-cause tourist activities in Australia, Iceland and Portugal, both in the short-run and in the long-run. In the long run, there is also evidence of a bi-directional relationship between the two variables in Greece. Consequently, while it is true that tourist activities play a central role in economic growth and job creation, it is no less true that it is a catalyst for the growth of housing prices in countries dependent on tourism.

The practical and political implications of the present study are of various order. First, as mentioned above, tourist activities are important for the local, regional and country economy growth and job creation; however, on the other side, there is a delicate environment and social equilibrium in tourist destinations which can easily be upset. Problems may arise when pressure on house prices is such that it creates serious social effects in terms of affordability, resident's quality of life, displacement and gentrification (e.g. Biagi et al., 2015; Franco et al., 2021; Füller & Michel, 2014; Sheppard & Udell, 2016). Second, our results show that it is important to internalize this negative externality impact caused by tourism, through the adoption of appropriate economic instruments and policies. Pigouvian taxes and restriction of land are among the policy instruments most used by the authorities to achieve the social optimum, in the presence of negative externalities (e.g. Aguilera et al., 2021; Logar, 2010; Palmer & Riera, 2003; Pintassilgo & Silva, 2007). The implementation of tourist taxes[6] and the control of new registrations of tourist accommodations have been one of the policies commonly adopted in cities and countries with the highest flow of tourists (see Aguilera et al., 2021). As mentioned above, there are however some countries whose tourist pressure has led to the adoption of more restrictive policies such as restrictions on the purchase of housing by non-residents (the case of New Zealand), limitations on the maximum number of tourists per day (the case of Dubrovnik in Croatia) or imposition of restrictions to obtain 'golden visas' through the acquisition of housing by non-residents (the case of Portugal). Third, the study shows the importance of designing sustainable tourism policies, that promote economic growth, regeneration of cities but without displacing low-income residents out of the city. Otherwise, the increasing occupation of the centres of large cities by tourists at the expense of the displacement of residents will lead to the so-called 'tragedy of the commons', a phenomenon in which the users of tourism resources are caught in a process that leads to the destruction of the resources upon which they depend (Pintassilgo & Silva, 2007).

While our study provides insightful implications, it is important to keep in mind its limitations. First, the analysis is carried out at the country level, but often the relationship between tourism and house prices is observed at a more local level. Second, due to the lack of data, it will be worth considering incorporating other tourism-dependent countries in terms of exports in future studies.

Our investigation directly indicates some lines of interesting future research. First, it is necessary to carry out studies like these in countries that do not have a strong dependence on tourism, in order to ascertain whether the conclusions are the same. Second, more research is needed, in order to achieve a complete welfare analysis of the impact of tourism in house prices. The tourist activities may have positive spillover effects on local businesses if it drives a net increase in tourism demand. However, tourist activities may have negative spillover effects if tourists create negative externalities, such as noise, congestion or deterioration in the quality of life for residents, for example as a result of the increase in house prices. As highlighted by Sheppard and Udell (2016), public policies that decrease house prices in pursuit of housing affordability may not lead to an increase in welfare, since, a policy of granting 'accessible' houses to the locals, can reduce economic growth, employment and public investment (such as improved police protection, better local schools or more and better public parks), that will cause a reduction in the well-being of the community. Understanding the net impact of tourist activities on resident's welfare is an open question to date. We leave these research questions for future work.

Notes

1. Several cross-country empirical studies utilize Fraser Institute's economic freedom scores as a proxy for institutional quality. The EFW is proxied by the summary of five indicators: (*i*) size of government; (*ii*) legal system and property rights; (*iii*) sound money; (*iv*) freedom to trade internationally; and (*v*) regulations. For a comprehensive survey of empirical studies utilizing the Economic Freedom of the World Index see Hall and Lawson (2014).
2. The Jarque-Bera normality test (χ^2_{NORMAL}) reveals that the residuals are normally distributed. The Breuch-Godfrey LM test (χ^2_{SERIAL}) show that the model is free from serial correlation problem. The autoregressive conditional heteroskedasticity (ARCH) LM test (χ^2_{ARCH}) indicates that the model is free from heteroskedasticity. The Ramsey RESET test (χ^2_{RESET}) reveals no errors or functionality problems in general specification. Finally, the CUSUM and CUSUMSQ test show that the estimated coefficients are also stable over the sample period.
3. https://www.cnbc.com/2018/08/16/new-zealand-bans-most-foreigners-from-buying-homes.html.
4. https://www.ft.com/content/07d828c8-e69e-11e9-9743-db5a370481bc.
5. https://www.bloomberg.com/news/articles/2020-01-29/portugal-cuts-incentives-for-foreign-buyers-amid-property-boom.
6. In many of these cities, part of the revenue obtained is intended to mitigate the impact of tourists in cities. For example, in the main city of Madeira (Portugal) – Funchal, one of the reasons for implementing the tourist tax is to finance a so-called 'social distortion programme' – an initiative aimed at helping locals cope with the increasing touristic pressure on the city. For more detailed information see https://www.themayor.eu/en/funchal-sets-sights-on-introducing-tourist-tax.

