COMUNICACIÓN

Título: Accounting for the role of spatial effects when modelling the factors driving the expenditure of tourists

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Tourist expenditure is a key variable in the analysis of the tourism industry. As a result, the literature on factors driving tourist spendings is nowadays important. In this paper, we extend the analysis by highlighting the role that the geographical dimension plays in this framework, using data on international visitors reaching 1872 destinations in Spain in year 2013. Spatial statistics allow to identify the presence of spatial dependence effects in data. Accordingly, we employ spatial econometrics to accommodate for such spatial effects in the analysis of factors driving the spendings of tourists. In doing so, we are able to account for the clustering behaviour observed in tourist expenditure data, and provide a quantitative measure of the spatial spillovers emerging in this setting, as a novelty in expenditure studies. In particular, we show that indirect spatial effects in the model explain around the 10% of the variance of the average tourist expenditure at a given destination. Results confirm the need of accounting for spatial association patterns when modelling the expenditure of tourists at destinations.

Palabras Clave: *(máximo 6 palabras)*

Clasificación JEL: tourist expenditure, spatial dependence, spill over effects, clustering pattern, tourism policy

Accounting for the role of spatial effects when modelling the factors driving the expenditure of tourists

1.Introduction

The expansion of the tourism industry at the beginning of the 21st century is remarkable. More than 1300 million people travelled internationally in 2017, with international receipts reaching €1,340 billion (UNWTO, 2018). Moreover, this sector has shown a particular resilience along the years of the crisis, becoming a key source of wealth and prosperity for many countries in the world (Garau-Vadell, Gutierrez- Taño & Díaz-Armas, 2018). In this context, the study of factors influencing expenditure of visitors occupies a central place in the literature. Macroeconomic approaches to tourism demand include time series forecasting of arrivals and receipts, with a geographical focus on the situation of whole countries or world regions (Son Li, Witt & Fei, 2010; Song & Witt, 2000). The most recent approaches to the analysis of tourist expenditure build on micro-economic modelling, with researchers employing survey data to identify the factors driving the spending behaviour of visitors. Recent surveys on the issue include those of Brida & Scuderi (2013), Sainaghi (2012), and Wang & Davidson (2010). The micro-economic modelling focus puts the individual in the centre of the analysis, with researchers seeking to explain why people consume tourist services and what factors lead the volume of individual spending. The usual geographical focus is here in the particular situation of a given selected destination, place or whole country. As a result, little attention has been paid to date towards other geographical dimensions that could affect the level of expenditure of tourists while in vacations. Territorial characteristics have usually entered in these models in a tangential way, either by including dummy variables controlling for destination characteristics in aggregate, or through trip characteristics that could influence the level of spending (Brida & Scuderi, 2013; Sainaghi, 2012). An example of the latter can be found in variables reflecting trip purposes (business, leisure, studies), accommodation supply (hotels, second-home residences), or tourism activities (gambling, hunting, culture) that majorly characterize the tourist experience at particular destinations.

In this context, the present paper seeks to introduce the geographical or spatial dimension as a central variable in the analysis of factors leading tourist expenditure. Several reasons underlie this focus. Tourism follows an unbalanced pattern of development across space, with important differences in the number of arrivals received for example by seaside and inland destinations (Aguiló & Juaneda, 2000; Andriotis, 2006). Accordingly, total tourist expenditure is unevenly distributed in space, following a clustering pattern similar to that governing other socio-economic variables such as the GDP or population growth (Le Gallo & Ertur, 2003). Seaside regions specialize in the sun and sand product, becoming mass tourism places able to attract a significant number of visitors annually. In these regions, tourism demand and supply co-locate around well-known destinations, conforming tourism clusters. This feature of data brings the issue of spatial dependence, traditionally arising when studying the locational pattern of socio-economic processes in the territory, as shown by the spatial statistics literature (Haining, 2003). In this case, the level of expenditure at one particular destination is associated with the level of expenditure at surrounding destinations, showing the presence of spatial autocorrelation in data. Failure to incorporate such spatial dependence effects when modeling expenditures would result in potentially misleading econometric results as shown by the spatial econometrics literature (Le Sage & Pace, 2009).

The present paper seeks to account for spatial association pattern and clustering nature of data when modelling tourist expenditure. This would help to extend the preceding literature, with the subject of analysis changing from tourists to destinations. However, and taking advantage of geo-referenced survey data, we will be able to retain some features of the preceding framework of analysis, namely, the tourist profile and trip & psychographic characteristics. Our modelling strategy would be then mixing geographical and tourist related characteristics, extending in this way the scope of previous studies on tourist expenditure. Spatial econometric techniques allow to identify the spatial features of data for a given territory. Building on these, the current investigation scrutinizes the main spatial features of tourist expenditure for the case of study, the municipalities of Spain. Employing Exploratory Data Analysis will help to identify how tourist expenditure spreads across the country geography, and how this variable clusters in the territory. Further, spatial econometric modelling provides two main effects from covariates in the model, that is, direct and indirect effects. Direct effects account for the usual relationships between dependent and independent variables in the model, circumscribed to the spatial limits of each destination in the sample. Indirect effects show how covariates in a given municipality influence the level of expenditure at neighbouring destinations and vice versa, in a so-called spillover effect. Building on the spatial modelling framework will allow to widen the geographical focus in the analysis of tourist expenditure, accounting for the clustering nature of this process, and obtaining a numerical measure of such agglomeration forces arising at tourist destinations. All these research findings will help to provide new advices in terms of tourism policy as well.

The rest of the paper is structured as follows. After this introduction, section 2 describes the data set and develops an exploratory spatial analysis. Section 3 presents the econometric model for tourist expenditure and results of the estimation procedure. Section 4 focuses on main results regarding spillover effects in the spatial model. Section 5 discusses main findings of the investigation and future extensions. Finally, section 6 concludes and presents some policy recommendations.

