Inbound international tourism to Canary Islands: a dynamic panel data model

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Abstract

This paper presents a dynamic model of international tourism demand to Canary Islands. The empirical analysis exploits the panel structure of the dataset (for the 15 most important countries of origin of tourists over the period 1992–2002) by a Generalized Method of Moments estimation of a dynamic model taking into account unobserved country-specific effects. The preferred model is the GMM-DIFF proposed by Arellano and Bond, however other models are also shown for comparison. A dynamic model where the lagged dependent variable is included as regressor is used to obtain short-run and long-run elasticities. Problems arising from the non-stationarity of data are dealt with by using a model in first differences. The estimated coefficient for the lagged dependent variable is always significant and may reflect a high degree of consumer loyalty or an important effect of word of mouth in determining demand of international tourism. In brief, the results suggest that tourism demand to Canary Islands must be considered as a luxury good and is highly dependent on the evolution of relative prices and cost of travel between origin and destination country.

Keywords: Dynamic model of tourism demand; GMM estimators; Short and long run elasticities; Consumer fidelity; Word of mouth effect

1. Introduction

The Canarian Archipelago, an autonomous community in the Spanish State and outermost region of the European Union, comprises seven islands (Lanzarote, Fuerteventura, Gran Canaria, Tenerife, La Palma, La Gomera and El Hierro) and six islets which are the tips of a vast volcanic mountain range lying beneath the Atlantic Ocean. It is located to the north west of the African continent, between latitude 27° 37' N–29° 25' N (subtropical position) and longitude 13° 20' N–18° 10' W of Greenwich (see Fig. 1). The Canarian Archipelago is approximately 1000 km from the Spanish mainland coast, and the closest and furthest distances from the African coast are 100 and 500 km, respectively. The combination of the trade winds which regularly hit the Archipelago, a rugged orography and cold sea currents give the islands a unique climate, characterized by gentle year round temperatures ranging from 18 °C in winter to 24 °C in summer.

Tourist attractions are very diverse in the islands. Visitors can enjoy not just the weather and beaches, but also a great variety of natural areas. In fact, the Canary Islands are one of the most extensively protected territories in Europe, with 42% of the land mass falling under some category of park land. Apart from the National Parks of Las Cañadas del Teide (Tenerife), Garajonay (La Gomera), Caldera de Taburiente (La Palma) and Timanfaya (Lanzarote), there are other parks, reserves and sites of scenic and scientific interest.

All these natural features, together with a significant supply of high quality accommodation and touristic services, have contributed to making the Canaries one of the most remarkable tourism destinations in the world, with more than 12 million visitors in 2002.
The volume of visitation in the Canary Islands has made the tourism business the most important determinant for their economic development. In fact, tourism accounts for at least 50% of the GDP (80% according to some authors) of the islands. Under such premises, the study of tourism and a knowledge of the factors influencing tourism demand may be very important for tourism suppliers and policymakers. Furthermore, tourism activity effects go far beyond economics impacts and is important at a social, cultural and environmental level. Social and cultural effects may be emphasized. The annual tourist/resident ratio is 6.7:1. Additionally, this inflow of tourism arriving at a destination with an area of just 7447 square kilometres will obviously have important environmental effects.

Canary Islands is a typical example of ‘sun, sand and sea’ tourism destination. Several author’s predictions are pessimistic for this kind of mass tourism destinations. These predictions are based on the high environmental costs of this kind of tourism and on changes in the preferences of the tourism consumer. In order to eliminate or mitigate the predicted negative effects on tourism, initiatives must be taken for protecting the environment and adjusting the supply to the requirements of the new tourist. The Canary Islands Government has taken the first step by laying down a protectionist measure, namely a tourism moratorium, limiting the construction of new accommodation units.

However, in this paper we will show that empirical data for the case of Canary Islands do not reflect a decline of the destination. In fact, during the period 1992–2002 the total number of tourists rose by an accumulative yearly average of 5%. When analysing the answers to the Survey on Tourist Expenditure in the Canary Islands conducted by ISTAC (Instituto de Estadísticas de Canarias), it seems fairly clear that visitor’s experience at the destination continue to be highly satisfactory. Related to this good impression, answers to the survey show that 94.1% of visitors intend revisiting the islands, and 96.9% declare their intention of recommending the destination to family and friends. Similarly 35% of visitors state they spent their last vacations on the islands. These results can only be explained by one of the following interpretations: (1) The consumer preferences for the destination did not change; or (2) Political strategies have been successful in satisfying the new requirements of the consumers.

