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The effects of tourism on EU regional cohesion: A comparative spatial cross-regressive assessment of economic growth and convergence by level of development

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Abstract

This research explores the implications of tourism for the regional cohesion of the European Union (EU). The performance of domestic and inbound tourism is tested statistically, taking into account the regions' level of development and both direct and spillover effects. The study therefore addresses a subdimension of tourism economic sustainability by focusing on the distribution of its effects. Within a tourism augmented conditional convergence framework, spatial cross-regressive models are estimated using the System Generalised Method of Moments. The unbalanced panel data set mainly comes from Eurostat's regional statistics database and covers 258 regions for the period 2000–2016. Our findings indicate that domestic tourism is a better instrument for enhancing the territorial cohesion of the EU, especially for less developed and transition regions. Inbound tourism clearly hinders the convergence of these regions and has negative direct and spillover effects on them. Inbound tourism also acts as a drag on the economic growth of more developed neighbouring regions. Policy implications include actions to support SME competitiveness, technological development and innovation, sustainable transport and network infrastructures, training and social inclusion. These areas are thematic objectives of the EU regional policy. Particular attention should be paid to coordinating the measures implemented under them.

KEYWORDS: Domestic tourism, Inbound tourism, Economic growth, EU regional convergence, Spatial cross-regressive models, Generalised Method of Moments.

Introduction

The Treaty on the Functioning of the European Union (TFEU) devotes special attention to the economic, social and territorial cohesion of the member states, that is, to narrowing gaps in development levels and welfare among the regions and peoples of the European Union (Article 174 of the consolidated version of the TFEU, 2012). According to the European regional policy, the promotion of economic growth is essential to close those divides. Regional convergence, which is closely linked to economic growth, is therefore of crucial importance for the economic and political sustainability of the European Union. In pursuit of this target, the European structural and investment funds support tourism development. The sector is considered key in several regional policy objectives, among them the improvement of competitiveness and economic growth (consolidated version of the TFEU, 2012 and Regulation No 1303, 2013). This support can be expected to continue in the period 2021–2027 in line with a large body of empirical research that confirms the tourism-led-growth hypothesis at the regional, national and country-group levels, especially for the EU. Nevertheless, another series of specialised studies has disputed the benign influence of tourism on economic growth and development. No consensus has been reached so far.

It should be noted that the existing literature uses mainly inbound tourism data, such as Stauvermann and Kumar (2016), Shahzad et al. (2017), Drogu and Bulut (2018), Sokhanvara et al. (2018) and Wu and Wu (2018). Domestic tourism has attracted the attention of researchers to a lesser extent. Some exceptions include Chou (2013), Saayman et al. (2001) and Xu (1999). Research contradistinguishing inbound and domestic tourism is even scarcer. The different modes of operation of these types of tourism have been examined by Winters et al. (2013), Zapata et al. (2011) and Zhao and Ritchie (2007). To the best of our knowledge, only Cortés-Jiménez (2008), Li et al. (2016) and Paci and Marrocu (2013) have evaluated the simultaneous effect of both kinds of tourism on regional economic growth for Spain and Italy, China and the ten most advanced economies and top tourism destinations in the EU, respectively. However, they did not test their findings statistically, nor consider the development level of regions. The last two papers used spatial models to deal with relative location correlations but did not control for endogeneity in them. Their results show that tourism contributes positively to regional cohesion, with domestic tourism having a greater impact.

We therefore evaluate the economic sustainability of domestic and inbound tourism from a spatial distributional perspective by testing their impact on the regional cohesion of the EU. According to the United Nations World Tourism Organization (UNWTO, 2004), economically sustainable tourism involves equitable distributional benefits. As is well known, distributional studies can focus on diverse perspectives; we select the territorial one. In brief, we contribute to the existing literature in several ways. Firstly, we control for the direct and spatial spillover effects of tourism and for endogeneity problems. Secondly, our data set is richer than those previously used. Moreover, we consider population density and ageing as handicaps of EU cohesion. Finally, we focus on development level. Hence, we complete previous research findings by comparing regions according to their level of development. Our results contradict the existing ones regarding the role of inbound tourism in the convergence process. Our conclusions can inform policy-making on tourism economic sustainability at the territorial level. The remainder of this paper is organised as follows: section 2 reviews the literature, section 3 describes the methodology and the data, section 4 explains the results and their policy implications, and a final section summarises the study and offers conclusions.

Economic growth, conditional convergence, cohesion and tourism

The seminal works of Solow (1956) and Swan (1956) on the modern theory of economic growth from a neoclassical production function perspective predicted conditional convergence: economies with a lower initial per capita GDP relative to the long-run or steady-state position grow more rapidly owing to the presumption of diminishing returns on capital. Steady-state levels of capital and output per worker depend on differential attributes of the economies concerned, such as the saving rate or the population growth rate, so convergence is conditional. This is the so-called conditional β-convergence, which differs from absolute β-convergence: less developed economies tend to grow more rapidly per capita than more developed ones without this being conditional on any other economic factor. This implies that all economies converge to the same steady-state, which is only verified in relatively homogeneous samples (Barro & Sala-i-Martin, 1992). It should be noted that since the mid-1980s, endogenous growth models, which address the limitations of neoclassical models, have also predicted conditional β-convergence.

A vast panel of empirical studies has focused on testing convergence among groups of countries or regions. The case of the EU has attracted particular attention owing to its original mandate of increasing regional cohesion across the member states. Monfort (2008) synthesised the results of this research and pointed out that i) a β-convergence process is manifest among EU regions although the speed of convergence varies over time; ii) this speed is higher in conditional convergence models than in absolute convergence ones; iii) convergence depends on the groups selected and iv) spatial effects are very relevant and tend to reduce the estimated global convergence speed and increase that of less developed regions. The analysis of the performance of European regional policy instruments has also received the attention of researchers, but no consensus has been reached. Dall'Erba and Fang (2017) stated that the heterogeneity of the results is due, *inter alia*, to the control of endogeneity and the presence of several regressors. In this regard, Percoco (2017) focused on the economic structure and concluded that promoting the service sector in its earlier stages induces higher growth rates.

In light of this literature and taking into account that more recent empirical studies on convergence recommend including additional factors of cross-country disparity, such as differentials in stocks of human capital (Barro & Sala-i-Martin, 2004), researchers in this field have turned their interest to tourism activity. The specialised research has extensively studied the impact of tourism on economic growth, mainly through receipts from foreign tourism, direct foreign investment, production and employment (see, among others, Kadiyali & Kosová, 2013; Llorca-Rodríguez et al. 2016). Among the most recent studies for the EU, Tugcu (2014) concluded that European countries in the Mediterranean area have a greater capacity to generate growth from tourism. For Portugal, Andraz et al. (2015) identified the regions where tourism exerts the strongest effects on the economic performance of the country. Perles-Ribes et al. (2017) confirmed the positive relationship between tourism and economic growth found in previous analyses on Spain. Using different samples of European countries, Antonakakis et al. (2015) and Dogru and Bulut (2018) coincided in showing that tourism development and economic growth are interdependent. The published research has also pointed out the role of tourism in reducing spatial economic inequalities, especially for less developed or small economies (Soukiazis & Proença, 2008; Vanegas & Croes, 2003, among others). In this regard, Li et al. (2016) summarised the spillover effects of tourism, dividing them into productivity spillovers (a mixture of labour movements and demonstration and competition effects), demand-side spillovers (travelling to multiple neighbouring destinations) and supply-side spillovers (prospects for market access and joint promotional actions).

In contrast, Ayres (2000), Monterrubio et al. (2018) and Sharpley (2002) highlighted the fact that tourism also generates higher inflation, competitiveness problems for other branches of production and tensions in ecosystems and societies, such as generational stress or international dependency. Nelson (2012), Thomas (2014) and Turrión-Prats and Duro (2018), among others, have drawn attention to other limitations of tourism-based development models: instability and seasonality of tourist demand, the difficulty of starting up a business, and international and national barriers. In addition, specialised studies have disputed the benign influence of tourism on cohesion. For example, Tosun et al. (2003) stated that tourism increases regional and class inequality. Haddad et al. (2013) discussed the effect of domestic tourism on interregional income transfers, while Ma et al. (2015) concluded that tourism does not decrease the economic gap between cities of China. Additionally, in a cross-sectional study of 109 countries, Du et al. (2016) found that tourism is insufficient for economic growth; Li et al. (2018) concluded that tourism does not have positive economic effects in all contexts and De Vita and Kyaw (2016) and Tang and Tan (2018) stated that income level has an impact on tourism performance.

