Mixed effects of low-cost airlines on tourism in Spain. A dynamic panel data model

Abstract

This article presents an estimate of the impact of low-cost airlines on Spanish tourism during the first decade of the 21st century by means of an analysis of tourist demand, coming from the principal EU-15 member states, in the main Spanish tourist areas, and using a dynamic panel data model. Effects on expenditure and the number of tourists are isolated. As expected, the expansion in low-cost airline activity has had a positive effect on the number of tourists and in their total expenditure, but while the first effect is statistically strongly significant the latter is not as expenditure per tourist decrease for some origin countries and some destination regions. This result is a useful guide to policy makers.

JEL Classification: D12, F14, L11, L83, L93.
Key words: Air Transport, Low Cost Airlines, Tourist demand

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1. Introduction

In the last decade the so-called "low-cost companies" (LCCs) have successfully challenged the firms already established in the market ("network companies"), with a different business model based on lower management and operating costs and lower prices, initially focusing on short-haul routes and the use of smaller planes, secondary airports and more frequent flights, along with a high load factor (Maliaghetti, 2009; Aguiló, Rey et al., 2008; Francis, Humphreys et al., 2007;Casadesus-Masanell and Ricart, 2007;).

Initially started in the US market with Southwest Airlines, the "low-cost company model" has spread all over the world and particularly to Europe, where a group of those companies has grown very rapidly since 1995 - mainly located in the UK and Ireland – with remarkable performers among them being Ryanair, EasyJet and Air Berlin. Compared with its counterparts in the U.S., European companies exhibit a more aggressive direct sales approach (Francis, Humphreys et al., 2006).

The LCCs success has been analyzed using different approaches, particularly the business model, the study of pricing techniques and its impact on airports (Francis, Humphreys et al., 2004, 2006; Franke, 2004; Doganis, 2006; Gudmundson, 2004). But there are few works focusing on their effects on economic activity and economic well-being and so on in one of the aspect more directly influenced by them, tourism.

A pioneer analysis can be found in Aguiló, Rey and others (2008) where some interesting hypotheses concerning several effects of LCCs are pointed out, although using the scarce information available in 2005. Here, the odds of mixed effect are suggested, positive on the number of tourists and negative or none on the expenditure by tourist, as the tourists response to cheap fares could be shorter and more frequents flights. Recently, Rey, Myro and Galera (2011) have shown evidence of a strong impact on the number of tourist, but the positive impact on expenditure remains unexplored in spite of being crucial to economic activity and growth.

This paper deals with this last unexplored aspect. By means of a dynamic panel data model for tourism demand, the LCCs effect on the Spanish´s number of tourist, aggregate expenditure and expenditure per tourist are estimated. The panel data used comprises the tourist flows coming from the EU-15 countries towards the six main Spanish tourist regions.

The article is organized as follows. In section two, there is a succinct description of the evolution of tourism and LCC activity in Spain during the present decade. Subsequently, the model to be estimated is presented and the statistical sources of information employed are described along with the econometric methods applied. Finally, the results obtained are presented and some concluding remarks made.

2. Tourism and LCCs in Spain

From 2000 to 2007, the number of tourists entering Spain increased by an annual rate of 3.4%, reaching a record figure of 58.6 million people in 2007. Nevertheless, in 2008 and 2009 this figure has shown a remarkable fall due to the effects of the international financial crisis to start a recovery in 2010. The increasing number of tourists went mainly to Catalonia, which became the top Spanish region by number of entries among the six considered in this study (i.e. Andalusia, Balearic Islands, Canary Islands, Catalonia, Valencia and Madrid) accounting for more than 90% of the total.

Although noticeable, the annual growth in the volume of tourists registered did not follow the pattern of world economic activity, since it was high in 2001 and 2002, years of slow growth and also marked by the 9/11 attacks[7], and on the other hand, became sluggish in the most expansive years, 2006 and 2007, which might have been due to a greater increase in prices in the Spanish market and tougher competition from other emerging countries.

Tourists arriving in Spain come mainly from Europe (around 85%), more specifically from the EU-15 countries and in particular from three of them, Germany, France and the United Kingdom, which account for nearly 60% of the total[8].