2. Exploratory data analysis: spatial dependence in tourist expenditure

This section analyses the spatial pattern of tourist expenditure by relying on spatial statistics techniques. As a first step, Exploratory Spatial Data Analysis (ESDA) is carried out in order to search for patterns of spatial association (Anselin, 1988). In this paper we will concentrate in the analysis of spatial autocorrelation features in data, given the expected clustering nature of tourist expenditure in space. In modelling spatial association patterns, the definition of the relationship between spatial units in the data set, through the spatial weights matrix W is required. Most usual definitions of the W matrix include the contiguity matrix with k-nearest neighbours, or some type of geographical distance function. The data set in the paper provides information on 1872 municipalities in Spain, making the main tourist destinations in the country. In the study, three types of W matrix will be used to better scrutinise the stability of the model. In particular, the inverse of squared distance, the second order of neighbourhood, and the average number of neighbours in the sample (20 nearest neighbours) will be employed. Results that will be showed along the text are those of the inverse of squared distance-based W matrix, given that this matrix presents the highest goodness of fit in the exploratory and regression models. Additionally, results regarding the other two specified W matrices are included in the Appendix. As will be shown, results regarding these three W specifications appear to be similar, either for the coefficients in the regression model, and for the spatial related effects, with no important differences arising among these three spatial contiguity specifications.

Expenditure data in the study comes from the Tourist Expenditure Survey (Egatur), carried out by the Institute of Tourism Studies of the Ministry of Tourism of Spain. The survey builds on questionnaires made to international tourists reaching Spain, showing questions about their level of expenditure, and their personal and trip characteristics[1]. The year of reference is 2013, this being the last available year with reliable data. Egatur provides information at the level of the individual tourist and the municipality or destination visited.

The spatial pattern of association for the tourist expenditure in Spain is primarily reflected by ESDA tools from spatial statistics. Figure 1 shows the Moran´s I (MI) Scatterplot for the total expenditure by the average tourist at the municipality level, with data in logs. The figure shows the nature of the spatial autocorrelation arising in data, a value for the MI statistic, and a fitted regression line for such pattern of association (Anselin, Syabri & Kho 2006). The value of the global MI statistic is of around 0.12 with high level of significance, showing the presence of positive spatial autocorrelation in tourist expenditure at the level of destinations.

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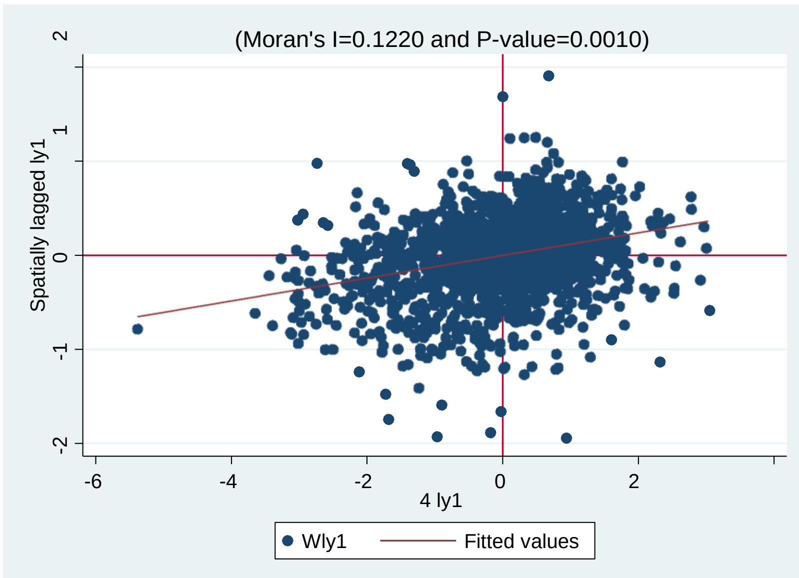
[1] For further detalis consult: http://estadisticas.tourspain.es/es-ES/turismobase/Paginas/default.aspx

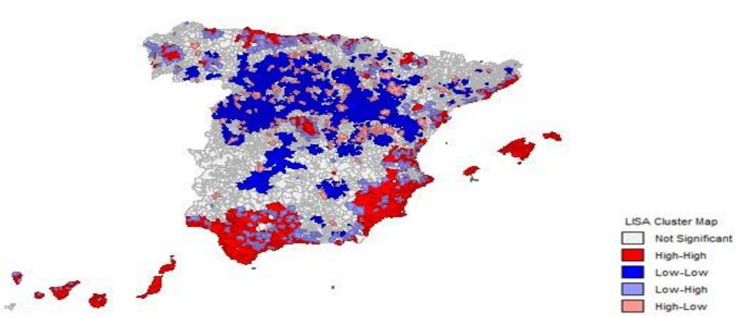
Figure 1: Moran´s I Scatterplot for total tourist expenditure in Spain in 2013



Source: Own elaboration

The global spatial measure yields only one statistic for the whole area of study, assuming homogeneous behaviour of the variable of interest across the space. Local Indicators of Spatial Association (LISA) render local MI indexes, and related statistical significance, showing the presence of local hot spots (Anselin 1995).

Figure 2: LISA map for tourist expenditure



Source: Own elaboration

Figure 2 presents the LISA map for the mean expenditure of tourists at destinations across Spain, showing local significant HH (high-high) clusters, high expenditure municipalities surrounded by other high expenditure ones, mostly located in the Mediterranean coast, from Catalonia in the north of the country, to Valencia and Andalusia in the centre and south. The two Islands, Balearic and Canary Islands, also show important local spatial autocorrelation HH treats. The centre of Spain with the capital Madrid, Basque Country in the north and Galicia in the north-west also show some HH clusters too. LH (low-high) local clusters arise in the seaside regions too, HL (high-low) clusters are more present in the centre of the country, away from the seaside destinations that accumulate the highest total expenditure of tourists. LL (low-low) clusters follow the same pattern as HL ones, located in the middle of Spain where rural tourism is present, a product with lower levels of expenditure by visitor.

Regarding other W specifications employed here, shown in table A. 1 of the appendix for sake of simplicity, the LISA map and MI Scatterplots are also computed. In section a) of the table the contiguity matrix W is defined for the 20 nearest neighbours, this being the average number of neighbours of a given municipality in the sample, while in section b) W is defined according to the first and second order of neighbourhood for each municipality. In both cases, MI statistic appear quite similar to that of the inverse of the squared distance used as the benchmark case, showing values of 0.15 and 0.14, respectively, and a positive slope of the fitted regression line, where HH and LL values dominate. LISA maps in table A.1 also show patterns of spatial association for tourist expenditures in line with figure 2, where HH spots accumulate around the Mediterranean coast and the two Islands and LL in the central inland destinations of the country.