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Appendix 1: Importance of Tourism Sector

This table provides information on the importance of the tourism sector in the eight countries analysed: Australia, Croatia, Cyprus, Greece, Iceland, New Zealand, Portugal and Spain. The information was collected from the OECD Tourism Trends and Policies 2020 (https://doi.org/10.1787/6b47b985-en).

Country	Importance of Tourism Industry in the Economy
Australia	**Contribution of the Tourism Industry to GDP**: AUD 60.8 billion to Australia's GDP in 2018–2019 (Weight of 3.1% in terms of GDP). **Employment:** The tourism industry employs 666,000 people, representing 5.2% of total employment. Direct employment in the tourism industry is higher than the agricultural and mining industries combined. **International Tourist Arrivals:** 9.3 million in 2018. These international visitors spent AUD 44.6 billion. **Importance of Tourism Industry in Exports:** Represents 65.5% of total service exports in 2018.
Croatia	**Contribution of the Tourism Industry to GDP:** HRK 75.1 million, which represents 19.6% of Croatian GDP in 2018. **Employment:** The tourism industry directly employed 86,600 people (6.6% of total employment). **International Tourist Arrivals:** 16.6 million in 2018. They represent 92.8% of total arrivals, staying 83.2 million nights with an average stay of five nights. **Importance of Tourism Industry in Exports:** Represents 37% of international tourism receipts (% of total exports) in 2018.
Cyprus	**Contribution of the Tourism Industry to GDP:** Tourism-related activities account for around 20% of Cyprus' GDP. **Employment:** The total employment in the tourism industry was estimated at 113,000 jobs. In 2018, the active population (age 15–64 years) in Cyprus was 417,000 people. **International Tourist Arrivals:** The total number of tourists in Cyprus in 2018 was 3.93 million. **Importance of Tourism Industry in Exports:** Tourism receipts accounted for more than 18 percent of Cyprus's total exports in 2019.
Greece	**Contribution of the Tourism Industry to GDP:** Tourism industry accounted for 6.8% of total Gross Value Added in 2018. Tourism industry is a key pillar of Greek economy. **Employment:** The Tourism industry directly employed 381,800 people in 2018, accounting for 10.0% of total employment in Greece. **International Tourist Arrivals:** In 2018, incoming tourism to Greece amounted to 33.1 million international tourist arrivals. **Importance of Tourism Industry in Exports:** The tourism sector exports accounted for 43.3% of total service exports in 2018. The Tourism industry is an export champion in Greece.
Iceland	**Contribution of the Tourism Industry to GDP:** ISK 520 billion, which represents 8.7% of Iceland GDP in 2018. **Employment:** The tourism industry directly employed 30,000 people (15.7% of the workforce). **International Tourist Arrivals:** International tourist arrivals totaled 2.0 million in 2019. **Importance of Tourism Industry in Exports:** The tourism sector exports accounted for 47.7% of total service exports in 2018.
New Zealand	**Contribution of the Tourism Industry to GDP:** NZD 16.2 billion, which represents 5.8% of New Zealand Gross Value Added in 2019. **Employment:** The tourism industry directly employed 230,000 people, representing 8.4% of total employment. **International Tourist Arrivals:** Visitor arrivals to New Zealand reached 3.9 million in 2018. **Importance of Tourism Industry in Exports:** Travel exports accounted for 63.8% of total service exports in 2018. New Zealand's biggest source of exports (20.4% of exports) came from the Tourism industry.
Portugal	**Contribution of the Tourism Industry to GDP:** Tourism industry accounted for 8.0% of total Gross Value Added in 2018, and grew twice as fast as the overall economy (8.0% compared with 3.9%). **Employment:** The tourism industry directly employed 413,000 people, representing 9.0% of the working population in 2017. **International Tourist Arrivals:** Visitor arrivals to Portugal reached 22.8 million in 2018. **Importance of Tourism Industry in Exports:** Travel exports accounted for 51.1% of total service exports in 2018. International tourism receipts totaled EUR 16.8 billion in 2018.
Spain	**Contribution of the Tourism Industry to GDP:** Tourism industry accounted for 11.8% of GDP in 2018. The tourism industry is one of the pillars of the economy and an important driver for economic and social development. **Employment:** The tourism industry responsible for 2.6 million direct jobs, representing 13.5% of the employment in 2017. **International Tourist Arrivals:** In 2018, tourist arrivals reached 82.8 million. **Importance of Tourism Industry in Exports:** Travel exports accounted for 52.3% of total service exports in 2018. International tourism receipts totaled EUR 89.8 billion in 2018.