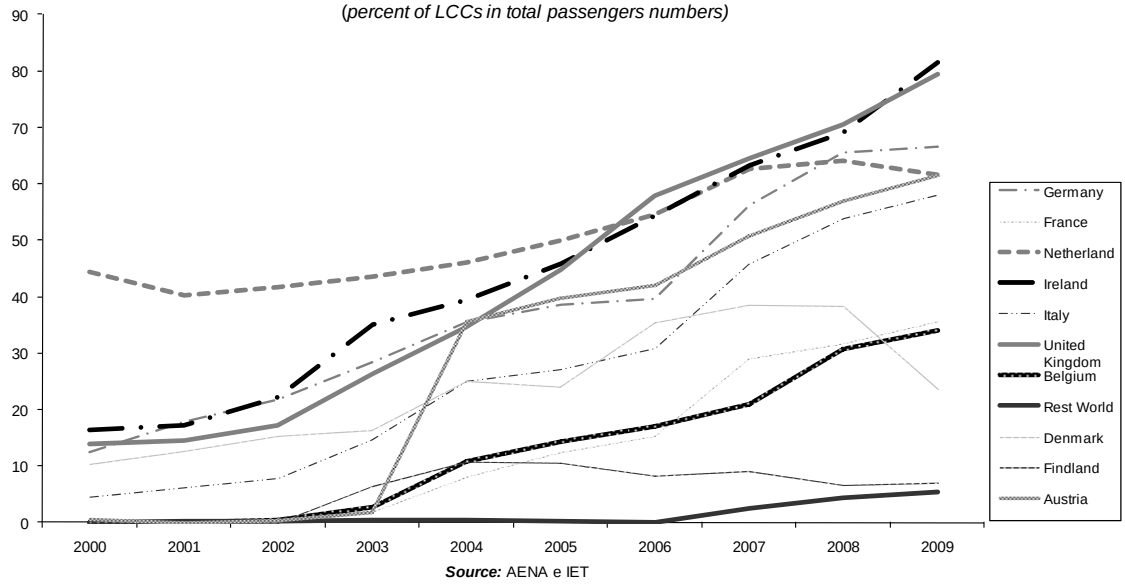
The evolution of tourism as described above must embody the growing influence of low cost airline companies too. Their weight in air traffic between Spain and the tourists' countries of origin of those heading for Spain has shown considerable growth, and currently accounts for more than 50% of that traffic, except for France, Denmark, Finland and the rest of the World (Figure 1)

[7] As a result of these attacks, the people arriving in Spain by air transport decreased in 2002, while the total amount of visitors increased by 3.6%.

[8] Their importance is greater in tourism in the Balearic Islands, Canary Islands and Valencia, and slightly above 50% in Andalusia and Catalonia. It is markedly lower in Madrid.

Figure 1.- ***Importance of LCC passengers arriving in Spain by countries***

(percent of LCCs in total passengers numbers)

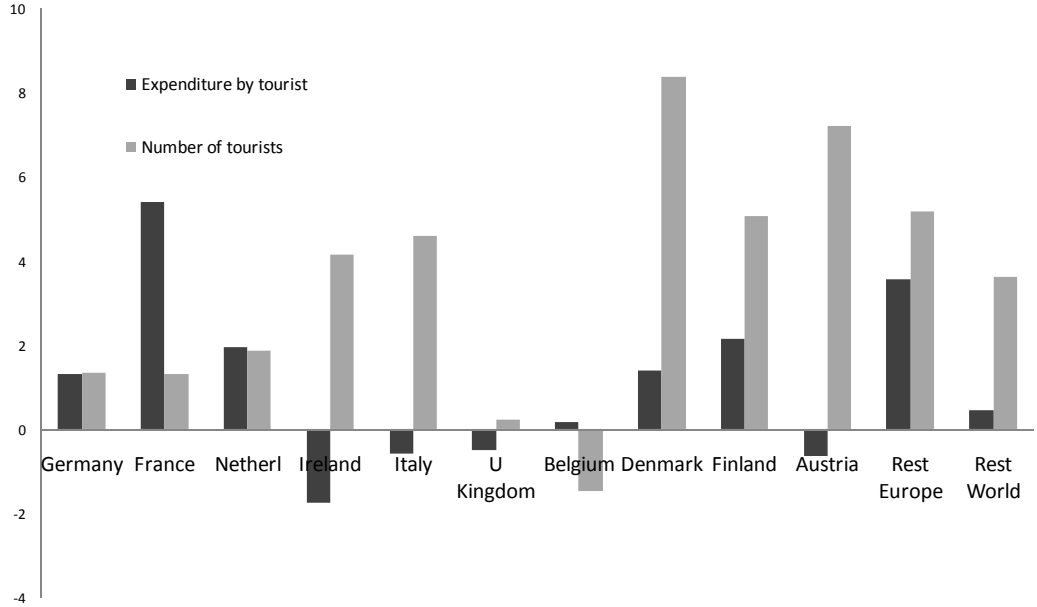


Source: AENA e IET

As can be seen in Figure 2, the arrivals from any of the European countries considered in this study have increased in the last years -apart from 2009 not included in Figure 2 because of the special characteristics of this year- but the expenditures by tourist have decreased for some of them, particularly in those countries of origin in which LCCs have increased their market shares more intensively since 2004 (i.e. Ireland, Italy, UK and Austria). Nevertheless, France and Belgium seem to be the only exceptions to this pattern, perhaps because LCCs market shares have a lower level and the number of tourists arriving by train and road were higher.