In general, ESDA analysis shows important spatial dependence patterns for tourist expenditure at the level of destinations, both from a global and local focus. In this way, the next section introduces the econometric analysis to determine the main factors explaining expenditure choices of tourists, in a framework taking into account the spatial association patterns arising in data

3.Econometric analysis

This section focuses on the econometric analysis of tourist expenditure at the level of destinations. The modeling exercise starts with the non-spatial OLS regression and then moves to the spatially extended specifications. Data in the model comes from Egatur survey, including 102,000 questionnaires for international tourists reaching Spain in 2013. The model of tourist expenditure includes as dependent variable the average tourist expenditure at a particular destination (in logs), relative to the number of tourists arriving at these destinations, to avoid size bias in estimation. As explanatory factors, we employ two main information sets. The first set includes the trip and visitor´s characteristics provided by Egatur survey, computing territorialized measures of these variables at the level of destination. In the second set we include local destination features able to influence the level of expenditure of tourists, proxied by variables reflecting the development of the tourism sector. Covariates in this set account for the tourism development index, and the level of local population. In particular, explanatory factors in the model include the following ones:

Profile of the tourist per destination:

This group of variables reflects the profile of tourists at destination. It is computed as the share of visitors with a particular profile at each single destination in year 2013. In particular:

- Origin of the tourist: Grouped for visitors coming from the European Union (EU), USA + Canada, North of Europe (Sweden, Finland, Denmark), Rest of Europe and Rest of the World.
- Level of income: High (more than €80,000 per year), middle (between €20,000 and €80,000 per year), and low level of income (less than €20,000 per year).
- Level of studies: Primary, secondary and tertiary schooling (according to UNESCO ISEC 2011 classification; see UNESCO, 2011).

Trip characteristics of tourists per destination:

This group of variables accounts for the trip characteristics of tourists per destination, computed as the share of tourists over total with particular trip characteristics arriving to each single destination in 2013. In particular:

- Size of the party: number of people coming in the tourist group (in logs).
- Length of stay: in average days for all visitors at destination (in logs).
- Purpose of the visit: including leisure, studies, personal, business, and other purposes.
- Type of accommodation: hotel, second-home, rent apartment, and other accommodations.

Destination specific attributes: Destination specific attributes include:

- Tourist index: This variable reflects the degree of specialization in tourism activities of the municipality, as a weighted average of the existing supply of tourist accommodation establishments, food and restaurants establishments, and leisure and tourist activities available (in logs) (source: Caixabank Annual Report, Spain, http://www.caixabankresearch.com).
- Total population: As a variable capturing the destination size and tourist consumption opportunities (in logs) (source: INE, Statistics Institute of Spain, www.ine.es).

The basic specification of the tourist expenditure model is then as follows:

$$EXP_i = \alpha_i + PROF_i + TRIP_i + TOURIND_i + POP_i + u_i$$

where:

EXP_i : Total average expenditure by tourists at destination i (in logs)
$PROF_i$: Variables conforming the profile of the tourists visiting destination i

$TRIP_i$: Variables conforming the trip characteristics of tourists visiting destination i

$TOURIND_i$: Tourist Index of destination i (in logs)

$POPi$: Resident population at destination i (in logs) u_i :

Residual of the model (error term).

Descriptives on the data set for the econometric model are presented in table 1, showing an average spending per visitor of around 952 euros, with a mean stay of 12 days, tourists coming in couple majorly, for leisure, personal and business purposes, accommodated in hotels and second-homes, coming from Europe mostly, with middle and high income levels, and with secondary and tertiary studies.

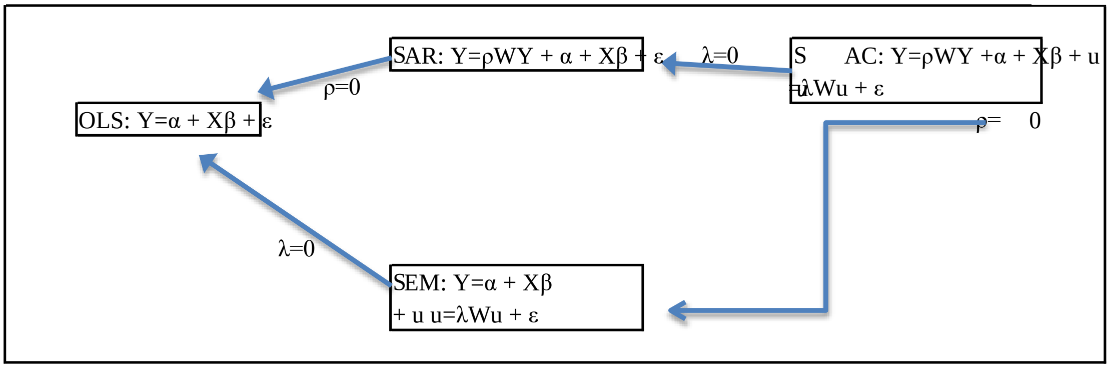
Table 1: Descriptives of the covariates in the econometric model

Variable	***Mean***	***Std. Dev.***	***Min***	***Max***
Total av. expenditure per tourist (in euros)	952	118	12	3710
Length of stay (average days)	12	10	1	50
Size of the party (av. number of people)	2.17	1.75	1	12
Leisure (percentage)	0.57	0.40	0	1
Studies (percentage)	0.02	0.09	0	1
Personal (percentage)	0.26	0.35	0	1
Business (percentage)	0.11	0.24	0	1
Other purpose (percentage)	0.04	0.02	0	1
Accommodation-second home (percentage)	0.27	0.34	0	1
Accommodation-hotel (percentage)	0.54	0.40	0	1
Accommodation-rent apartment (percentage)	0.08	0.19	0	1
Other accommodation (percentage)	0.09	0.03	0	1
European Union (percentage)	0.64	0.21	0	1
USA + Canada (percentage)	0.04	0.01	0	1
North of Europe (percentage)	0.05	0.01	0	1
Rest of Europe (percentage)	0.13	0.05	0	1
Rest of the World (percentage)	0.14	0.03	0	1
High income (percentage)	0.20	0.14	0	1
Medium income (percentage)	0.75	0.22	0	1
Low income (percentage)	0.05	0.02	0	1
Tertiary studies (percentage)	0.23	0.12	0	1
Secondary studies (percentage)	0.59	0.27	0	1
Primary studies (percentage)	0.18	0.08	0	1
Tourist index	81	431	1	940
Population (in people)	20961	95705	5	3198645

Source: Own elaboration based on Egatur 2014, INE and CaixaBank data.