It should be noted that research on the tourism-economic growth-convergence nexus in the EU has focused mainly on southern regions, as the cases of Soukiazis and Proença (2008), Proença and Soukiazis (2008) and Kostakis and Theodoropoulo (2017) show. The empirical results of these studies reveal a significant conditional convergence induced by tourism. The study of Kostakis and Theodoropoulo was the only one that used spatial models, but the authors did not control for the spatial spillover impacts of tourism. Paci and Marrocu (2013) enlarged the sample to include northern regions and controlled for spatial spillover effects, but did not control for endogeneity.

Most of the above-mentioned studies centre on the performance of inbound tourism, which can be weakened by leakages (Archer, 1978; Jafari, 1986). According to Winters et al. (2013), inbound tourists, compared to domestic ones, exhibit a higher spending pattern, but one that is more dependent on imports and less closely linked to local products. In this regard, domestic tourism may be a better way to promote backward economic linkages and thus to enhance local economic growth. In addition, because the demands for services and accommodation are lower, domestic tourism in less developed regions can provide a platform for diversifying productive activity towards other sectors or tourism market niches (Llorca-Rodríguez et al., 2018).

Domestic and inbound tourism can also differ with respect to their effects on regions neighbouring the destination regions. Yang and Fik (2014) argued that inbound tourists exert a positive indirect effect on nearby areas, as they visit multiple destinations. However, the lower knowledge barriers faced by domestic tourists can increase their day trips to locations close to the destination region (Paci & Marrocu, 2013). In addition, despite the role of the Internet in recent years (Navío-Marcoa et al., 2018), most international tourism marketing maintains the traditional oligopolistic structure (Gössling, 2017; Trunfio et al. 2006). This leads to tourist concentration through economies of scale and hence limits movements of tourists in less flexible itineraries, creating territorial tensions (Coccossis & Nijkamp, 1995; Lau & McKercher, 2007). Moreover, supplying accommodation for domestic tourists tends to require more goods and services from nearby regions, and inter-regional competition for resources can be lower for domestic tourism, as it involves less demand for them at the destination (Scheyvens, 2007; Zhao & Ritchie, 2007). In addition, domestic tourism allows neighbouring regions that do not specialise in tourism to benefit greatly from the externalities generated by physical infrastructure (Paci & Marrocu, 2013).

In summary, tourism can impact on economic convergence in a variety of ways and the ambiguity of the net effect persists from a theoretical standpoint (Blake et al., 2001, among others). Moreover, the roles of domestic and inbound tourism can differ in that each may have local and spillover linkages of differing intensity depending on the behaviour of those involved (Ashley, 2006; Winters et al., 2013). Accordingly, our comparative analysis focuses on a quantitative estimation of the direct and spatial spillover effects of both domestic and inbound tourism on regional economic growth and conditional convergence in the EU, taking into account the development level of the regions and controlling for endogeneity.

Model, method and data

Data availability influences the model and the estimation method. Eurostat has compiled figures for arrivals and nights spent at tourist accommodation establishments by country of residence since 1990 in the database on regional statistics by NUTS classification. However, statistics on regional economic accounts and labour markets offer shorter time series, reducing the possible period of analysis. Moreover, there are recurrent gaps in the data for some regions. For this reason, we must be particularly cautious in selecting the model and the estimation method, as well as in performing the specification tests required to reach accurate conclusions. In this regard, it is important to emphasise that our panel data set is more extensive than those used in previous studies in both its cross-sectional and temporal dimensions and therefore richer in socio-economic features related to the main differential ways in which inbound and domestic tourism impact on regional cohesion.

Model and method

From the Solow-Swan models of economic growth and for discrete time intervals, the process of absolute convergence of the regions considered in our data set can be approximated in a simplified empirical way as:

$$Dy_{i,t} = f(Y_{i,t-\tau}) \qquad (1)$$

where i =1, … n is the number of regions, t = 1..., T is the time periods, $Dy_{i,t}$ is the average rate of growth in the τ time length of per capita income and $Y_{i,t-\tau}$ is the level of per capita income in the initial period (Barro & Sala-i-Martin, 2004).

As previously mentioned, absolute convergence occurs only in relatively homogeneous samples. The heterogeneity of the NUTS2 regions forces us to consider different stationary states for them and hence a conditional convergence model. Hence, in our model we have to include the increasing returns to scale factors that compensate for the diminishing returns of scale of capital stock (Proença & Souzakis, 2008). In order to do so, we take into account the augmented Solow model of Mankiw et al. (1992) and include accumulation of human capital as distinct from physical capital. In addition, in line with the purpose of our research, we follow the tourism augmented conditional convergence framework developed by Li et al. (2016). The conditional convergence process can be expressed as:

$$Dy_{i,t} = f(Y_{i,t-\tau}\ ,\ X^{j}_{i,t-\tau}) \qquad (2)$$

where $X^j_{i,t-\tau}$ is a vector which encompasses the variables that promote economic growth with an increasing-returns-to-scale property, such as human or technological capital (Li et al., 2016), and other structural factors that determine the steady-states. Within this last category we include specific challenges faced by EU regional policy, such as low population density and population ageing. Following Paci and Marrocu (2013), among others, our model will therefore be:

$$D_{GDP_{i,t}} = \gamma_i + b\ GDP_{i,t-\tau} + \alpha_1 Physcap_{i,t-\tau} + \alpha_2\ Humcap_{i,t-\tau} + \alpha_3 RD_{i,t-\tau} + \alpha_4 Oldep_{i,t-\tau} + \alpha_5 Popden_{i,t-\tau} + \alpha_6 T_{i,t-\tau} + u_{i,t} \quad (3)$$

where γ_i denotes the different steady-states of the different regions, b is the coefficient of convergence, α_j are the coefficients of the X^j variables and $u_{i,t}$ is the stochastic error term. The speed or rate of convergence is given by $\beta = -\frac{\ln(1-b)}{\tau}$, where τ is, again, the length of time in which we measure the per capita income growth rate (see, for example, Proença & Souzakis, 2008).

As the regions usually show significant spatial association (Paci & Marrocu, 2013; Sarafidis & Robertson, 2009), we consider the possible presence in the model of spatial correlations specified on the basis of relative location (Anselin, 1988). Following the recommendations of Elhorst (2014) and considering the purpose of this research, we chose to apply the spatial cross-regressive specification, also known as the spatial lag of X (SLX) model (LeSage & Pace, 2009). The SLX model includes spatially lagged explanatory variables which are treated as original explanatory variables. It is the most flexible option to model the spatial spillover effects of explanatory variables and allows the parameterisation of the elements of the spatial weights matrix (W). In contrast to other spatial econometric models, the SLX model facilitates a more straightforward interpretation of the results: the direct effects are the coefficient estimates of the non-spatial variables, whereas the spatial spillover effects (externalities resulting from tourism in a nearby region according to Yang & Wong, 2012) are those of spatially lagged explanatory variables (Vega & Elhorst, 2015). Moreover, it allows dealing with the endogeneity of explanatory variables and of their spatially lagged values. This is a clear advantage for our analysis. It should be noted that according to the economic literature (see, among others, Antonakakis et al.,2015 and Durlauf et al. ,2009), we cannot assume the strict exogeneity of all our explanatory variables since the dependent variable is the growth rate of per capita real GDP (D_{GDP}), which can influence the explanatory variables. That is, they can behave as predetermined or endogenous variables depending on whether their current values are only correlated with past values or also with contemporaneous or future values of the errors or of the dependent variable (Moral-Benito, 2011). Hence we reformulate our model according to the following expression:

$$D_{GDP_{i,t}} = \gamma_i + b\ GDP_{i,t-\tau} + \alpha_1 Physcap_{i,t-\tau} + \alpha_2\ Humcap_{i,t-\tau} + \alpha_3 RD_{i,t-\tau} + \alpha_4 Oldep_{i,t-\tau} + \alpha_5 Popden_{i,t-\tau} + \alpha_6 T_{i,t-\tau} + \theta W T_{i,t-\tau} + u_{i,t} \quad (4)$$

where W is the row standardised spatial weights matrix and θ is the spatial parameter to be estimated, which represents the spatial spillover effect of the explanatory variable. The inverse distance band weights matrix is selected for the estimations taking into account the nature of our variables of interest (tourism activity proxies): its elements are inversely related to the bilateral geographical distance (in kilometres) for each pair of regions (Figure 1 shows the neighbourhood map). This is in accordance with the first law of geography: "Everything is related to everything else, but near things are more related than distant things" (Tobler, 1970).