Figure 2.- ***Evolution of tourism in Spain***

(rates of change between 2004 and 2008)



Subsequently, the evidence seems to point to a decreasing effect on the expenditure per tourist that could offset the positive effect of an increasing number of tourists on the aggregate expenditure. In the next section, procedures and results of estimates addressed to clarify this hypothesis are exposed.

3. Analysis model and data sources

As in any other type of demand analysis, the amount of tourism consumption in a specific country depends on consumer's income in the countries of origin and the relative prices of travel to the destination place (i.e. Spain) so that the general specification of the econometric model is as follows (Song et al., 2009):

$$TOUR_{i,t} = F(GDP_{i,t}; PRC_{i,t}; X_{i,t}) \quad [1]$$

where $TOUR_{it}$ represents the tourism consumption from country *i* relative to its total population, that can be measured as expenditure (EXP) or as number of tourists (NUMBTOUR) or expenditure by tourist (EXPPT); GDP_{it} is the per capita GDP of the country of tourists origin, PRC_{it} are the relative prices in common currency of the destination country with respect to that of origin and X_{it} is a set of other variables containing additional information regarding prices of this special service which is tourism, such as distance between host and dispatching country, price of transport, volumes of infrastructure of host country, etc.

The expected coefficients are positive for consumer's income and infrastructures in the host country and negative for the relative prices and transport costs, which are often approximated by means of the price of crude oil as air transport fares are not available.

The estimated model in this article follows the econometric steps of the works of Garín-Muñoz (2006, 2007), but it is applied to a set of six Spanish regions, called Autonomous Communities (Comunidades Autónomas), according to their legal status (hereafter CCAA). These six regions account for 90% of tourism originating from the ten EU-15 countries taken (i.e. Austria, Belgium, Denmark, France, Finland, Germany, Ireland, Italy, the Netherlands and the United Kingdom). Moreover, it introduces a variable that measures LCC activity in each of the flows of tourists considered, in order to record its effect. The period covered is from 2004 to 2009 – as data on expenditure by tourist, parsed by origin countries and region of destination, are not available before 2004.

Obviously, the combination of different destination regions with different countries of origin throughout a period of six years makes our approach more complex than those considering merely one destination and several countries of origin or those considering several destinations and only one country of origin.

The final form of the general model [1] to be estimated is as follows:

$$\ln TOUR_{ij,t} = \alpha + \beta_1 \ln GDP_{ij,t} + \beta_2 \ln PRC_{ij,t} + \beta_3 \ln OP_t + \beta_4 \ln LCC_{ij,t} + \beta_5 \ln I_{j,t} + \beta_6 \ln D + \beta_7 \ln GREG_{j,t} + \mu_{ij} + e_{ij,t} \quad [2]$$

where sub indexes refer to the dispatching country *i* and the host region *j* and the variables integrated in $X_{i,t}$ are: OP, the oil price; LCC the percentage of passengers flying with LCCs; I, the infrastructures of the host region; D, the distance in kilometers between the country of origin and the destination region, and GREG the value of the relative per capita income of each region (CCAA) in comparison with the Spanish average. As the variables are expressed in logarithms the coefficients may be interpreted as elasticities.

Below, the chosen form for measuring each of these variables is put forward and their statistical sources mentioned. The dependent variable is measured in three different ways: the number of tourists emanating from each country as a percentage of the latter's population (NUMBERTOUR), their total expenditure also related to the population (EXP), and a measure of individual consumption resulting from the division of total expenditure and the number of tourists emanating from any country with destination to any of the six regions considered (EXPPT). The data on number of arrivals and expenditure by tourist at any CCAA from any country contemplated has been facilitated directly by the Tourism Studies Institute of Spain (Instituto de Estudios Turísticos, IET), the main agency in charge of the data regarding tourism in Spain. Among the explanatory variables, the most important in light of the studies carried out so far, and displayed above, is consumer's income - here approximated by the per capita Gross Domestic Product of each of the countries from which the tourists originate - collected from the World Economic Outlook Database provided by the International Monetary Fund (IMF), measured in Purchasing Power Parity (PPP). As a common practice, the relevant price for tourism is divided into two components. First, there is an index expressing the cost of living of tourists in every CCAA, related to the cost of living in each of the countries of origin adjusted for the exchange rate (the variable PCR). This has been built using harmonized price indexes for every country (also collected from the IMF cited databases) and a relevant index for tourism consumers in every CCAA in Spain. This last index is a simple average of the price indexes for two items; on the one hand, services of domestic transport and restaurants, cafeterias, hotels and other areas on the other hand, both taken from the Spanish National Institute of Statistics (Instituto Nacional de Estadística ,INE). To express such indexes in the same currency, the exchange rates provided by the IMF database have been used only for those of the United Kingdom and Denmark - the countries not belonging to the Euro zone.