Modelling strategy includes the basic estimation by OLS procedure, followed by spatially extended models, including the SAR, SEM and SAC models. The relationships among these models are shown in figure 3:

Figure 3: OLS and spatially extended models



Source: Own elaboration.

Note: OLS=Ordinary Least Squared model, SAR=Spatial Autoregressive Model, SEM= Spatial Error Model, SAC= Spatial Autoregressive Combined model.

As shown by literature, OLS estimates result in biased and inefficient coefficients in the presence of spatial dependence in data. Accounting for such an issue requires to impose some spatial structure in the model. Usual approaches employ the SAR (Spatial Autoregressive) and SEM (Spatial Error) specifications of the linear model ((Anselin & Bera, 1998), as well as the SAC model (Spatial Autoregressive Combined Model), with spatial effects in the dependent and error terms (Le Sage and Pace, 2009; Elhorst, 2010).

Estimation of the four models for tourist expenditure are shown in table 2, with log- log specification and W defined as the inverse of squared distance. The first one column in the table is the OLS specification, with relevant goodness of fit according to this literature, given an R-sq above a value of 0.5 (Thrane, 2014). All spatial extended models show positive and significant spatial parameters, including the SAR (ρ), the SEM (λ), and the SAC models (ρ) and (λ) (Arbia & Baltagi, 2009). In the SAR model, the spatial parameter estimate is of 0.13, in the SEM of 0.16, and in the SAC of 0.11 and 0.028, respectively, this last one not being significant. In general, the spatial models behave quite well, showing an increase in the goodness of fit measures regarding the non-spatial OLS specification, what highlights the need to account for spatial autocorrelation effects when modeling the expenditure of tourists at destinations. LR tests reject the null hypothesis of no spatial effects in data for all three spatial specifications, as well as the Wald test do. The SAR and SAC specifications seems to perform slightly better according to the log-likelihood and R- sq measures, although all three spatial specifications show very similar results in terms of estimated coefficients in the model and goodness of fit. A general message of the econometric modelling exercise seems to be the necessity of controlling for spatial dependence effects in tourist expenditure analysis. In this regard, it appears that the OLS model is not appropriate, given the presence of spatial structure in data, as shown by literature (Anselin et al., 1996; Anselin & Florax, 1995).

Regarding the role of explanatory factors in the expenditure model, estimates of the spatial equations seem to outperform those of the OLS specification, while all coefficients appearing quite similar for SAR, SEM and SAC models, showing an important stability of the regression output. In general, traditional factors playing a role in the previous non-spatial literature of tourist expenditure also seem to work in the spatially extended framework (Sainaghi, 2012; Wang & Davidson, 2010). In this regard, the most important explanatory factor in order to influence the (log of) average tourist expenditure at destination is the length of stay of the tourist, followed by the type of accommodation (hotel and rent apartment) chosen, and coming from more distant origin countries (North America, and the Rest of the World). The following variables increasing expenditure in the model include those of being a business tourist, with high-income level, and tertiary education. In this way, trip characteristics and profile of the visitors continue to be important determinants in the spatial tourist expenditure model, as in the previous non-spatial literature (Marrocu, Paci & Zara, 2015; Brida & Scuderi, 2013). The model also controls for fixed regional effects with some of them not appearing to be significant.

[Insert Table 2 here]

In general, all spatial specifications show the presence of spatial dependence in tourist expenditure at destinations, with spatial parameters being positive and significant, what would be recommending the use of spatial econometrics techniques. In comparison with OLS results, coefficients in the spatial specifications do not change drastically, although the regression shows higher goodness of fit than the non-spatial regression.

Regarding the other two W specifications in the appendix, the econometric results show the same message. In particular, the table A.2 a) for the 20 nearest municipalities, show spatial parameters of 0.08, 0.07, and 0.10 plus -0.047 (not significantly different from zero) for SAR, SEM and SAC specifications, respectively. All tests indicate the significance of the spatial components of the models, while log-likelihood and AIC tests point to a slightly better performance of the SAR and SAC models. However, all three specifications seems to behave well, and estimated coefficients stay quite close among these three models, showing an important stability of the output. LR tests also reject the null of non-spatial structure in data. Regarding the b) section of table A.2, for the W defined as the first and second order of neighbourhood for the destinations in the sample, results show once more the pre-eminence of the spatial specifications, plus the rejection of the null of non-spatial structure in data. Goodness of fit measures, such as log-likelihood, AIC, and R-sq present values very close to each other for the three spatial models, and with regards to the other two W specifications along the study. Such results point towards an important stability of estimates across different specifications of the W matrices, and for all three spatial equations, namely SAR, SEM and SAC models. In the next section, the study focuses on the spatial effects arising in the model, including their estimation, stability and interpretation.

4. Direct and indirect effects in the spatial model

As posed by Le Sage and Pace (2009), in spatial models the interpretation of estimated coefficients is not direct as in the OLS model. Effects in the spatial framework include the direct and indirect effects of covariates. Direct effects can be though as the effect of covariates on the dependent variable within the spatial limits of the *ith* destination. Indirect effects would be capturing the effects of covariates from *ith* destination spilling over the neighbouring area, or those of neighbouring areas spilling over the *ith* destination. Spatial spillovers arise as a result of impacts extending through neighbouring regions or even coming back to the origin region in a chain of spatial connection of indirect effects. The magnitude of the indirect effects will then depend on: (1) the position of the region in space (or in general in the contiguity structure), (2) the degree of connectivity among regions as expressed by the W matrix of the model, (3) the value of the parameter ρ measuring the strength of the spatial dependence in data, and (4) the level of the β coefficients (Le Sage and Pace, 2009).