From equation (4), two hypotheses on the direct effect of tourism on economic growth can be stated according to previous research:

Hypothesis 1. Tourism in region i ($NUTS2_i$) enhances the economic growth of region i. Therefore, $\alpha_6 > 0$.

Hypothesis 2. Tourism in region i ($NUTS2_i$) damages the economic growth of region i ($\alpha_6 < 0$) or has no effect in the best case ($\alpha_6 = 0$).

In addition, the hypotheses on the spillover effects of tourism are:

Hypothesis 3. Tourism in neighbouring region j ($NUTS2_j$) enhances the economic growth of region i ($NUTS2_i$). Therefore, $\theta > 0$.

Hypothesis 4. Tourism in neighbouring region j ($NUTS2_j$) damages the economic growth of region i ($\theta < 0$) or has no effect in the best case ($\theta = 0$).

Under EU regional policy, regions are categorised into three groups: less developed regions, transition regions and more developed regions. We use this classification to account for possible cluster differences by establishing two groups of regions in our estimations: less developed and transition regions versus more developed regions.

[Figure 1 near here]

Our estimation method selection process starts by applying Fisher's tests for unit root or stationarity based on an augmented Dickey-Fuller test. According to the p-values, we reject the hypothesis that all the panels contain a unit root. To deal with the heterogeneity of the panel, we then examined NUTS2-specific effects and time effects (see, for instance, Russell & Mackinnon, 2004). We select fixed effects models pursuant to the F-tests for fixed effects models, the Breusch-Pagan Lagrange multiplier (LM) for random effects and Hausman tests which compare random effects and fixed effects models. In addition, we run two-way fixed effects models and conclude that time effects exist, except for less developed and transition NUTS2 models. Following this point, we included time dummies in our models. However, when the final estimation method we selected is applied to a short panel using explanatory variables lags as instruments, the dummies prove not to be statistically significant since we lose time periods. We opted not to include them.

According to the Wald test, there is heteroscedasticity in our models. Serial correlation is not a problem in our estimations; they actually run on three time periods. Nor is multicollinearity a problem as indicated by the condition number and the variance inflation factor for the different models.

The p-value obtained from Pesaran's cross-sectional dependence test led us to reject its null hypothesis (errors are strictly cross-sectionally independent or weakly cross-sectionally dependent) except for the models on clusters of regions. Most of our models therefore have error cross-sectional dependence. The Moran's I tests confirm a statistically significant spatial correlation for tourism proxies even in the models in which we accept the null hypothesis of the Pesaran test (see Figures 2 and 3 for tourism proxies). Figure 4, which depicts the regional distribution of nights spent at tourist accommodation establishments considering both domestic and inbound tourism, reveals this clear geographical pattern.

[Figure 2 near here]

[Figure 3 near here]

[Figure 4 near here]

To summarise briefly, we have to tackle a linear functional relationship, fixed NUTS2 effects, problems of heteroscedasticity and error cross-sectional dependence due to spatial correlation and the non-strict exogeneity of explanatory variables. The usual way to address this last problem is to use instrumental variables estimation. Nevertheless, we lack valid external instrumental variables as required by this method. The use of lags of the instrumented variables solves this issue. We therefore estimate equation (4) using the Generalised Method of Moments (GMM) developed by Arellano and Bover (1995) and Blundell and Bond (1998) which, moreover, does not rely on the assumption of normality of the errors (Elhorst, 2014) and does not require complete knowledge of the distribution of the data (Zivot & Wang, 2006).

In System GMM, the standard errors of two-step estimations can be downward biased in small samples if the number of instruments is large, and therefore inference can be affected (Arellano & Bond, 1991). In order to avoid this, and following Roodman (2009a), we collapse the instruments and limit the lag depth amounts. The Hansen J-test for joint validity of instruments, which is also a test of structural specification, is applied to examine the existence of over-identification. Hansen's p-value should be in the range between 0.1 and 0.25 (Roodman, 2009b). The difference-in-Hansen test is also reported in our estimations to test the validity of the subsets of instruments (Roodman, 2009b).

Lastly, the Wald test for the parameters of the models and the Hausman test for differences in coefficients of the models are performed when necessary to test the significance of the difference in the estimates of domestic and inbound tourism variables or in the models for the two groups of regions, respectively.

Variables and data

Our dependent variable is the average annual rate of growth for discrete time intervals (five years) in percentage terms of per capita gross domestic product (D_{GDP}) expressed in 2015 constant thousands euros using the Harmonised Index of Consumer Prices (HICP). The explanatory control variables include the level of per capita real GDP (GDP) in the initial period to capture convergence and catch-up processes; the ratio of gross fixed capital formation to GDP as a measure of physical capital ($Physcap$); and the percentage of the active population with at least upper secondary education ($Humcap$) and intramural R&D expenditure as a percentage of GDP (RD) to measure human and technological capital. It should be noted that an insufficiently qualified workforce is another challenge for EU regional policy. Moreover, old-age dependency ratio 2nd variant (population 60 and over to population 20–59 years) and population density (inhabitants per square kilometre) were selected as additional explanatory control variables to reflect the demographic challenges for EU regional policy ($Oldep$ and $Popden$). Both variables are expressed in log terms in our model. Finally, the explanatory variable of interest is nights spent at tourist accommodation establishments as a proxy for tourism activity (T). As previously mentioned, and following Llorca-Rodríguez et al. (2018), we consider both domestic and inbound tourism ($Domnights$ and $Inbnights$ respectively) together with total tourism ($Totalnights$) in our analysis. We also estimate our models using arrivals of domestic and inbound tourists at tourist accommodation establishments ($Domarrivals$ and $Inbarrivals$) in order to check the robustness of our estimations. We divide the selected tourism variables by the population of the destination to take into account the capacity limitations of tourism production, as is usual in the specialised research in this area.

The data for all these variables mainly come from the Eurostat database on regional statistics, which compiles information on economic accounts, demographic structure, labour market, tourism, and science and technology as Table 1 shows. The Eurostat database on general statistics (economy and finance section) is the HICP data source we used to deflate GDP. Since data on regional economic accounts are issued with considerable delay with respect to other types of data, our analysis covers the period 2000-2016. At the time of starting the econometric analysis, more recent data on regional accounts were not available. Nevertheless, we can consider discrete time intervals of 5 years in our analysis. That is, our τ is 5. This allows us to avoid the possible bias of the economic cycle and catch medium- to long-term growth patterns. Our dependent variable, the average annual rate of growth of per capita gross domestic product (D_{GDP}), is therefore computed over three five-year periods: 2000–2005, 2005–2010 and 2010–2015. We include the explanatory variables lagged at their values in the initial period, following the literature on growth models (Barro & Sala-i-Martin, 2004; Paci & Marrocu, 2013). This explains why the descriptive statistics of the estimation sample compiled in Table 2 show an analysis period of 11 years (2005–2015). Given the heterogeneity of the EU NUTS2, the temporal variation (within standard deviation) in almost all the variables is lower than the variation between regions (between standard deviation), especially for the variables representing population density and inbound tourism. The variables related to GDP are the exception due to the time period analysed. The domestic tourism variables show a lower variation between regions than the inbound tourism variables. In addition, the between standard deviation of human capital and GDP variables is notable, again indicating the heterogeneity of our panel data set.