Another important component of tourism prices is the cost of travel. However, due to the unavailability of travel cost data, in this study the price of crude oil (OP) is used as a proxy for this variable. The variable I, measuring the level of development of infrastructures, is approximated through the kilometers of high capacity roadways existing in each CCAA obtained from the INE and General Directorate of Roads (Dirección General de Carreteras). Finally, the distance variable, D, is approximated through the kilometers

separating the most important Spanish cities by air within each CCAA (Seville, Manacor, Santa Cruz de Tenerife, Valencia, Barcelona and Madrid) and the European capitals from which tourists originate: Vienna, Brussels, Denmark, Paris, Oslo, Berlin, Dublin, Rome, Amsterdam, London.

In model [2], there are two kinds of individual effects, those of the countries and those of regions, a matrix 10x6 represented by μ_{ij}. Then, there is the error term e_{ijt} which is assumed to be serially uncorrelated with zero mean and independently distributed across countries and regions, but heteroskedasticity across time, countries and regions is allowed for. Moreover, e_{ijt} is assumed to be uncorrelated with the initial condition $TOUR_{it}$, and with the individual effects μ_{ij} for any t.

Such a panel cannot be estimated without any indication to distinguish every country in every region, so a set of dummies has been created to the n-1 regions (i.e. 5 regions) avoiding the trap of the dummies: dccaa_1; dccaa_2; dccaa_3; dccaa_4; dccaa_5, respectively indicating Andalusia, the Balearic Islands, the Canary Islands, Valencia and Madrid. However with this procedure the static fixed effect (FE) model cannot be estimated as these dummies are dropped. So only the random effect (RE) model can be obtained.

After the first static-type estimation, where it is assumed that the vector of the explanatory variables is strictly exogenous, a dynamic-type one was carried out, by introducing the dependent variable among the explanatory ones, lagged one year. In doing this there is a better capture of a phenomenon that shows a clear dynamic, as consumption of tourism depends on previous levels that are gradually moving in conformity with a backing that values reached currently. If past tourism is neglected, the effect of the relevant variables considered will tend to be overestimated, as the coefficients will capture for direct and indirect effects (Garín-Muñoz, 2006).

Nevertheless, when we proceed in that way, not only the FE but the RE estimators become biased and inconsistent (even if the rest of the regressors are assumed to be strictly exogenous), unless the number of time periods is large, tending towards infinity (Garín-Muñoz, 2006). The OLS estimator, which omits both the country-specific effects and the region-specific effects, is also biased if such effects are relevant. One solution to this problem is first to differentiate the model and use lags of the dependent variable as instruments for the lagged dependent variable. The solution given in this study is to use the Balestra estimator (Balestra and Nerlove, 1966) and the one-step and two-step versions of the GMM-DIFF of Arellano and Bond (1991). In the first of them the instruments for the lagged dependent variable are the current and lagged values of the exogenous variables. The GMM-DIFF procedure of Arellano and Bond makes use of the fact that values of the dependent variable lagged two periods or more are valid instruments for the lagged dependent variable. This will generate consistent and efficient estimates of the parameters of interest.

Then the dynamic model to be estimated is as follows:

$$\Delta \ln TOUR_{ij,t} = \beta_1 \Delta \ln TOUR_{ij,t-1} + \beta_2 \Delta \ln GDP_{ij,t} + \beta_3 \Delta \ln PRC_{ij,t} + \beta_4 \Delta \ln OP_t + \beta_5 \Delta \ln LCC_{ij,t} + \beta_6 \Delta \ln I_{j,t} + \beta_8 \Delta \ln GREG_{j,t} + e_{ij,t} \quad [3]$$

where $\Delta \ln TOUR_{ij,t} = \ln TOUR_{ij,t} - \ln TOUR_{ij,t-1}$

and TOUR is measured alternatively as number of tourists from any country with destination to any region as percentage of population in the origin country (NUMBERTOUR), their total expenditure, EXP, and the expenditure by tourist (EXPPT).

4. Empirical results

As reference information, in Table 1 the descriptive statistics of the variables used are presented. It can be seen that there is a considerable variation for most variables except for GDP and relative prices as all the origin countries have high per capita income levels and most of them are integrated in the Euro zone, which makes the evolution of their prices similar.