Table 3 shows the direct and indirect effects arising in the model for the SAR and SAC equations, as these two models allow for computation of spatial effects related to spatial parameters (ρ), and seem to slightly outperform the rest of models in the tourist expenditure regressions. In general, spatial or indirect effects appear to be significant and higher in value for the leading covariates influencing tourist expenditure, like the length of stay, origin of the tourist, and type of accommodation chosen. They also appear significant for other relevant covariates, such as the level of studies of the tourist, income level, size of the party, and trip purpose. The magnitude of the indirect effects is as expected lower than those of the direct effects. In sum, results show the relevance of the length of stay, accommodation type chosen, and presence of long-distance visitors in driving up the level of tourist expenditure at their own destination, with such effects spilling over the neighbouring municipalities too

Equally, a higher presence of longer stayers, coming from distant countries and lodging in good hotels will increase the average expenditure of tourists at neighbouring destinations, also pushing up the expenditure level of the reference location. In this way, it seems that destinations specialise in tourism products, for example in the seaside area, attracting a type of specific tourist and trip profiles that render a higher average expenditure, with spillovers helping to reinforce the specialisation of neighbouring places in that holiday segment too. This situation results in the emergence of HH and LL expenditure clusters across the country as shown in figure 2, with a significant role played by spatial effects in shaping the spatial distribution of tourist expenditure. One important conclusion here is the need of employing spatial regression models when analysing tourist expenditure at destinations, allowing for unbiased regression output and a clear image of the role played by neighbouring effects in reinforcing tourism specialisation patterns.

[Insert Table 3 here]

Estimates in table 3 indicate that indirect effects, defined as a spatially weighted mean of spillovers arising to/from neighbouring destinations, in the case of the W matrix using the inverse of the squared distance, account for a share of around 11%-
13% of total effects in SAR and SAC specifications. This is an important value in terms of indirect effects, as the situation of surrounding areas clearly affect the level of spending at the reference destination. Results in table A.3 of the appendix show direct and indirect effects in the spatial models with other W matrices, a) includes the 20 nearest neighbours and b) the first and second order of neighbour regarding the reference destination for the whole sample. In both cases, indirect effects show significant coefficients, with leading covariates in the expenditure functions playing a similar role as in the previous benchmark case of table 3. The SAR and SAC spatial indirect effects in section a) show mean values of 8% and 10% of total effects in the model, respectively. In section b) indirect effects account for 10% and 12% of total effects in the model, for SAR and SAC specifications, respectively. In general, estimated spatial indirect effects would be playing a similar role in all defined regressions, despite changes in the W specification, showing an average value of around 10% of total effects. The magnitude of direct and total effects also appear to be very similar between all regression results, both across spatial models (SAR, SAC and SEM) and for different specifications of the W matrices. This result remarks the stability of regression output in the tourist expenditure analysis along the present study, as well as the higher goodness of fit provided by spatial regressions in comparison with the non-spatial OLS approach.

5. Discussion of results and future research extensions

According to the main results of the investigation, spatial dependence appears to be an issue for tourist expenditure studies. Previous research focusing on micro- economic models, based on survey data, has contributed quite significantly to improve our knowledge on what are the major determinants of the expenditure of tourists. However, a more grounded approach seems to be appealing when disentangling the factors driving the behaviour of tourists at the level of destinations. Formation of clusters of high and low level of tourist expenditure seems to be the pattern in Spain, as well as in many other tourist countries in the world. In this way, our modeling exercise could be generalized to the analysis of other world tourism regions, or even to other tourism topics characterized by spatial dependence patterns. Regarding the main results of the econometric modeling section, length of stay appears to be the most important determinant of tourist expenditure, as shown by previous contributions (Thrane & Farstad, 2011). Trip characteristics as the type of accommodation chosen, and the purpose of the visit also influence the level of expenditure majorly. Profile of the visitor, particularly according to the origin of the tourist, and the level of income and studies appear as relevant factors in explaining tourist expenditure at destinations too (Marrocu, Paci & Zara, 2015; Brida & Scuderi, 2013).

In terms of the degree of novelty of the present paper, table 4 summarises the main papers dealing with spatial models in the tourism literature found by authors. According to this table, initial papers were dealing with ESDA analysis in order for example to study the distribution of hotels in the south of Spain, or tourism

expenditure with LISA maps. Further, researchers have started to employ spatial models in line with those of the present paper, like SAR, SEM, SAC or Durbin models. Some of them applied spatial panel data to study growth models of tourism, gravity augmented models or pooled regressions. In this sense, applications of spatial econometrics in tourism studies are still at initial stages of development, with this paper aiming to do a contribution in this regard. In particular, tourist expenditure studies count on a large tradition, given the relevance of the topic in the generation of wealth and employment for destinations. However, traditional expenditure studies rely in non-spatial analysis, including different econometrics techniques, such as initial OLS models, quantile regressions, SURE analysis, Discrete Choice models, or time series analysis for forecasting purposes. In this context, the present paper makes two main contributions to the tourist expenditure literature: first, the paper demonstrates the need of accounting for spatial effects related to neighbouring areas as one of the leading factors influencing the level of expenditure at destinations. Not accounting for such effects could produce biased coefficients in the estimation of tourist expenditure functions. And second, most expenditure studies employing a micro-level data approach has focused on the case of one single destination or a whole country as the territorial area of research, as shown in table 4. However, clustering behaviour appear to be a stylised fact of tourist expenditure, what would recommend to employ a suitable geographical focus enabling to account for this type of agglomeration effects. Spatially extended models allow to account for this feature of the process, clearly enriching the analysis in regards to the previous literature. In sum, econometric results in the study have shown that the level of tourism expenditure not only depends on decisions and investments carried out by a particular destination, but on how the related tourism cluster behaves. This is clearly a novel and relevant contribution to this literature, helping to introduce spatial methods in tourism analysis, and improving the existing knowledge about factors surrounding the salient topic of factors driving tourist expenditure.