[Table 1 near here]
[Table 2 near here]

Results and policy implications

Tables 3 and 4 contain, respectively, the GMM estimates and the results of the statistical tests for the models considering all the EU regions and the models considering the NUTS2 groups following the EU Regional Policy classification. For each of the models, we analyse the impact of tourism variables on the convergence (cohesion process) speed and then their direct and spatial spillover effects on economic growth in order to discuss the previously proposed hypotheses. Other control variables are also analysed; specifically, physical, human and technological capital, the old-age dependency ratio, and population density. It should be noted that over-identification is not a problem in our models according to the results of the Hansen J-tests. In addition, in all cases the results of the difference-in-Hansen tests support the validity of the instruments used. To close this section, we discuss the policy recommendations derived from our results.

[Tables 3 and 4 near here]

Models considering all EU regions

Conditional convergence is confirmed by the negative estimated coefficient of the level of per capita real GDP for the initial period in the base model performed taking into account all the regions in the sample and excluding tourism from the analysis (Table 3, first column). Lower starting GDP entails higher growth only if the rest of the explanatory variables are held constant (Barro & Sala-i-Martin, 2004).

Including the total nights spent by domestic and inbound tourists in the model accelerates convergence, as shown by the magnitude of the GDP coefficient in the second column of Table 3. This result is confirmed when we consider different models for each type of tourism or when we include them jointly in a single model (columns 3, 4 and 5 of Table 3, respectively). Even so, domestic tourism reveals itself to be a better instrument for boosting conditional convergence than inbound tourism, since including it separately increases the above-mentioned coefficient more intensively, in line with the results obtained by Li et al. (2016) for provinces of China and by Paci and Marrocu (2013) for some regions of the EU.

It should be noted that nights spent by tourists, whether total, domestic or inbound, have a positive impact on the economic growth of the destination region in the estimations compiled in Table 3, thus corroborating Hypothesis 1. Domestic tourism presents a higher coefficient than inbound tourism, as Paci and Marrocu (2013) found. Nevertheless, we cannot state that this difference is statistically significant according to the p-value of the Wald test performed on the equality of these coefficients.

When the recorded nights spent in nearby areas are analysed, only the spatial lags of domestic tourism display positive coefficients in our estimations. Hence, Hypothesis 3 is fulfilled only for domestic tourism. In contrast, inbound tourism reduces the economic growth of neighbouring regions as established in Hypothesis 4, suggesting a competition effect across regions. This is reflected in the negative coefficient estimated for the spatial lag variable of total tourism. These various spatial spillover effects of domestic and inbound tourism are statistically significant, as the result of the Wald test performed for the fifth model of Table 3 shows.

The same outcomes are obtained in the estimations performed to check the robustness of our analysis, taking tourist arrivals as a proxy (columns 6, 7, 8 and 9 of Table 3). We can therefore briefly state that when all EU regions are considered, tourism, whether domestic or inbound, drives the economic growth of the destination region but only domestic tourism boosts the economic growth of the neighbouring regions as well. Inbound tourism received by regions reduces the income of their neighbours.

The other variables behave as expected in our models. According to previous studies, human and technological capital drive economic growth, as they enhance innovation, total factor productivity and high value-added production (Fischer et al., 2009; Marrocu & Paci, 2012). Like Paci and Marrocu (2013), we find that physical capital does not contribute to regional growth performance, but probably only has level effects. Our estimates also show that low population density is a handicap for territorial cohesion in the EU and substantiate the challenge it poses for regional policy. Sparsely populated regions fail to achieve the agglomeration and knowledge diffusion benefits that densely populated regions enjoy (Becker et al., 1999; Klasen & Nestmann, 2006). Moreover, the prior literature highlights the ambiguity of the relationship between population ageing and economic growth. An increase in life expectancy reduces the depreciation rate of aggregate human capital. However, individuals extend the education period and working cohorts are therefore reduced. This negative effect will be greater as the qualification level increases and the return on human capital decreases (López-Díaz & Ridruejo, 2003). This is why population ageing displays negative coefficients in all the models reviewed in this section.

Models considering the NUTS2 development level

When we run the estimations breaking down the NUTS2 sample according to the EU regional policy classification (Table 4), the drag inbound tourism exerts on the economic growth and convergence process of less developed and transition regions is clearly confirmed: including inbound tourism in the models reduces the speed of convergence. Both the direct and spillover effects of inbound tourism are negative for these regions, thus confirming hypotheses 2 and 4. In contrast, the effects of domestic tourism are positive as established in hypotheses 1 and 3. The Wald tests confirm the statistical significance of these differences between the two types of tourism. In contrast, the results for more developed regions show a positive direct effect of inbound tourism. The p-values of the Hausman tests performed between the models that include this tourism component for the two groups of regions allow us to conclude that inbound tourism has a significantly different direct impact on the economic progress of EU regions depending on their development level.

It is also important to note one differential trait in the control variables of these models: the positive effect of greater life expectancy outweighs the negative impact of a reduction in working cohorts for the less developed and transition regions. It should be noted that De la Croix and Licandro (1999) found that life expectancy can impact positively or negatively on economic growth depending on its initial value: lower initial life expectancy rates cause the effect to take a turn for the better. Our findings confirm this point.

Policy recommendations

The policy-making implications of our results are clear, especially for the less advanced regions: domestic tourism must be rescued from oblivion in development planning and the strategies for promoting inbound tourism should seek to make it truly sustainable, taking into account the territorial tensions such tourism generates. Decreasing dependency on imports, fostering the participation of locals in the development of tourism programmes, supporting local enterprises to mitigate the oligopolistic structure of the supply side and improving skills among the labour force can reduce the leakages and increase the backward linkages of inbound tourism. Moreover, the diversification of products and their proper international promotion should expand inbound tourist itineraries. In this sense, physical and technological capital investments in tourism-related infrastructure should improve the accessibility, productivity and competitiveness of less advanced destinations. In addition, tourism development should be part of a broader development policy based on standard income determinants and handicaps such as depopulation. Finally, income redistribution policies must be applied more intensively to attenuate regional inequality derived from foreign direct investment in tourism (see, among others, Del Vecchio & Passiante, 2017; Du et al., 2016; Li et al., 2018; Ozturk & van Niekerk, 2014; Stauvermann & Kumar, 2016).

The implementation of the European regional policy through the partnership agreements could be an excellent opportunity to address the required reforms. The member states should coordinate tourism actions in their programmes under several of the EU's thematic objectives such as the competitiveness of SMEs; research, technological development and innovation; environment and resource efficiency; sustainable transport and network infrastructures; education, training and lifelong learning; or social inclusion, poverty and discrimination. The European Commission should pay special attention to this concern to enhance regional cohesion and therefore ensure tourism economic sustainability since this sector is, in fact, considered a means not an end of the European regional policy.

Conclusions

Compared to prior research and despite limitations due to the lack of available data, our research broadens the sample from the territorial and temporal perspectives and uses a methodology that makes it possible to address the endogeneity problems highlighted in the previous literature. Furthermore, we control the direct and spatial spillover effects of inbound compared to domestic tourism by taking the level of development of the regions into account. To the best of our knowledge, this is the first study to have tackled all these challenges.

Our results show that domestic tourism proves to be a clear amplifier of economic growth and of the regional convergence process in the EU, as it boosts the income not only of the destination regions but also of neighbouring ones, as previous research has shown. As a novelty, we find that this feature is maintained regardless of the regional level of development. However, in contrast to earlier contributions, inbound tourism is shown to induce a clear competition effect across regions, thus hindering the economic growth of neighbouring regions. In addition, it also acts as a drag on the convergence of the destination region in the case of less developed and transition regions. Inbound tourism therefore compromises the economic sustainability of the EU by weakening the effectiveness of its regional policy. Consequently, domestic tourism development is a better instrument for enhancing territorial cohesion, especially for less developed and transition regions. Policy-making should focus on domestic tourism and reduce the oligopolistic structure and leakages of the supply of inbound tourism by promoting local participation and reinforcing structural change and economic growth determinants in regions with lower development levels.

It should be noted that our findings take on a special meaning in light of the UN Sustainable Development Goals and of the unprecedented COVID-19 crisis (Gössling et al., 2020). Indeed, boosting equitable economic growth is essential due its interrelations with the global challenges we are currently facing. The correct implementation of the measures we propose would allow this goal and others to be achieved in the areas of poverty, education, employment or innovation and basic infrastructure. These measures would also meet the UN call (United Nations, 2020) to rethink tourism development and promote an inclusive recovery. Moreover, given the persistent uncertainty about the total lifting of restrictions on the international movement of people, the focus of this strategy should be on domestic tourism. The European Commission (2020), clearly in line with our research, has recognised this point.