Table 1.- ***Descriptive statistics: variations over origin countries, destination regions and years for the period of time 2004-2009***

Variable	Mean	SD (OV)	SD (BG)	SD (WG)	Min	Max
LnNUMBERTOUR	2.74	.98	.97	.17	.18	4.73
ln EXP	9.54	.94	.94	.17	7.05	11.67
ln EXPPT	6.80	.21	.20	.07	5.98	7.17
ln GDP	10.44	.11	.08	.06	10.22	10.68
ln PRC	4.73	.08	.07	.05	4.58	5.13
ln GREG	4.62	.18	.18	.01	4.34	4.88
ln D	7.48	.41	.41	0	6.71	8.45
ln OP	4.13	.28	8.05e-07	.28	3.64	4.58
ln LCC	3.20	1.61	1.39	.94	-3.80	4.61

S.D: standard deviation; OV: overall; WG: within groups; BG: between groups

In Table 2 the results from the different estimations performed on the impact of LCCs on the number of tourist are offered. Thus, in the first column those for the RE static model are shown. All the variables have the expected sign, except the price of crude oil, even though it is not significant. Moreover, the variable accounting for the distance it also appears to be not significant. The elasticity of GDP is in line with other previous works, much lower than in a similar estimate referred to the larger period 2000-2009 (Rey, Myro and Galera, 2011). Regarding the variable which is of greatest interest (i.e. LCC) measuring the effect of the activity of this type of companies, it shows the expected sign, indicating that a greater number of tourist travelling with low cost companies has been accompanied with an increase on the total number of tourist. Nevertheless, the coefficient falls short of significance.

It is worth noticing that the explanatory power of the model is very limited, as is to be expected, given the existence of a dynamic structure in the explanation of the dependent variable (i.e. the number of tourists per capita). Also to be considered is the existence of a correlation between the residuals and the explanatory variables, which cannot be eliminated

by means of the estimation of the fixed effects model due to the nature of the panel with two individual types of effects, those coming from different countries and regions.

Table 2. – ***Estimates for the static and the dynamic models of number of tourists per capita, 2004-2009***

Variable	1 RE GLS	2 Balestra	3 AR-Bond 1 step	4 AR-Bond 2 step and additional instruments
lnNUMBERTOUR $_{ij, t-1}$		.978*** (.012)	.462*** (.103)	.553*** (.043)
ln GDPi	1.344*** (.356)	-.019 (.118)	.986*** (.325)	.925*** (.121)
ln PRCij	-.567** (.267)	-.204* (.110)	-.290 (.255)	-.098 (.140)
ln GREGj	4.547*** (.993)	3.321*** (.839)	2.169** (1.121)	1.294** (.545)
ln OPi	.092 (.071)	.120*** (.043)	.060 (.051)	.067*** (.017)
ln Dj	-.499 (.369)	.052 (.033)		
ln LCCij	.007 (.010)	.012** (.006)	.026*** (.009)	.030*** (.007)
D_ccaa1	1.643*** (.566)	1.334*** (.356)		
D_ccaa2	-.213 (.353)	.181*** (.062)		
D_ccaa3	.193 (.439)	.812*** (.222)		
D_ccaa4	1.448*** (.562)	.806*** (.237)		
D_ccaa5	-1.720*** (.377)	-.351*** (.101)		
_cons	-26.467*** (7.420)	-15.470*** (4.574)	-.030*** (.012)	-.045*** (.006)
R^2	0.30	0.98		
Sargan (d.f.)			83.19 (32)	40.10 (32)
M1			-3.47	-3.47
M2			2.41	2.12
Wald test	88.20 (11)	13231.20 (12)	104.84 (6)	509.39 (6)
Numb. Obser.	338	338	321	321
Long run parameters				
ln GDP	1.34		1.83	2.07
ln PRC	-.57			
ln LCC			.05	.07

Dependent variable (ln NUMBERTOURij,t): log of per capita number of tourists from country *i* to region *j* at time *t*. Standard errors in parentheses. All the estimates are obtained using the instruments ln NUMBERTOUR lagged up to two periods in order to reduce

finite sample biases resulting from having too many instruments relative to the cross/sectional sample size. In columns 2.2, 2.3 and 2.4, the variables are first differenced. In all cases, the Wald test denotes the joint significance of the independent variables.
*** Indicates statistical significance at the 1% level.
** Indicates statistical significance at the 5% level.
* Indicates statistical significance at the 10% level.

The introduction of a dynamic model is made through the Balestra estimator and Arellano-Bond stages indicator and the results are recorded in columns 2, 3 and 4 in Table 2. All of them match now those obtained in a previous work (Rey, Myro and Galera, 2011) considering a larger time window (2000-2009). On the one hand, short-term income elasticity stands at slightly below 1 and gives rise to a long-term value around 2. Oil prices continue being non-significant and relative prices cease to be. The relative income per capita of each region is positive and significant, which is indicative of an increase on the number of tourist to regions with large income per capita relative to the national average and perhaps capture for higher quality of equipments and infrastructures. The elasticity of LCCs is positive and improves substantially in Arellano-Bond one-step and two-step estimators, increasing its significance and long run value in the two-step procedure. Taking the most trust estimate of one step, a 10% increase in the percentage of tourists carried by LCCs leads to a short-term 0.26% per capita rise in the number of tourists and a 0.5% long-term rise.