[Insert Table 4
here]

These results open important avenues of research for the future. As shown in this investigation, characteristics of destinations should be progressively added as important factors explaining the behaviour of tourists, in addition to the profile of the tourist and features of the trip usually employed in this literature. Moreover, as we have seen, all factors explaining the behaviour of tourists could in fact conform one single framework of analysis, where the specialization features of a destination determine, endogenously, the profile of visitors arriving and the trip experience taking place. In this setting, highlighting the own characteristics of the destination and surrounding geographical areas could provide pivotal information to better understand how tourist clusters emerge and develop. Additionally, from a methodological point of view, future developments of the research include using new methods of estimation, like hierarchical models, allowing to take advantage of both the individual and territorial characteristics of data. The present paper represents a first step to introduce spatial econometric techniques in the study of tourist behaviour. Accounting for a wider set of variables on destination characteristics in the model is another target in this line of research. These objectives compose our research agenda for the near future.

6. Conclusions and policy recommendations

The present paper has focused on extending the literature and methods of the tourist expenditure analysis. Tourism revenues at destinations hardly rely on tourist expenditures, representing a key resource for many countries in the world, and particularly relevant for southern Mediterranean countries hardly affected by the recent crisis. Improving our understanding of factors influencing the level of expenditure of tourists at destination continues to be hot topic of research nowadays. In this context, the present study has focused on the clustering nature of tourist expenditure across the country geography, with Spain as a case study. Employing data at the municipal level, and building on spatial modelling techniques, the study has highlighted the role played by spatial spillovers emerging from neighbouring destinations in conforming the level of expenditure at a reference destination. Regression results have shown that spatial indirect effects account for 10% of the variance of the average tourist expenditure level at a given destination in the sample.

Global and local indicators of spatial association have also shown the presence of spatial dependence processes in expenditure at destinations, and the existence of important tourism expenditure clusters along the country. In terms of the econometric framework, OLS and three spatially extended models have been applied in estimating the determinants of tourist expenditure. Covariates included a mix of territorially related variables with other traditional variables of the literature. Results have shown the better performance of spatially extended models in terms of goodness of fit and accuracy of the regression estimates. Estimation results of the expenditure spatial models have proven to be in line with findings of the previous literature. Variables regarding the tourist profile and characteristics of the tourist experience, like stay duration, accommodation chosen and origin country, education and income of the tourist, all play a major role in this setting.

Main findings of the investigation have shown that spatial dependence is an important issue in tourist expenditure modelling, and should be accounted for in order to improve the robustness of coefficient estimates in the model and their corresponding level of significance. Clustering behaviour characterises the level of tourist expenditure at destinations in Spain, with seaside and Islands destinations showing the highest level of expenditure in the country. In contrast, inland destinations and territories in the centre of the geography, away from sun and sand product specialization, show lower levels of agglomeration of tourism activities and hence spendings. Spillover or indirect effects arising in the spatial econometric framework have also shown how the clustering process for tourism becomes reinforced by the neighbourhood of major destinations in Spain, for the seaside part of the country, and around the capital, Madrid.

Policy recommendations would be mixing traditional recipes taken from the local and regional policies with those belonging to the tourism policy corpus. Regarding the first set of guidelines, a traditional centre-periphery development model emerges, although in this case the centre would be located in the coastal areas, and the periphery in the centre of the country. Typical recipes of funding transferring schemes from the centre to the periphery would result in a desirable tourist and regional policy, where highly crowded destinations could redistribute arrivals and corresponding expenditure to neighbouring places, and in a wider extent, to less crowded more distant territories. This more balanced pattern of tourism development would require however a global strategy at the country level, including the launching of new tourism products for less developed destinations, and some repositioning policies for highly crowded and mature destinations. In particular, policies focused on increasing tourism expenditure at destinations should focus on the major determinants identified by the model, namely, the length of stay of visitors, the accommodation pattern characterizing the destination, the capacity of attracting long distance visitors with high purchasing power, and tourists with high and mid income levels and upper- secondary and tertiary studies. These could be the marketing targets of LL tourism destinations.

Finally, clustering and spillover effects in tourist expenditure found by the research raise important questions in policy terms. Large destinations and seaside places have shown important agglomeration economies leading to a continued process of growth and development. Taking advantage of these spillover effects for the enlargement of the HH expenditure clusters is a traditional policy pursued by local authorities and Destination Management Organizations. However, such an issue brings a traditional discussion to the forefront. In particular, the debate on the trade-off between the capacity of growth of top destinations, versus their carrying capacity and sustainability related issues. The impact of crowded destinations on the quality of life of the resident population, and on the natural resources where the destination builds on, are no doubt two salient topics of the present literature in tourism research. In any case, the study of all these issues transcends the scope of the present investigation, despite sharing with it the geographical focus of the analysis. At this extent, this becomes another promising field of research where employing the spatial modelling techniques in the tourism research area.

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Tables and Figures

Table 2: Results of the expenditure equation for the OLS and Spatial models (W: $1/d^2$)