The role domestic and inbound tourism plays in other areas of income distribution, such as inequality, poverty and deprivation, should be addressed in future research since they are sources of social instability and therefore produce tensions in the EU as well. The focus could go beyond the mere consideration of GDP per capita and consider broader aspects of citizens' living conditions and welfare.

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Data availability statement

Data sharing is not applicable to this article as no new data were created or analysed in this study

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Tables

Table 1. Variables, proxies, and sources

VARIABLE	PROXY	CODE IN MODELS	EUROSTAT'S SOURCE OF DATA
INCOME GROWTH	Average annual rate of growth for five-year intervals of per capita gross domestic product expressed in constant thousands of 2015 euros using the HICP (Harmonised Index of Consumer Prices)	D_{GDP}	Database on regional statistics: Economic accounts Database on general statistics: Economy and finance
LEVEL OF PER CAPITA INCOME	Level of per capita real GDP in the initial period	GDP	Database on regional statistics: Economic accounts Database on general statistics: Economy and finance
PHYSICAL CAPITAL	Ratio of gross fixed capital formation to GDP	Physcap	Database on regional statistics: Economic accounts
HUMAN CAPITAL	Ratio of the active population with at least upper secondary education to total active population	Humcap	Database on regional statistics: regional labour market statistics
TECHNOLOGICAL CAPITAL	Ratio of Intramural R&D expenditure to GDP	RD	Database on regional statistics: Regional Science and technology statistics
POPULATION AGEING	Old dependency ratio, 2nd variant (population 60 and over to population 20 to 59 years)	Oldep	Database on regional statistics: Regional demographic statistics
POPULATION DENSITY	Inhabitants per square kilometre	Popden	Database on regional statistics: Regional demographic statistics
DOMESTIC TOURISM	Ratio of nights spent at tourist accommodation establishments by residents in the reporting country to population of destination	Domnights	Database on regional statistics: Occupancy in collective establishments
	Ratio of arrivals of residents in the reporting country at tourist accommodation establishments to population of destination	Domarrivals	Database on regional statistics: Occupancy in collective establishments
INBOUND TOURISM	Ratio of nights spent at tourist accommodation establishments by non-residents in the reporting country to population of destination	Inbnights	Database on regional statistics: Occupancy in collective establishments
	Ratio arrivals of non-residents in the reporting country at tourist accommodation establishments to population of destination	Inbarrivals	Database on regional statistics: Occupancy in collective establishments
TOTAL TOURISM	Ratio of nights spent at tourist accommodation establishments by residents and non-residents in the reporting country to population of destination	Totalnights	Database on regional statistics: Occupancy in collective establishments
	Ratio of arrivals of residents and non-residents in the reporting country at tourist accommodation establishments to population of destination	Totalarrivals	Database on regional statistics: Occupancy in collective establishments

Source: Own elaboration based on Eurostat's database

Table 2. Descriptive statistics of the estimation sample

VARIABLE		MEAN	SD	MIN	MAX	OBSERVATIONS
D_{GDP}	overall	.7969222	2.639611	-6.524835	10.9516	N=774
	between		1.450627	-2.259576	6.287136	n=258
	within		2.206507	-5.674494	7.139504	T=3
Domarrivals	overall	1.079472	0.893946	0.0604648	11.91364	N=2838
	between		0.8664327	0.0928288	5.132395	n=258
	within		0.2260087	-0.7538316	7.860712	T=11
Domnights	overall	3.292748	3.577997	0.1341104	51.34162	N=2838
	between		3.438914	0.1951373	27.68491	n=258
	within		1.008768	-8.7071	26.94946	T=11
Humcap	overall	71.99707	14.49142	15.66	97.05	N=2838
	between		14.04685	20.97545	96.16364	n=258
	within		3.65823	58.48252	84.99252	T=11
Inbarrivals	overall	0.6483897	1.162641	0.0065376	9.501873	N=2838
	between		1.156739	0.0092106	8.851963	n=258
	within		0.1356666	-0.5861846	3.10087	T=11
Inbnights	overall	2.88086	7.240547	0.0178007	75.25031	N=2838
	between		7.194602	0.0238015	58.33818	n=258
	within		0.9196107	-10.47013	19.79298	T=11
GDP	overall	26.79331	12.99913	2.430638	91.37094	N=2838
	between		12.85791	3.218962	82.04644	n=258
	within		2.057715	14.95912	38.104	T=11
Oldep	overall	3.690624	0.18503	3.009142	4.21671	N=2789
	between		0.178881	3.090172	4.161545	n=258
	within		0.0455253	3.54392	3.87401	T=10,8101
Physcap	overall	22.87829	5.45688	9.994155	69.76228	N=2838
	between		4.619833	12.89702	42.86325	n=258
	within		2.917176	5.684688	49.77731	T=11
Popden	overall	4.997014	1.098597	1.193922	8.839566	N=2838
	between		1.100271	1.193922	8.755135	n=258
	within		0.0242295	4.850525	5.130139	T=11
RD	overall	1.353979	1.189433	0.0599792	12.19	N=2838
	between		1.154242	0.1140102	7.196618	n=258
	within		0.2952504	-0.3826391	11.0353	T=11
Totalarrivals	overall	1.727299	1.661958	0.0075754	12.17926	N=2838
	between		1.64055	0.1548377	10.27761	n=258
	within		0.2831775	0.1053121	8.390947	T=11
Totalnights	overall	6.174223	8.946101	0.1782481	82.95738	N=2838

between	8.853172	0.3225526	65.58331	n=258
within	1.389368	-7.680406	29.19777	T=11

Source: Own elaboration based on Eurostat's regional statistics database.

Table 3. Two-step system GMM estimations for all EU region models

	BASE MODEL	TOTAL NIGHTS MODEL	DOMESTIC NIGHTS MODEL	INBOUND NIGHTS MODEL	DOMESTIC & INBOUND NIGHTS MODEL	TOTAL ARRIVALS MODEL	DOMESTIC ARRIVALS MODEL	INBOUND ARRIVALS MODEL	DOMESTIC & INBOUND ARRIVALS MODEL
GDP	-0.109***	-0.113***	-0.172***	-0.110***	-0.170***	-0.120***	-0.195***	-0.112***	-0.193***
	(0.019)	(0.018)	(0.020)	(0.018)	(0.022)	(0.021)	(0.022)	(0.020)	(0.021)
Physcap	-0.076***	-0.062***	-0.061***	-0.069***	-0.065***	-0.130***	-0.121***	-0.069***	-0.072***
	(0.023)	(0.020)	(0.014)	(0.022)	(0.023)	(0.031)	(0.031)	(0.025)	(0.017)
Humcap	0.056***	0.061***	0.072***	0.059***	0.064***	0.059***	0.062***	0.060***	0.070***
	(0.011)	(0.012)	(0.011)	(0.012)	(0.013)	(0.013)	(0.011)	(0.011)	(0.01)
Oldep	-0.767**	-0.635*	-1.419***	-0.696**	-1.185***	-0.217	-1.158***	-0.551*	-1.419***
	(0.329)	(0.347)	(0.290)	(0.315)	(0.357)	(0.409)	(0.443)	(0.313)	(0.315)
Popden	0.519***	0.324**	0.697***	0.391**	0.670***	0.366*	0.883***	0.310*	0.633***
	(0.174)	(0.161)	(0.162)	(0.158)	(0.195)	(0.190)	(0.199)	(0.165)	(0.178)
RD	0.689***	0.671***	1.091***	0.704***	0.821***	0.681***	0.924***	0.647***	0.871***
	(0.166)	(0.156)	(0.174)	(0.167)	(0.164)	(0.158)	(0.159)	(0.176)	(0.144)
Totalnights/Totalarrivals		0.077***				0.494***			
		(0.021)				(0.117)			
WTotalnights/WTotalarrivals		-0.080*				-0.443**			
		(0.041)				(0.222)			
Domnights/Domarrivals			0.108***		0.109**		0.702***		0.579*
			(0.034)		(0.049)		(0.270)		(0.304)