Given the importance of understanding the tourism sector and in particular the demand of tourism at a time when serious doubts exist about its evolution, this paper concentrates on the study of the international tourism, which represented about 82% of the total number of arrivals to Canary Islands in 2002. The paper proceeds as follows. In Section 2, a market analysis is shown, analyses, among other things, the evolution of the number of arrivals, composition by markets of origin, and the seasonality of arrivals. Section 3 discusses the model for explaining tourism demand and justifies the use of a dynamic model. The data sources and the econometric methods used for estimation are also presented in the same section. Section 4 contains the estimation results and their economic interpretation. Conclusions and policy implications of the results are summarized in Section 5.

2. Market analysis

In this section, an exhaustive description of the demand is presented. First, based on data on number of arrivals (AENA, 1992–2002), the volume, composition and evolutionary patterns of inbound foreign
tourism are analysed. Then, based on the answers to the Tourism Expenditure Survey (EGT) conducted by the ISTAC during the period 1998–2002, several other characteristics of tourism are revised. For this survey, tourists were interviewed when departing from the airport at the end of their holiday in the Canary Islands. Questions are about socio-demographic variables, the organization of the holiday, tourist spending, purpose of travel, type of accommodation, degree of satisfaction, intention of repeat visit, and so on.

2.1. Volume, evolution and composition of international tourist arrivals

The measure of tourism used in this paper is number of arrivals (people entering the islands by airports). The data period is 1992–2002. According to this data, tourism growth during the 11 years period rose by an accumulative yearly average of 5%. Fig. 2 shows the evolution of international tourism arrivals during the period. However, the rate of growth was not homogeneous either through the period or from the countries of origin.

Fig. 3 shows the annual rates of growth, and it can be observed that the most significant increase was during 1994 (with a 15.6% increase in the number of arrivals with respect to the year before) followed by the rate of growth of 1998 (with a 10.9% of increase). On the other hand, a negative increase (−3.5%) took place during 2002. The decrease in the number of arrivals during 2002 must not be interpreted as a sign of the beginning of the crisis in this type of tourism destination. On the contrary, this figure is fully in line with the general evolution of tourism in the world as a consequence of the negative effects on tourism of the September 11th events. On the other hand, given the weight of the German market on the total number of arrivals to Canary Islands, the economic recession in Germany may be another reason for explaining the negative evolution of the sector during 2002.

Fig. 4 reveals the differences across countries in the evolution of demand. The most positive evolution of tourism arrivals corresponds to Ireland with a cumulative yearly average rate of growth of 19.2% and at the other end of the ranking is Switzerland with an accumulative yearly average decrease of 3.5%.

When talking about tourism demand, the volume of visitors is not only important but also how these visitors are distributed throughout the year. In this sense, Canary Islands is a privileged destination in terms of seasonality. Demand is fairly homogeneously distributed throughout the year, probably because one of the most important motivations of tourists is weather, and the weather is quite uniform through the year. Contrary to what happens in other places, winter is the high season. In fact, according to data for 2002, most of the arrivals were during the month of March. During the winter season, there are not many short-haul substitutes for the European sun, sand and sea tourist. When analysing the monthly profile of tourism by countries of origin, it may be observed that tourism from Scandinavian and North European countries is
highly concentrated during the winter season. On the contrary, tourism from Mediterranean countries tends to be concentrated during the summer season. Thus, diversification of tourism can help not only to diversify risks but also to smooth seasonality. Fig. 5 shows the monthly profile of arrivals during 2002.

Canary Islands inbound tourism market is diverse, with arrivals from United Kingdom and Germany dominating the market. In fact, international arrivals are highly concentrated. According to 2002 data, 90% of the arrivals are generated in six European countries: UK (40%), Germany (27%), Holland (5%), Sweden
At the beginning of the period, Germany was the most important market of origin of visitors. However, after 1997, arrivals from the United Kingdom surpass the number of arrivals from Germany. Fig. 7 shows the volume and evolution of the six most important markets.