Summarizing, all the estimates show an important and significant influence of LCC companies in the demand for tourism in Spain. Apparently the potential negative effect of increasing oil prices was at least partially offset by growing competition in the air transport market coming from the LCCs that enabled a rapid increase in the number of tourists heading for Spain. Therefore, this last factor together with the rapid economic growth in the EU origin countries and the maintenance of their consumption patterns seem to be key elements in the explanation for the rapid growth of tourism in Spain throughout the present decade.

In Table 3, we present the results of the estimation of equations [2] and [3] in which the endogenous variable ln NUMBERTOURij,t has been replaced by ln EXPij,t, which denotes the natural logarithm of the total expenditure of tourists also taken in per capita terms. In this way, we try to evaluate to what extend the observed increase in the number of tourist coming to Spain, and associated to the activity of LCCs, has been accompanied by an improvement in the total amount of resources spent.

As can be observed in column 1 of Table 3, most of the explanatory variables show the expected sign. Thus, consumer's income measured through the GDP of the countries of origin appears to be positive and highly significant. Likewise, the relative prices are negative and significant at conventional statistical levels.

Table 3. – ***Estimates for the static and the dynamic models of tourists' expenditure, 2004-2009***

Variable	1 RE GLS	2 Balestra	3 AR-Bond 1 step	4 AR-Bond 2 step and additional

				instruments
$lnEXP_{ij, t-1}$		.957***	-.152	-.217*
		(.015)	(.130)	(.120)
ln GDPi	1.437***	.035	1.068***	.850***
	(.356)	(.140)	(.371)	(.282)
ln PRCij	-.821***	-.200	-.564**	-.391*
	(.268)	(.127)	(.288)	(.224)
ln GREGj	2.516***	3.462***	1.554	.447
	(.999)	(1.117)	(1.815)	(2.144)
ln OPi	.064	.135**	.120*	.127***
	(.072)	(.061)	(.068)	(.042)
ln Dj	-.240	.062		
	(.352)	(.041)		
ln LCCij	-.004	.007	.013	.015
	(.010)	(.008)	(.012)	(.014)
D_ccaa1	.960*	1.397***		
	(.557)	(.470)		
D_ccaa2	-.030	.210***		
	(.337)	(.085)		
D_ccaa3	-.213	.833***		
	(.426)	(.296)		
D_ccaa4	1.098**	.865***		
	(.543)	(.317)		
D_ccaa5	-1.377***	-.421***		
	(.361)	(.135)		
_cons	-11.721	-16.489***	-.002	-.015
	(7.404)	(5.956)	(.017)	(.015)
R^2	0.34	0.97		
Sargan (d.f.)			15.26 (9)	7.28 (9)
M1			-0.20	0.53
M2			0.91	1.02
Wald test	85.15 (11)	8103.85 (12)	54.40 (6)	61.53 (6)
Numb. Obser.	338	281	217	271
Long run parameters				
ln GDP	1.44		0,93	.7
ln PRC	-.82		0,50	-.32
ln LCC				

Dependent variable (ln EXPij,t): log of expenditure of tourists from country *i* to region *j* at time *t*; standard errors in parentheses All the estimates are obtained using the instruments ln EXP lagged up to two periods in order to reduce finite sample biases resulting from having too many instruments relative to the cross/sectional sample size. In columns 2.2, 2.3 and 2.4, the variables are first differenced. In all cases, the Wald test denotes the joint significance of the independent variables.

*** Indicates statistical significance at the 1% level.

** Indicates statistical significance at the 5% level.

* Indicates statistical significance at the 10% level.

Furthermore, the relative income per capita of each Spanish region is positive and significant, whilst the oil price, the distance between capitals and the LCCs variable are none of them significant. The latter does not even show always a positive coefficient. Moreover, as it happened in the number of tourists' case, the dummy variables, which refer to regions, are all significant except those for travel to the Balearic and Canary Islands.

The explanatory power of the static model is very limited as the independent variables are able to explain solely a 34% of the variation in the dependent variable. As mentioned above, this static-type estimation assumes that the vector of the explanatory variables is strictly exogenous. Therefore, to capture the dynamic nature of the phenomenon, as the expenditure on tourism depends on previous levels that are gradually moving in conformity with a backing that values reached currently, a dynamic-type estimation has been carried out, by introducing the dependent variable lagged one period (i.e. ln EXPij,t-1) among the explanatory ones.

Accordingly, in column 2 we make use of the Balestra estimator (Balestra and Nerlove, 1966), in which the instruments for the lagged dependent variable are the current and lagged values of the exogenous variables.

As can be observed, the explanatory power of the dynamic-type model increases substantially with respect to the static version. Moreover, the parametric Wald test indicates that the explanatory variables are jointly different from zero and, therefore that the statistical model is significant as a whole.