WDomnights/WDomarrivals			0.225***		0.373***		1.241***		1.897***
			(0.075)		(0.121)		(0.452)		(0.375)
Inbnights/Inbarrivals				0.074***	0.066**			0.654***	0.560***
				(0.026)	(0.029)			(0.162)	(0.177)
WInbnights/WInbarrivals				-0.086*	-0.188***			-0.773***	-0.839***
				(0.051)	(0.067)			(0.281)	(0.295)
Number of observations	511	511	511	511	511	511	511	511	511
Number of groups	258	258	258	258	258	258	258	258	258
Number of instruments	74	94	104	84	83	86	85	78	98
F-test	F(6, 258) =31.26 Prob>F=0.000	F(8, 258)=29.84 Prob>F=0.000	F(8, 258)=39.30 Prob>F =0.000	F(8, 258) =22.92 Prob>F=0.000	F(10, 258)=22.58 Prob>F=0.000	F(8, 258)=25.14 Prob>F=0.000	F(8, 258)=33.96 Prob > F= 0.000	F(8, 258)=22.26 Prob > F=0.000	F(10, 258)= 25.54 Prob > F=0.000
Hansen test of overid. Restrictions	chi2(68)=81.66 Prob>chi2=0.124	chi2(86)=99.49 Prob>chi2=0.152	chi2(96)=106.01 Prob>chi2=0.228	chi2(76)=86.83 Prob>chi2=0.186	chi2(73)=87.34 Prob>chi2=0.121	chi2(78)= 87.43 Prob>chi2=0.218	chi2(77)=86.37 Prob>chi2=0.218	chi2(70)=83.64 Prob>chi2=0.127	chi2(88)=102.33 Prob>chi2=0.141
Difference-in-Hansen tests of exogeneity of instrument subsets (H0: H = exogenous):									
-GDP/GDP; Domnights/GDP; WInbnights/GDP; Domnights; WInbnights/GDP; Domarrivals/GDP; WInbarrivals (treated as endogenous variables)	chi2(33)=13.35 Prob>chi2=0.999	chi2(9)=11.85 Prob>chi2=0.222	chi2(54 =28.42 Prob>chi2=0.998	chi2(40)=20.05 Prob>chi2=0.996	chi2(24)=15.01 Prob>chi2=0.921	chi2(15)=7.62 Prob>chi2=0.938	chi2(40)=26.09 Prob>chi2=0.956	chi2(36)=16.47 Prob>chi2=0.998	chi2(28)=23.81 Prob>chi2=0.692
-WTotalnights/WDomnights/Domarrivals (treated as endogenous variables)		chi2(42)=14.16 Prob>chi21.000	chi2(6)=11.87 Prob>chi2=0.065		chi2(5) = 9.21 Prob>chi2=0.101				chi2(18)=5.44 Prob>chi2=0.998
- Physcap; Humcap (treated as predetermined variables)	chi2(16)=14.85 Prob>chi2=0.536	chi2(16)=10.11 Prob>chi2=0.861	chi2(18)=10.27 Prob>chi2=0.923	chi2(16)=15.68 Prob>chi2=0.475	chi2(14)=9.44 Prob>chi2=0.802	chi2(12)=8.74 Prob>chi2=0.725	chi2(16)=9.55 Prob>chi2=0.889	chi2(18)=26.93 Prob>chi2=0.080	chi2(18)=12.81 Prob>chi2=0.803
-RD (treated as predetermined variable)	chi2(9)=13.38 Prob>chi2=0.146	chi2(8)=9.07 Prob>chi2=0.337	chi2(8)=15.42 Prob >chi2=0.051	chi2(9)=8.63 Prob>chi2=0.472	chi2(9) =16.84 Prob>chi2= 0.051	chi2(6)=13.23 Prob>chi2=0.040	chi2(8)=13.65 Prob>chi2=0.091	chi2(7)=9.32 Prob>chi2=0.230	chi2(9)=12.27 Prob>chi2=0.199
-Oldep; Popden (treated as predetermined variables)	chi2(16)=18.09 Prob>chi2=0.319	chi2(18)=23.16 Prob>chi2=0.185	chi2(18)=21.69 Prob>chi2=0.246	chi2(18)=18.56 Prob>chi2=0.419	chi2(16)=24.10 Prob>chi2=0.087	chi2(16)=26.60 Prob>chi2=0.046	chi2(18)=19.66 Prob>chi2= 0.353	chi2(16)=22.38 Prob>chi2=0.131	chi2(18)=37.19 Prob>chi2=0.010

-WInbnights/WTotalarrivals/WDomarrivals (treated as endogenous variables)								
				chi2(14)=1.95 Prob>chi2=1.000	chi2(36)=21.12 Prob>chi2=0.977	chi2(3)=5.99 Prob>chi2=0.112		chi2(6)=7.68 Prob>chi2=0.262
-Totalnights/Inbnights/Totalarrivals/Inarrivals (treated as exogenous variables)								
	chi2(1)=2.74 Prob>chi2=0.098		chi2(1) =3.41 Prob>chi2=0.065	chi2(1)=4.05 Prob>chi2=0.044	chi2(1)=4.88 Prob>chi2=0.027		chi2(1)=1.68 Prob>chi2=0.196	chi2(1)=4.47 Prob>chi2=0.035
Wald test on WDomnights=WInbnights/ WDomarrivals=WInarrivals				F(1, 258)=11.38 Prob>F=0.0009				F(1, 258)=29.61 Prob>F=0.0000
Wald test on Domnights=Inbnights/ Domarrivals=Inarrivals				F(1, 258)=0.46 Prob>F=0.5003				F(1, 258)=0.00 Prob>F=0.9632

Note: Robust standards errors in parenthesis. *** p < 0.01; ** p < 0.05; * p < 0.1

Source: Own elaboration based on Eurostat’s regional statistics database

Table 4. Two-step system GMM estimations for models according to the EU NUTS2 classification

	LESS DEVELOPED AND TRANSITION REGIONS				MORE DEVELOPED REGIONS			
	BASE MODEL	**DOMESTIC NIGHTS MODEL**	**INBOUND NIGHTS MODEL**	**DOMESTIC & INBOUND NIGHTS MODEL**	**BASE MODEL**	**DOMESTIC NIGHTS MODEL**	**INBOUND NIGHTS MODEL**	**DOMESTIC & INBOUND NIGHTS MODEL**
GDP	-0.171***	-0.275***	-0.149***	-0.262***	-0,085***	-0.148***	-0.091***	-0.124***
	(0.043)	(0.031)	(0.025)	(0.022)	(0,024)	(0.020)	(0.021)	(0.019)
Physcap	-0.254***	-0.102***	-0.162***	-0.029	-0,066***	-0.037**	-0.118***	-0.120***
	(0.066)	(0.036)	(0.032)	(0.028)	(0,012)	(0.018)	(0.030)	(0.032)
Humcap	0.020	0.024**	0.013	0.016*	0,093***	0.127***	0.124***	0.105***
	(0.016)	(0.011)	(0.013)	(0.009)	(0,018)	(0.010)	(0.014)	(0.012)
Oldep	0.014	0.502*	0.867**	0.278	-0,939***	-1.879***	-1.269***	-1.172***
	(0.714)	(0.302)	(0.398)	(0.233)	(0,314)	(0.282)	(0.344)	(0.378)
Popden	1.416***	0.382*	0.525*	0.299	0,064	0.286***	0.252***	0.348***
	(0.449)	(0.230)	(0.307)	(0.217)	(0,120)	(0.105)	(0.098)	(0.118)
RD	1.077**	0.790***	0.558*	1.020***	0,350***	0.535***	0.002	0.511***
	(0.460)	(0.260)	(0.322)	(0.231)	(0,132)	(0.096)	(0.108)	(0.110)
Domnights		0.138***		0.180***		0.105**		0.090*
		(0.042)		(0.033)		(0.052)		(0.052)
WDomnights		0.408***		0.485***		0.130*		0.199**