2.2. Some important characteristics of inbound tourist arrivals

Most of the overseas tourists (95.9%) arriving in Canary Islands say they come for holiday purposes. These holidaymakers declare that the main reasons for choosing the Canaries are: weather (92%), beaches (47%), beautiful scenery (31%), peace and quiet (21%) and the price (16%). In terms of organization of the travel, the EGT (Encuesta del Gasto Turístico, 2002) conducted by ISTAC reveals that a 63% of all foreign tourists visiting the Canary Islands uses the services of some tour operator.

In terms of accommodation, hotels (43%) and rented apartments (45%) represent a very similar share of the total. Also of note are property ownership and time-sharing accommodations, which are increasing from year to year.

Given that the measure of tourism used in this study is number of arrivals, it may be relevant to assess average length of stay and average spending per capita and day. The average length of stay is unusually high in the islands. However, according to data in the EGT, the number of nights has been decreasing during the period 1998–2002 and last year it was 10.85 nights. The average spending per capita and day in 2002 was 102.38 euros (64.69 euros in the origin country and 37.69 in the destination).

3. Model specification and data source

Published studies on tourism demand analysis can be divided into two groups. The first focuses on univariate modelling approaches while the second concentrate on multivariate modelling (econometric) techniques. The univariate forecasting models extrapolate historic trends of tourism demand into the future without considering the underlining causes of the trends. On the other hand multivariate modelling approaches also pay a particular
attention to the factors that influence tourism demand and hence they are more useful than the univariate approach for policy evaluation purposes. However, several studies (Chan, Hui, & Yuen, 1999; Du Preez & Witt, 2003; Kulendran & Witt, 2001; Turner, Kulendran, & Pergat, 1995; Witt, Song, & Louvieris, 2003) compared the forecasting ability of the Box-Jenkins approach to other modelling techniques and found that they generally outperform econometric models.

However, multivariate models may be improved by considering the possibility of a change in consumer preferences. This study considers the dynamic structure of consumer preferences. There are two different ways of doing this. A simple dynamic specification is to include a deterministic trend in the model (Garín-Muñoz, 2004). This specification implies that taste changes would continue unabated even if prices and income remained constant over a long period of time. The other way of handling the dynamic structure of preferences is to consider taste changes as endogenous by including previous consumption in the model (Fujii & Mak, 1981; Witt & Martin, 1987).

This latter approach is the one followed in this study. There are two reasons for the inclusion of previous consumption as an explanatory variable. One reason is that there is less uncertainty associated with holidaying in a country with which you are already familiar compared to travelling to a previously unvisited foreign country. The other is because knowledge about the destination spreads as people talk about their holiday, thereby reducing the uncertainty for potential visitors to that country. Then, in a dynamic model of international tourism demand, the lagged dependent variable must be interpreted as habit formation or as interdependent preferences. Furthermore, if the impact of past tourism is neglected, the effect of the relevant variables considered will tend to be overestimated (as the estimated coefficients will involve direct and indirect effects). Several authors point out that many empirical tourism demand studies suffer from this neglect of the dynamic structure (Morley, 1998).

In the case of international tourism demand to Canary Islands, based on the results of the Survey on Tourism Expenditure (EGT), the inclusion of previous consumption as an explanatory variable is indicated. Answers to the survey reflect, among other things, a high degree of consumer loyalty and also an important effect of word of mouth in determining demand of international tourism. Moreover, the proposed model is based on standard economic theory. The demand for tourism, as for the demand of any other good or service, depends basically on the price of the good and consumer’s income.

The first decision to be made is the selection of the dependent variable. In this case, the dependent variable \( Q_{it} \) is measured by tourist arrivals per capita to Canary Islands from country \( i \) in year \( t \). There are several other ways to measure the volume of tourism, such as the number of people in tourist accommodations (hotels, rented apartments or campgrounds); however the use of these measures does not include a significant number of tourists who arrive in the islands and stay in their own residences or visit family or friends. The data on number of arrivals was obtained from AENA as published by ISTAC (1992–2002). This source includes all the visitors arriving in Canary Islands at any one of its airports.

Because of the special characteristics of tourism, the issue of which price must be included in the study is particularly difficult. For a product like international tourism, price consists of numerous components. The price of goods and services bought in the destination would normally account for a significant portion of the total price. However, other costs including transportation to the destination, travel insurance, opportunity cost of travel time and exchange rates may also be significant and can affect totals. Then a difficult part of any of these studies consists in deciding on an appropriate measure of price. In this study the price of tourism is divided into two components. First, there is an index expressing the cost of living of tourists in Canary Islands relative to the cost of living in each one of the origin countries adjusted by the exchange rate. The defined index will be:

\[
PT_{it} = \frac{TPI_{Canary Islands}}{(CPI_{origin} * ER_{Canary/origin})},
\]

where \( ER_{Canary/origin} \) is the number of monetary units of the destination by each monetary unit of the country of origin of the tourists, and \( TPI_{Canary Islands} \) is an index of prices constructed by taking into account a basket of the goods more representative of tourist consumption.