The lagged value of expenditure appears to be positive and significant supporting the idea of a dynamic process on expenditure determinants. The rest of the variables present the expected sign, except the oil price and the distance in kilometers between capitals, even though the latter is not significant. It is worth mentioning, that the sign on the oil price variable for the period 2004-2009 is positive and significant pointing towards a positive effect on expenditure of increases in the transport costs.

The variable of interest, ln LCC, shows a positive sign indicative of a direct relationship between expenditure and the number of tourist travelling with low cost companies, even though is not significant.

In columns 3 and 4 of Table 3, the one-step and two-step versions of the GMM-DIFF of Arellano and Bond (1991) are estimated. Accordingly, we make use of the fact that values of the dependent variable lagged two periods or more are valid instruments for the lagged dependent variable. Thus, this will generate consistent and efficient estimates of the parameters of interest.

All the variables that do not present time variation, as the distance between capitals and the region dummies, are drop from the estimation. The rest of covariates appear to be significant, except the regressor accounting for the relative income per capita of the

different Spanish regions with respect to the national average and our variable of interest, the effect of LCCs on tourists' expenditure, even though both have a positive sign.

The short run elasticities of GDP and PRC in the more trust one-step estimation are 1,068 and -0.564 respectively, meaning that a 10% increase in the GDP of the tourists' countries of origin gives a short run increase of 1,068% in the expenditure. In the long-run the corresponding elasticities obtained are equal to 0.93 and -0.5.

In brief, in seems that the percentage of passengers flying with LCCs for the period 2004-2009 did not significantly increase the total expenditure of tourists travelling to the Spanish regions considered in this study. This result is in line with the observed evolution of tourist per capita for some countries as presented in Figure 2. Apparently, the positive effect of LCCs on the numbers of tourists would be offset by a negative effect on the expenditure by tourist, even though the latter is not always significant.

In order to better capture what has happened, in Table 4 the results of the estimation regarding the influence of LCCs on the expenditure per tourist are analysed. It is worth noticing that according to the results previously obtained (i.e. a positive and significant impact on the number of tourist and a not significant effect on the total expenditure), a priori we expect a slight negative effect of LCCs activity on the expenditure per tourist.

Thus, in column 1 we present the estimates for the static-type model. The coefficient on the relative cost of living of tourist in every Spanish region with respect to their countries of origin is significant and shows a negative sign indicating that the expenditure per tourist is reduced when the ratio is larger. Moreover, the relative income per capita of the regions of destination it also shortens the expenditure per tourist in a significant way. The distance separating the Spanish cities and the European capitals of the countries of origin appears to be positive and significant in raising the expenditure per capita of tourist travelling to Spain. This fact points towards a positive association between longer distance trips and the expenditure per tourist realized.

The variable of interest, the percentage of passengers flying with LCCs, seems to be significant in determining the expenditure per tourist. Hence, the estimated coefficient equals -0.009, which is indicative of the expected negative effect of this variable on the expenditure per capita of tourist travelling to Spain and can explain why the LCCs effect on total expenditure becomes not significant. Nevertheless, this result has to be taken with caution as the estimated model is not considering the dynamic nature of determination of expenditure per tourist.

Accordingly, in column 2 we introduce a dynamic model through the use of the Balestra's estimator. The use of this estimator increases the model's explanatory capacity, as measured by the R-squared obtained, and shows that the covariates included explain approximately a 90% of the variation on the expenditure per tourist.

Table 4. – ***Estimates for the static and the dynamic models of expenditure per tourist, 2004-2009***

Variable	1 RE GLS	2 Balestra	3 AR-Bond 1 step	4 AR-Bond 2 step and additional instruments
$lnEXPPT_{ij,t-1}$		.666***	.302***	.305***
		(.043)	(.123)	(.098)
ln GDPi	-.150	-.165***	.002	-.009
	(.112)	(.061)	(.230)	(.159)
ln PRCij	-.248***	-.133**	.102	.062
	(.098)	(.060)	(.169)	(.104)
ln GREGj	-2.333***	-1.437***	-3.657***	-2.445**
	(.426)	(.539)	(1.001)	(1.121)
ln OPi	.011	.051*	-.003	.008
	(.027)	(.028)	(.041)	(.032)
ln Dj	.277***	.114***		
	(.046)	(.023)		
ln LCCij	-.009**	-.001	-.002	-.001
	(.004)	(.004)	(.008)	(.005)
D_ccaa1	-.818***	-.559***		
	(.187)	(.226)		
D_ccaa2	.164***	.009		
	(.051)	(.040)		
D_ccaa3	-.490***	-.362***		
	(.121)	(.143)		
D_ccaa4	-.448***	-.351**		
	(.134)	(.151)		
D_ccaa5	.373***	.167***		
	(.065)	(.066)		
_cons	18.409***	10.362***	-.019**	-.012
	(2.714)	(2.939)	(.008)	(.009)
R^2	0.71	0.86		
Sargan (d.f.)			18.92 (9)	10.71 (9)
M1			-3.91	-4.11
M2			0.10	-.09
Wald test	220.36 (11)	1678.05 (12)	21.45 (6)	21.03 (6)
Numb. Obser.	338	281	217	271
Long run parameters				
ln GDP		-.49		
ln PRC	-.25	-.40		
ln LCC	-.01			