		(0.094)		(0.095)		(0.071)		(0.091)
Inbnights			-0.040**	-0.027*			0.031*	0.044*
			(0.322)	(0.015)			(0.018)	(0.027)
WInbnights			-0.095**	-0.220***			-0.006	-0.139**
			(0.040)	(0.030)			(0.043)	(0.056)
Number of observations	225	225	225	225	286	286	286	286
Number of groups	113	113	113	113	145	145	145	145
Number of instruments	34	68	52	83	52	65	51	59
F-test	F(6, 113)=17.25 Prob>F=0.000	F(8, 113)=60.93 Prob>F=0.000	F(8, 113)=35.55 Prob>F=0.000	F(10, 113)=60.94 Prob>F=0.000	F(6, 145)=21.28 Prob>F=0.000	F(8, 145)=49.08 Prob>F=0.000	F(8, 145)=29.04 Prob>F=0.000	F(10, 145)=25.21 Prob>F=0.000
Hansen test of overid. restrictions	chi2(28)=35.62 Prob>chi2=0.152	chi2(60)=71.39 Prob>chi2=0.149	chi2(44)=56.31 Prob>chi2= 0.101	chi2(73)=84.06 Prob>chi2=0.177	chi2(37)=48.21 Prob>chi2=0.103	chi2(57)=68.52 Prob>chi2=0.141	chi2(43)=54.39 Prob>chi2=0.114	chi2(49)=59.81 Prob>chi2=0.138
Difference-in-Hansen tests of exogeneity of instrument subsets (H0: H = exogenous):								
-GDP/GDP; Domnights (treated as endogenous variables)	chi2(5)=9.85 Prob>chi2=0.080	chi2(18)=3.56 Prob>chi2=1.000	chi2(9)=2.37 Prob>chi2=0.984	chi2(3)=1.01 Prob>chi2=0.799	chi2(8)=6.02 Prob>chi2=0.645	chi2(16)=17.49 Prob>chi2=0.35	chi2(4)=4.83 Prob>chi2=0.305	chi2(6)=6.48 Prob>chi2=0.372
-Domnights (treated as endogenous variable)				chi2(15)=3.05 Prob>chi2=1.000				chi2(8)=2.59 Prob>chi2=0.957
-WDomnights/Domnights; Domnights (treated as endogenous variables)		chi2(6)=4.33 Prob>chi2=0.632		chi2(7)=4.25 Prob>chi2=0.751		chi2(9)=6.05 Prob>chi2=0.735		chi2(7)=6.74 Prob>chi2=0.456
-Inbnights; WInbnights/WInbnights (treated as predetermined variables)			chi2(18)=24.16 Prob>chi2=0.150	chi2(18)=10.06 Prob>chi2=0.930			chi2(10)=4.46 Prob>chi2=0.924	chi2(4)=8.04 Prob>chi2=0.090

-Physcap; Humcap (treated as predetermined variables)	chi2(10)=0.09 Prob>chi2=1.000	chi2(18)=22.21 Prob>chi2=0.223	chi2(12)=2.29 Prob>chi2=0.999	chi2(18)=14.17 Prob>chi2=0.718	chi2(16)=11.02 Prob >chi2=0.808	chi2(18)=17.70 Prob>chi2=0.475	chi2(12)=18.39 Prob>chi2=0.104	chi2(16)=13.89 Prob>chi2=0.607
-RD (treated as predetermined variable)	chi2(1)=0.00 Prob>chi2=0.971	chi2(8)=5.76 Prob>chi2=0.674	chi2(1)=0.02 Prob>chi2=0.877	chi2(8)=14.52 Prob>chi2=0.069	chi2(9)=6.19 Prob> chi2=0.720	chi2(8)=13.37 Prob>chi2=0.10	chi2(8)=11.45 Prob>chi2=0.177	chi2(3)=6.81 Prob>chi2=0.078
-Oldep; Popden (treated as predetermined variables)	chi2(18)=33.52 Prob>chi2=0.014	chi2(18)=19.21 Prob>chi2=0.379	chi2(12)=11.55 Prob>chi2=0.483	chi2(14)=13.56 Prob>chi2=0.483	chi2(10)=8.64 Prob>chi2=0.567	chi2(14)=5.34 Prob>chi2=0.980	chi2(16)=13.80 Prob>chi2=0.613	chi2(14)=13.10 Prob>chi2=0.519
-Inbnights (treated as predetermined variable)							chi2(1)=1.82 Prob>chi2=0.177	chi2(1)=1.86 Prob>chi2=0.172
Wald test on WDomnights=WInbnights				F(1, 113)=36.08 Prob>F=0.0000				F(1, 145)=7.16 Prob>F=0.0083
Wald test on Domnights=Inbnights				F(1, 113)=24.34 Prob>F=0.0000				F(1, 145)=0.52 Prob>F=0.4720
Hausman test on difference between the models for the two region groups H0: difference in coefficients not systematic					chi2(6)=14.72 Prob>chi2=0.0226	chi2(8)=11.87 Prob>chi2=0.1573	chi2(8)=249.59 Prob>chi2=0.0000	chi2(10)=19.99 Prob>chi2=0.0294

Note: Robust standard errors in parenthesis. *** p < 0.01; ** p < 0.05; * p < 0.1

Source: Own elaboration based on Eurostat’s regional statistics database

Figures

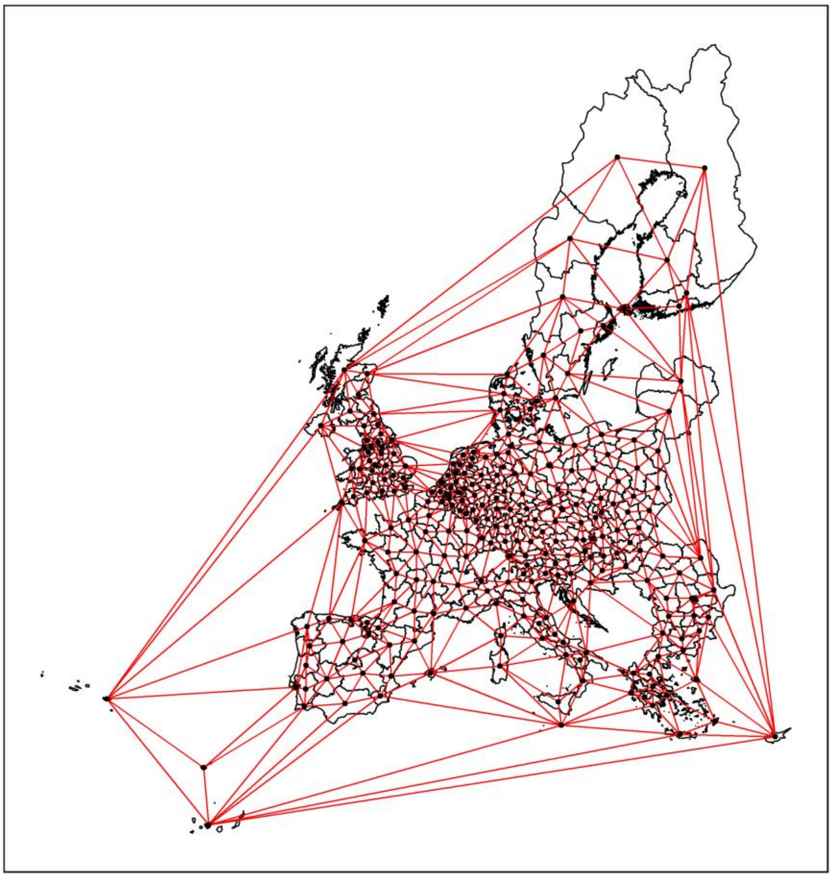

Figure 1. Neighbourhood map
Source: Own elaboration based on Eurostat’s regional statistics database