Data on exchange rates (ER) and consumer price indexes (CPI) for the origin countries were collected from International Financial Statistics Yearbook published by the International Monetary Fund (IMF, 1992–2003). Data on Canary Islands tourist price indexes (TPI) were collected from National Statistics Institute of Spain (INE, 1992–2002).

Another important component of the holiday price is the cost of travel. However, due to the unavailability of travel cost data, in this study the price of crude oil (PCO) is used as a proxy for this variable.

The per capita Gross Domestic Product of each of the countries of origin (\( GDP_{i,n} \)) of tourists is the income variable used in the study and was also collected from the International Financial Statistics Yearbook published by the International Monetary Fund.

Therefore, from a theoretical point of view, the demand of tourism will be a function of: the quantity of tourism demanded during the last period, the cost of living of tourists in the destination, the price of crude oil
(as a proxy for the cost of travel), the consumer’s level of income, and several time dummies included for controlling the special events occurring during the sample period. This relationship may be expressed as follows:

\[ Q_{it} = f(Q_{i,t-1}, PT_{it}, PCO_{it}, GDP_{it}, \text{time dummies}) \]  

(1)

In this study, a panel data set is used consisting of annual data on 15 countries of origin of tourists arriving to Canary Islands during the 11-year period (1992–2002). The use of annual data avoids the problems derived from seasonality. The panel is unbalanced in the sense that there are more observations on some countries than on others. Table 1 shows descriptive statistics for the variation over countries of origin of tourism and time (1992–2002). It is seen that there is considerable variation for most variables. Standard deviations are calculated for the untransformed variables as well as for the within groups (WG), between groups (BG), and first-difference (FD) transformations. As expected, for most variables, the BG variation in the data is considerably larger than the WG variation, which in turn is larger than the FD variation. In order to take advantage of these results, the selected method of estimation must retain part of the between countries variation.

Using a pooled time-series/cross-section data set with the 15 most important markets as the observational unit increases the range of variation of variables because of substantial differences across countries in level of income and socio-demographical characteristics. Also, the utilization of this type of data enables us to have the 15 most important markets as the observational unit for any year.


Table 1
Descriptive statistics: variations over countries of origin and time, 1992–2002

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Min</th>
<th>Max</th>
<th>S.D.</th>
<th>S.D (WG)</th>
<th>S.D. (BG)</th>
<th>S.D. (FD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LnQ</td>
<td>-3962</td>
<td>-7680</td>
<td>-2342</td>
<td>1155</td>
<td>242</td>
<td>1296</td>
<td>121</td>
</tr>
<tr>
<td>LnGDP</td>
<td>10209</td>
<td>8352</td>
<td>10729</td>
<td>485</td>
<td>93</td>
<td>614</td>
<td>26</td>
</tr>
<tr>
<td>LnPT</td>
<td>-2916</td>
<td>-5387</td>
<td>2739</td>
<td>1927</td>
<td>57</td>
<td>1952</td>
<td>51</td>
</tr>
<tr>
<td>LnPCO</td>
<td>624</td>
<td>193</td>
<td>972</td>
<td>196</td>
<td>196</td>
<td>5</td>
<td>257</td>
</tr>
</tbody>
</table>

In Eq. (2), \( \lambda_t + \eta_t + e_{it} \) is the fixed effects decomposition of the error term in which \( \lambda_t \) and \( \eta_t \) are the time and country-specific effects, respectively. The error component where \( e_{it} \) is assumed to be serially uncorrelated with zero mean and independently distributed across countries, but heteroskedasticity across time and countries is allowed for. Moreover, \( e_{it} \) is assumed to be uncorrelated with the initial condition \( Q_{it} \), for \( t = 2, \ldots, T \), and with the individual effects \( \eta_t \) for any \( t \). The two dummy variables \( d_{2001} \) and \( d_{2002} \) were included to capture the influence of the possible effects on tourism of the September 11th events. Each one of these variables takes the value of 1 in the mentioned year for all the countries and 0 otherwise. A positive sign is expected for the coefficients \( \beta_1 \) and \( \beta_4 \), and negative one for the coefficients of \( \beta_2 \), \( \beta_3 \), \( \beta_5 \) and \( \beta_6 \).