	Winv2	VARIABLES	OLS MODEL	SAR MODEL	SEM MODEL	SAC MODEL
		rho		0.132***		0.117**
				[0.000]		[0.030]
		lambda			0.164***	0.028
					[0.002]	[0.724]
Tourist profile	Rest of Europe	perc_EU	-0.157***	-0.161***	-0.163***	-0.162***
			[0.000]	[0.000]	[0.000]	[0.000]
		perc_US_Canada	0.398***	0.399***	0.393***	0.398***
			[0.000]	[0.000]	[0.000]	[0.000]
		perc_Nord_Europe	0.091	0.081	0.068	0.078
			[0.332]	[0.377]	[0.459]	[0.395]
		perc_Rest_of_World	0.355***	0.348***	0.335***	0.346***
			[0.002]	[0.002]	[0.003]	[0.002]
	Low income	perc_high income	0.258***	0.251***	0.264***	0.254***
			[0.000]	[0.000]	[0.000]	[0.000]
		perc_middle income	0.136**	0.128**	0.140**	0.130**
			[0.037]	[0.048]	[0.031]	[0.045]
	Secondary education	perc_tertiary	0.143***	0.139***	0.138***	0.139***
			[0.000]	[0.000]	[0.000]	[0.000]
		perc_primmary	-0.203***	-0.198***	-0.198***	-0.198***
			[0.006]	[0.007]	[0.007]	[0.007]
Trip characteristics		ln_size_party	-0.108***	-0.108***	-0.108***	-0.108***
			[0.000]	[0.000]	[0.000]	[0.000]
		ln_lenth of stay	0.624***	0.621***	0.622***	0.621***
			[0.000]	[0.000]	[0.000]	[0.000]
	Other purpose	perc_leisure	0.086	0.085	0.104	0.089
			[0.225]	[0.223]	[0.137]	[0.207]
		perc_studies	0.189	0.185	0.205	0.189
			[0.151]	[0.154]	[0.113]	[0.147]
		perc_personal	-0.080	-0.074	-0.053	-0.071
			[0.295]	[0.321]	[0.477]	[0.346]
		perc_business	0.296***	0.298***	0.319***	0.302***
			[0.000]	[0.000]	[0.000]	[0.000]
	Other accommodation	perc_hotel	0.580***	0.568***	0.566***	0.568***
			[0.000]	[0.000]	[0.000]	[0.000]
		perc_second-home	0.108**	0.095*	0.090*	0.093*
			[0.028]	[0.051]	[0.064]	[0.055]
		perc_rent apartment	0.539***	0.528***	0.523***	0.527***
			[0.000]	[0.000]	[0.000]	[0.000]
Destination characteristics		ln_tourist index	0.019**	0.019**	0.020**	0.020**
			[0.026]	[0.021]	[0.019]	[0.020]
		ln_tot_population	0.010	0.008	0.009	0.008
			[0.271]	[0.378]	[0.342]	[0.377]
		ccaa2	0.107*	0.127**	0.105	0.125**
			[0.085]	[0.039]	[0.124]	[0.048]
		ccaa3	0.132*	0.124	0.148*	0.127
			[0.097]	[0.115]	[0.098]	[0.113]
		ccaa4	0.129**	0.106*	0.133*	0.109*
			[0.042]	[0.093]	[0.072]	[0.095]
		ccaa5	0.046	0.001	0.048	0.006

	ccaa1		[0.451]	[0.989]	[0.498]	[0.928]
		ccaa6	0.058	0.067	0.056	0.066
			[0.411]	[0.333]	[0.486]	[0.354]
		ccaa7	0.242***	0.252***	0.248***	0.252***
			[0.000]	[0.000]	[0.000]	[0.000]
		ccaa8	-0.062	-0.025	-0.059	-0.028
			[0.176]	[0.596]	[0.252]	[0.561]
		ccaa9	-0.149***	-0.104***	-0.148***	-0.108***
			[0.000]	[0.007]	[0.001]	[0.009]
		ccaa10	-0.020	-0.015	-0.013	-0.015
			[0.615]	[0.699]	[0.785]	[0.716]
		ccaa11	-0.058	-0.016	-0.048	-0.019
			[0.329]	[0.788]	[0.477]	[0.757]
		ccaa12	-0.005	0.007	0.003	0.007
			[0.933]	[0.898]	[0.962]	[0.907]
		ccaa13	0.022	0.039	0.005	0.035
			[0.735]	[0.539]	[0.942]	[0.592]
		ccaa14	0.036	0.036	0.030	0.035
			[0.662]	[0.662]	[0.742]	[0.675]
		ccaa15	0.060	0.100	0.065	0.097
			[0.370]	[0.132]	[0.382]	[0.159]
		ccaa16	-0.034	0.003	-0.034	-0.001
			[0.503]	[0.958]	[0.562]	[0.981]
		ccaa17	0.081	0.106	0.082	0.104
			[0.443]	[0.310]	[0.472]	[0.330]
		Constant	4.674***	3.842***	4.682***	3.932***
			[0.000]	[0.000]	[0.000]	[0.000]
		Observations	1,872	1,872	1,872	1,872
		R-squared	0.635	0.6358	0.6347	0.6358
		Log-Likehood		-1154.992	-1156.657	-1154.944
		AIC		2385.985	2389.315	2387.889
Spatial diagnosis		LM Error (Burridge)	9.686***	8.4650**	10.86***	8.7142**
			0.002	0.0036	0.0010	0.0032
		LM Error (Robust)	0.422	0.4856	8.6984**	1.1873
			0.516	0.4859	0.0032	0.2759
		LM Lag (Anselin)	14.026***	22.52***	56.51***	26.96***
			0.000	0.000	0.000	0.0000
		LM Lag (Robust)	4.762**	14.54***	54.35***	19.43***
			0.029	0.0001	0.000	0.0000
		Wald test of spatial terms		12.26***	9.70***	
				0.0005	0.0018	
		LR test SAR vs OLS		12.74***		
		(H0:Rho=0)		0.0004		
		LR test SEM vs OLS			9.498***	
		(H0:Lambda=0)			0.0021	
		LR test SAC vs OLS				12.6****
		(H0:Rho+Lambda=0)				0.0018

Table 3: Direct and indirect effects in the spatial models of tourist expenditure (W:1/d^2)

SAR MODEL	Direct effects	P>z	Indirect effects	P>z	Total effects	P>z
perc_eu	-.1612834	0.000	-.0241732	0.013	-.1854566	0.000
perc_us_canada	.3991708	0.000	.0598278	0.016	.4589986	0.000
perc_nord_eu	.0814951	0.377	.0122145	0.396	.0937096	0.378
perc_r_world	.3488157	0.002	.0522805	0.028	.4010962	0.002
perc_high	.2518154	0.000	.0377421	0.016	.2895575	0.000
perc_med	.1279795	0.048	.0191816	0.089	.1471611	0.047
perc_sup	.1390302	0.000	.0208379	0.011	.159868	0.000
perc_prim	-.1984832	0.007	-.0297487	0.041	-.2282319	0.007
lsize_gr	-.1076808	0.000	-.0161392	0.007	-.1238201	0.000
ln_days	.6215873	0.000	.0931636	0.002	.7147509	0.000
perc_ocio	.0855086	0.223	.012816	0.252	.0983246	0.223
perc_estudios	.1853783	0.154	.0277845	0.192	.2131629	0.154
perc_personal	-.0743599	0.321	-.0111451	0.348	-.085505	0.322
perc_trabajo	.2980035	0.000	.0446648	0.016	.3426683	0.000
perc_hot	.5692824	0.000	.0853241	0.003	.6546065	0.000
perc_pr_fam	.0946695	0.051	.0141891	0.094	.1088586	0.051
perc_rent	.5283721	0.000	.0791925	0.004	.6075645	0.000
lnind_tur	.0194825	0.021	.00292	0.064	.0224026	0.021
lntot_pop	.0077709	0.378	.0011647	0.390	.0089356	0.377
Indirect effects			**13.03%**			