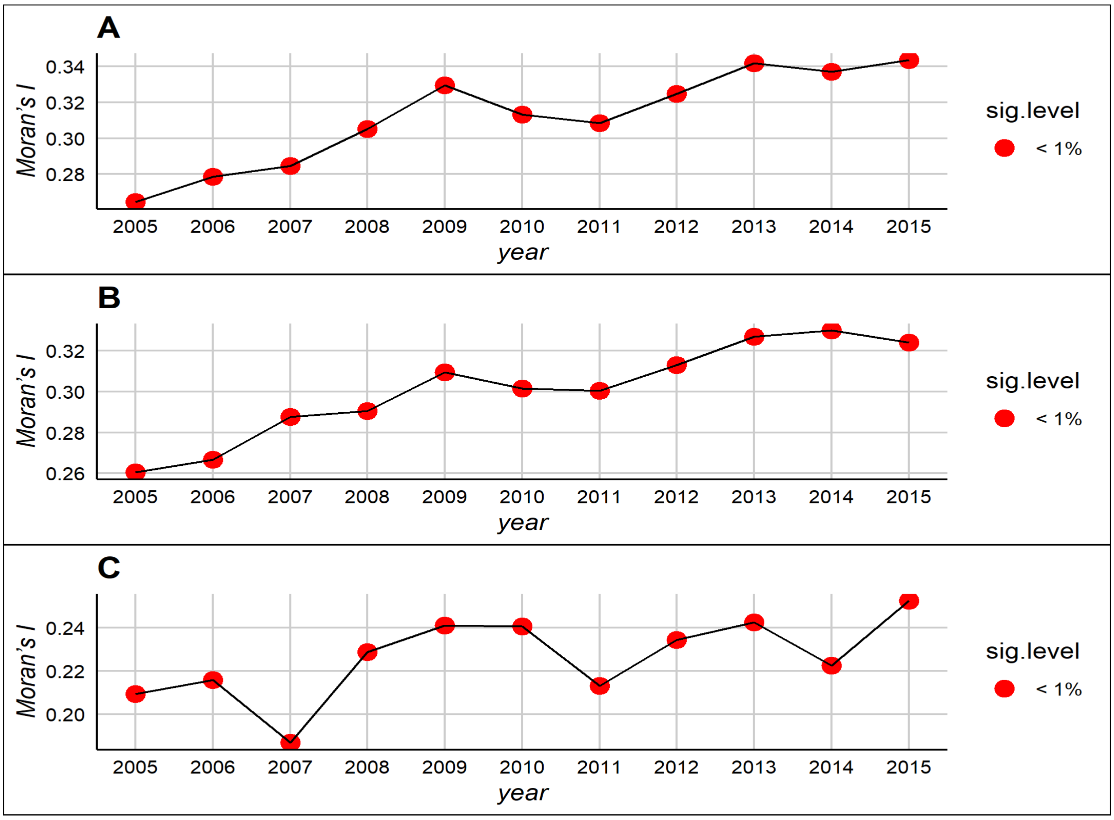

Figure 2. Moran's I for tourism proxies: All EU regions
Note: *Totalnights* (A), *Inbnights* (B) and *Domnights* (C)
Source: Own elaboration based on Eurostat's regional statistics database

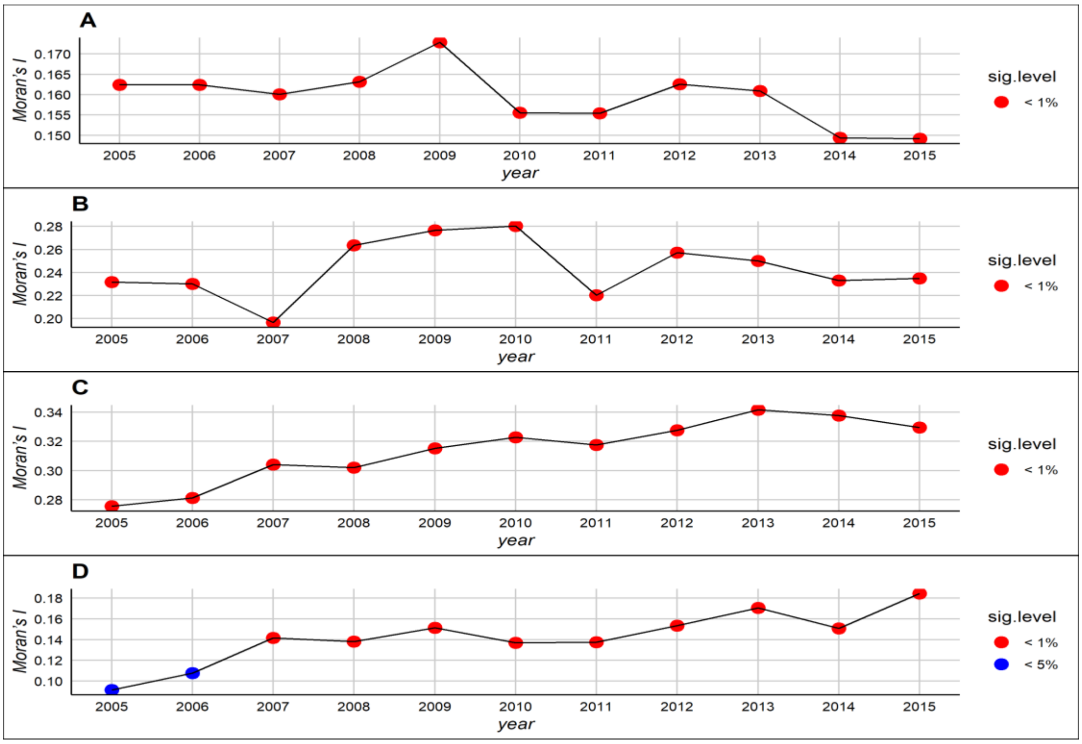

Figure 3. Moran's I for tourism proxies: Regions classified according to EU regional policy
Note: $Inbnights$ – less developed and transition regions (A), $Domnights$ – less developed and transition regions (B), $Inbnights$ – more developed regions (C), $Domnights$ – more developed regions (D).
Source: Own elaboration based on Eurostat's regional statistics database

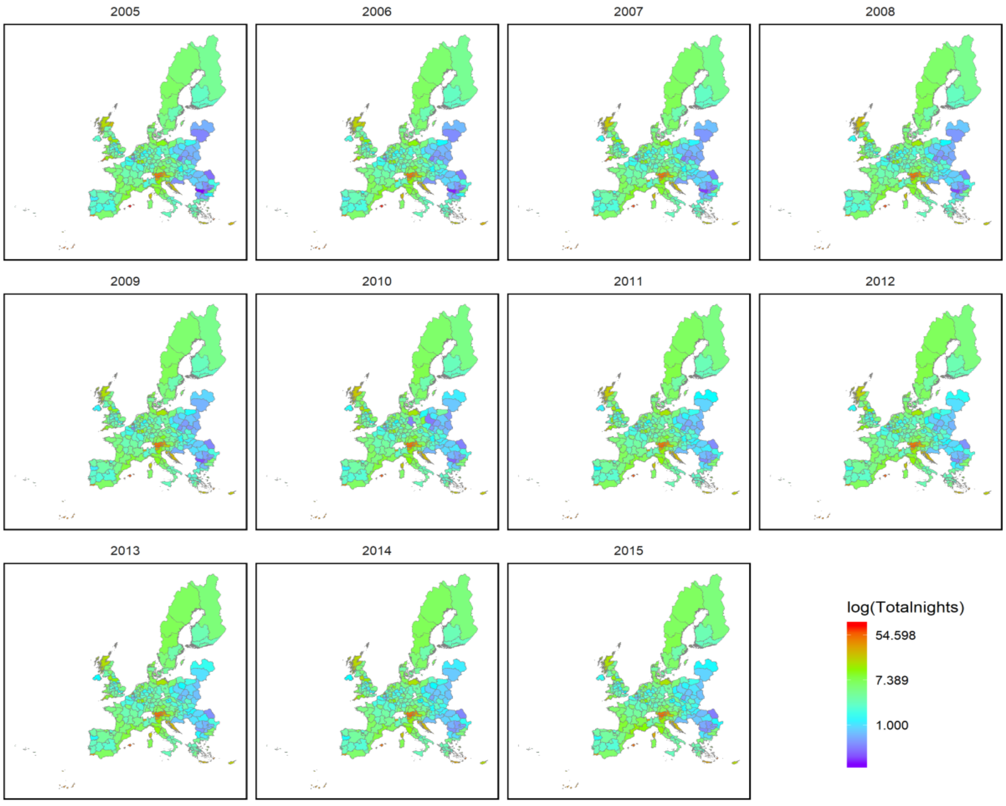

Figure 4. Nights spent at tourist accommodation establishments
Source: Own elaboration based on Eurostat's regional statistics database