When lagged dependent variables are included as regressors, both the within groups (WG) and random effects estimators are 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), see e.g., Baltagi (1995). The OLS estimator which omits the country-specific effects is also biased if these effects are relevant. One solution to this problem is to first difference 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 GMM procedure of Arellano and Bond (1991). This estimator (GMM-DIFF) 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. The dynamic model to be estimated will therefore be:

\[
\Delta \ln Q_{it} = \beta_1 \Delta \ln Q_{i,t-1} + \beta_2 \Delta \ln PT_{it} + \beta_3 \ln PCO_{it} + \beta_4 \ln GDP_{it} + \beta_5 D_{2001} + \beta_6 D_{2002} + \Delta e_{it}
\]

(3)

where \( i = 1, \ldots, N; \ t = 1, \ldots, T; \ \Delta \ln Q_{it} = \ln Q_{it} - \ln Q_{i,t-1} \), and analogously for the other variables.

The advantage of using a dynamic model is that both short-run and long-run elasticities are obtained. A further advantage relates to the fact that data must be differentiated in dynamic panel data models. By differen-
coring data and removing the problem of non-stationarity, this method will provide confidence in the reported coefficients and standard errors.

The GMM-DIFF estimator could be viewed as a simultaneous estimation of a system of equations, one for each year, using different instruments in each equation and restricting the parameters \((\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6)\) to be equal across equations.

4. Estimation results

This section will present the results of the GMM-DIFF estimator and the different tests of model validity. Even when the selected estimator in this study is the GMM-DIFF, for comparison the results of the static model and some other estimators based on the generalised method of moments (GMM), which are consistent for \(N \to \infty\) and \(T\) fixed are also presented.

4.1. Static model

As a starting point, a static version of the model is estimated, i.e., a model without the second term of the right-hand side of Eq. (2). In addition to the standard error component assumptions, it is assumed that the vector of the explanatory variables is strictly exogenous. Eq. (4) shows the estimated values of the within groups estimator (t-values in parentheses).

\[
\ln Q_{it} = -0.66 \ln PT_{it} - 0.13 \ln PCO_{it} + 2.34 \ln GDP_{it} - 0.10 d_{2001} - 0.17 d_{2002} + v_{it}
\]

\[
R^2 = 0.66.
\]  

4.2. Dynamic model

Care must be taken with the estimated parameters from the static model because the non-inclusion of the lagged levels of tourism may result in an overestimation of the parameters. In fact, when last year's volume of tourism is excluded from the explanatory variables of the model, the estimated parameters account for total (direct and indirect) effects. In order to avoid this problem, this subsection describes the estimation of the dynamic model by GMM. The results of the Balestra–Nerlove estimator (Balestra and Nerlove, 1966) and the one-step and two-step versions of the GMM-DIFF of Arellano and Bond are given.

The Balestra–Nerlove estimator is shown in the first column of Table 2. In this case, in a model of fixed effects, the instruments for the lagged dependent variable are the current and lagged values of the exogenous variables. This model is appropriate when all the regressors are strictly exogenous.

Columns 2.2, 2.3 and 2.4 of Table 2 show three different versions of the different GMM estimates of Arellano and Bond. All the estimates are obtained by using the instruments \(\ln Q_{it}\) 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. Columns 2.2 and 2.3 (corresponding to the one-step and one-step robust to heteroskedasticity estimators) differ in terms of the t-ratio. In fact, most of the robust standard errors are higher than those that assume a homoskedastic error term. Column 2.4 contains the two-step GMM estimates. While the two-step estimator should theoretically be preferred, experimental evidence reports problems concerning a downward bias in the estimates of the standard errors. Although in this case both procedures appear to yield very similar outcomes, this study nevertheless follows the recommendations of Arellano and Bond (1991) and use only the one-step results for inferences regarding the coefficients. The two-step results were mainly used to assess the validity of the specification. In this estimator, a critical assumption underlying the estimations is the lack of any second order autocorrelation in the residuals from the first differences. The Arellano and Bond tests for first- and second-order serial correlation (m1 and m2 reported in the bottom lines of the table) do not detect any serial correlation problem in the residuals.