SAC MODEL winv2	Direct effects	P>z	Indirect effects	P>z	Total effects	P>z
perc_eu	-.1620141	0.000	-.0213071	0.079	-.1833212	0.000
perc_us_canada	.3980501	0.000	.052349	0.085	.4503991	0.000
perc_nord_eu	.0784981	0.395	.0103236	0.437	.0888217	0.396
perc_r_world	.3461701	0.002	.0455261	0.101	.3916962	0.002
perc_high	.2539275	0.000	.0333949	0.078	.2873225	0.000
perc_med	.1298314	0.045	.0170746	0.149	.146906	0.045
perc_sup	.1387618	0.000	.0182491	0.074	.1570108	0.000
perc_prim	-.1983119	0.007	-.0260807	0.113	-.2243926	0.008
lsize_gr	-.1078038	0.000	-.0141777	0.066	-.1219814	0.000
ln_days	.6219123	0.000	.08179	0.053	.7037022	0.000
perc_ocio	.0886912	0.207	.0116641	0.280	.1003553	0.206
perc_estudios	.188796	0.147	.0248293	0.237	.2136253	0.147
perc_personal	-.070607	0.346	-.0092858	0.402	-.0798927	0.348
perc_trabajo	.3018736	0.000	.0397005	0.080	.3415741	0.000
perc_hot	.5684472	0.000	.0747586	0.055	.6432058	0.000
perc_pr_fam	.0932836	0.055	.0122681	0.162	.1055516	0.055
perc_rent	.5272268	0.000	.0693375	0.059	.5965643	0.000
lnind_tur	.019634	0.020	.0025821	0.136	.0222162	0.021
lntot_pop	.0078408	0.377	.0010312	0.409	.008872	0.376
Indirect effects			**11.62%**			

Table 4: Review of the tourism literature on spatial methods and tourist expenditure

Title	Reference	Description	Dependen variable	Modeling strategy
Spatial tourism models				
1. Spatial distribution of tourism supply in Andalusia	Sarrion-Gavilan, D. Benitez-Marquez, D. Mora-Rangel, E. (2015).	The paper uses ESDA tools to study the spatial distribution of the hospitality industry in Andalusia, Spain	Number of establishments and nights of stay	ESDA Analysis
2. Spatial and temporal dynamics of expenditures of international tourism of China	Zhang & Yang (2015)	The paper explores the spatial and temporal dynamics of expenditures of international tourists in China by using spatial statistics techniques	Spatial distribution of international tourism expenditure	LISA scatter map, Moran I, Theil index
3. Spatial analysis of International tourism growth in China's cities	Neelam, and Green (2016)	The paper aims to identify the spatial patterns of international tourism both at the national and regional scale	Total expenditure of foreigners at city destinations in China	LISA Maps OLS regression
4. Tourism spatial spillover effects and urban economic growth	Ma, Hong & and Zhang (2015)	Analysis of spillovers effects in tourism growth at the city level	Real average GDP pc by city (y_{it+1}/y_{it})	Panel data model. Durbin and SAR fixed effects
5. Spatial effects in regional tourism growth	Yang & Fik (2014)	Analysis of spillovers effects in tourism growth at the regional level	Regional tourism growth rates	SAR, SEM and Durbin models
6. Urban livability and tourism development in China: analysis of sustainable development by mean of spatial panel data	Liu, Nijkamp, Huang & Lin(2017)	The paper tests if liveability has a positive influence on tourism development	Level of tourism development of city, and the level or urban livability of cities	Pooled regression, SAR, SEM SAC, DURBIN
7. Different tourists to different destinations. Evidence from spatial interaction models	Marrocu & Paci (2013)	Origin-destination spatial interaction model to study the location of tourists at destinations	Tourist flows, arrivals	Augmented gravity model
Non-Spatial tourism expenditure models				
8. Domestic tourism expenditures: the non-linear effects of length of stay and travel party size	Thrane & Farstad (2011)	Follows a parsimonious approach when modelling tourist expenditure	Tourist expenditure	OLS model
9. Micro-economic determinants of tourist expenditures: a quantile regression approach	Marrocu, Paci & Zara (2015)	The paper studies the distribution of tourist expenditure by segmenting the profile of tourists and good and services chosen	Expenditure per person per day	Quantile regression
10. Low-cost travel and tourism expenditures	Eugenio-Martin, Inchausti-Sintes (2016)	The paper studies the expenditure distribution of low cost travelers	Expenditure at origin and destination per person and per night	SURE models
11. Determinants of tourist expenditure: a review of microeconometric models	Brida & Scuderi (2013)	Review of the econometric approach of the analysis of tourism expenditure at the individual level	Survey analysis	Non-spatial methods included in a review of more than 80 papers
12. Discretionary expenditure and tourism consumption: insights from a choice experiment	Crouch, Oppewal, Huybers, Dolnicar, Louviere & Devinney (2017)	The study analyses how budget restrictions affect the consumption of tourism services	Purpose of the visit	Discrete choice models
13. Students' summer	Thrane (2016)	Factors determining students' length	Lenth of stay	OLS regression

tourism: determinants of length of stay		of stay relying on personal characteristics of students		
14. Place-based attributes and spatial expenditure behavior in tourism	Bernini, C. Cracolic, F. and Nijkamp P. (2017).	Simultaneous analysis of the decision to participate in the tourism market, and the decision to spend money on tourism. Investigate the impact of locational-specific characteristics upon the domestic tourism demand	Tourist expenditure at the level of households	2SLSmodels