Dependent variable (ln EXPPTij,t): log of per capita number of tourists from country *i* to region *j* at time *t*; standard errors in parentheses All the estimates are obtained using the instruments ln EXPPT lagged up to two periods in order to reduce finite sample biases resulting from having too many instruments relative to the cross/sectional sample size. In columns 2.2, 2.3 and 2.4, the variables are first differenced. In all cases, the Wald test denotes the joint significance of the independent variables.

*** Indicates statistical significance at the 1% level.

** Indicates statistical significance at the 5% level.

* Indicates statistical significance at the 10% level.

However, not all the variables report the expected signs. Thus, the GDP of the origin country shows a negative and significant impact on expenditure per tourist.

The introduction of a lagged dependent variable seems to be appropriate as the coefficient on ln EXPPT shows to be positive and significant implying that previous levels of expenditure per tourist are a good indicator of current values. More precisely, it seems that the higher the expenditure per tourist of the previous period the larger the contemporaneous value of the variable.

The relative cost of living, the income per capita of the Spanish regions with respect to the national average and the distance between capitals maintain their signs and continue to be significant. Thus, the greater the relative difference in the cost of living and income per capita of the Spanish regions the lower the expenditure per tourist. Likewise, the larger the distance to be travelled the larger the expenditure per tourist. The LCCs effect keeps its negative sign although loses significance.

With respect to the dummy variables accounting for the regional effects, all of them are significant, except the dummy for the Balearic Islands.

Finally, in columns 3 and 4 we report the results for the estimation of the dynamic model using the one-step and two-step versions of the Arellano and Bond estimator to obtain consistent and efficient estimates of the parameters of interest.

As can be seen, with this procedure only the parameters accompanying the autoregressive term and the covariate that accounts for the value of the relative per capita income of each Spanish region remain significant. Both of them present the expected sign, and their magnitudes are quite similar in the one-step and two-step procedures, giving an idea of the robustness o the results.

The econometric tests indicate that these last estimates are acceptable as the Sargan test of over-identifying restrictions does not detect any correlation between the instruments and the error terms of the first differences equation. Furthermore, with respect to the validity of the instruments, the Arellano-Bond first and second order serial correlation tests *m1* and *m2* reject the null hypothesis at conventional significance levels.

Summarizing, the estimates show the lack of a significant influence of LCCs in the average expenditure per tourist for the period 2004-2009, even though some of them point to a negative effect as was expected. Therefore, it seems that despite the positive influence of LCCs on the number of tourist coming to Spain, there is a non significant effect on the total expenditure being the main reason a negative, although not always significant, effect on the expenditure per tourist. Accordingly, the strong impact of LCCs on the number of tourists that arrive to Spain is transformed in a positive but very slight effect on their total expenditure because of the reduction in the expenditure by tourist for some countries in some Spanish locations.

Concluding remarks

In the previous pages a study has been carried out regarding tourism in Spain during the present decade and relating it to the expansion of low-cost airlines (LCCs) by a tourism demand model into which a variable has been introduced to measure the percentage influence of LCCs in the volume of airline passenger traffic.

We have worked with data of tourists originating from ten of the EU-15 countries with higher per capita income and six Spanish Autonomous Communities (Comunidades Autónomas, CCAA), which are tourist destinations in Spain and account for 90% of total tourism. Accordingly, a panel data has been drawn up which consists of countries of origin, destination CCAA and years.

In the six-year period we have considered, tourism in Spain, which is one of the world's top countries when measured by the number of visitors, has undergone a noticeable expansion, despite the vigorous emergence of competing countries, several of them in Central and Eastern Europe. This expansion has been halted in 2008 with the outbreak of the international financial crisis.

Throughout the decade, low-cost airlines, led by EasyJet, Ryanair and Air Berlin, have developed remarkably, and in 2009 accounted for slightly more than 50 percent of air passenger traffic to Spain coming from EU-15 countries. It seems that undoubtedly this expansion must be tourism-related.

By estimating the tourism demand function for 2004-2009, the LCCs reveal to have positively and strongly influenced the number of tourist arriving to Spain but only slightly the total expenditure made by them, as the expenditure by tourist decrease for some countries and some locations. This means the destination country is not maximizing the benefits from increasing arrivals of tourists. This result should take policy makers to improve prices and non price competitiveness of the destination places, a true determinant variable, as a way to make longer the average stay of a tourist and increase its expenditure.

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