Estimates would be inconsistent if the null hypothesis of no second order serial correlation (m2 test) is rejected at a significant level. In this case, according to the m2 test there is no significant second-order autocorrelation that is the crucial point with respect to the validity of the instruments. Sargan test of overidentifying restrictions (Sargan, 1958), which is based in the two-step estimator, does not indicate correlation between the instruments and the error term of the first differenced equation.

\[\text{ARTICLE IN PRESS}\]
Table 2
Estimation results for the dynamic model 1992–2002

<table>
<thead>
<tr>
<th>Variable</th>
<th>2.1 Balestra–Nerlove</th>
<th>2.2 Arellano–Bond one-step</th>
<th>2.3 Arellano–Bond one-step (robust)</th>
<th>2.4 Arellano–Bond two-step</th>
</tr>
</thead>
<tbody>
<tr>
<td>LnQ_{it−1}</td>
<td>0.63 (3.39)</td>
<td>0.60 (6.30)</td>
<td>0.60 (6.78)</td>
<td>0.65 (5.83)</td>
</tr>
<tr>
<td>LnGDP</td>
<td>0.95 (2.13)</td>
<td>1.17 (3.68)</td>
<td>1.17 (4.25)</td>
<td>0.86 (1.64)</td>
</tr>
<tr>
<td>LnPT</td>
<td>−0.53 (−3.40)</td>
<td>−0.74 (−4.43)</td>
<td>−0.74 (−2.69)</td>
<td>−0.90 (−0.64)</td>
</tr>
<tr>
<td>LnPCO</td>
<td>−0.15 (−3.63)</td>
<td>−0.13 (−4.36)</td>
<td>−0.13 (−3.40)</td>
<td>−0.12 (−6.53)</td>
</tr>
<tr>
<td>D_{2001}</td>
<td>−0.07 (−2.20)</td>
<td>−0.04 (−1.87)</td>
<td>−0.04 (−1.87)</td>
<td>−0.04 (−1.87)</td>
</tr>
<tr>
<td>D_{2002}</td>
<td>−0.11 (−2.87)</td>
<td>−0.07 (−2.67)</td>
<td>−0.07 (−2.67)</td>
<td>−0.07 (−1.82)</td>
</tr>
<tr>
<td>cons.</td>
<td>−12.56 (−2.36)</td>
<td>−0.01 (−1.45)</td>
<td>−0.01 (−1.45)</td>
<td>−0.01 (−1.13)</td>
</tr>
<tr>
<td>m₁</td>
<td>−0.41</td>
<td>−0.64</td>
<td>−0.64</td>
<td>−0.68</td>
</tr>
<tr>
<td>m₂</td>
<td>−1.49</td>
<td>−1.18</td>
<td>−1.18</td>
<td>−1.05</td>
</tr>
<tr>
<td>Sargan (d.f.)</td>
<td>76.52 (16)</td>
<td>—</td>
<td>13.18 (16)</td>
<td></td>
</tr>
<tr>
<td>Wald test</td>
<td>260096.03 (6)</td>
<td>53.30 (6)</td>
<td>76.30 (6)</td>
<td>153.95 (6)</td>
</tr>
<tr>
<td>N. Observations</td>
<td>140</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
</tbody>
</table>

Long run parameters

<table>
<thead>
<tr>
<th>Variable</th>
<th>2.2 Arellano–Bond one-step</th>
<th>2.3 Arellano–Bond one-step (robust)</th>
<th>2.4 Arellano–Bond two-step</th>
</tr>
</thead>
<tbody>
<tr>
<td>LnGDP</td>
<td>2.57</td>
<td>2.92</td>
<td>2.92</td>
</tr>
<tr>
<td>LnPT</td>
<td>−1.43</td>
<td>−1.85</td>
<td>−1.85</td>
</tr>
<tr>
<td>LnPCO</td>
<td>−0.41</td>
<td>−0.22</td>
<td>−0.22</td>
</tr>
</tbody>
</table>

Dependent variable (LnQ_t): log of arrivals per capita. t-ratios in parentheses. All the estimates are obtained using the instruments LnQ_t 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 (Alonso–Borrego & Arellano, 1999). Column 2.1 is a fixed effects model (variables in levels). 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.

The results are very similar in all of the models. In order to interpret these results, it should be noted that the estimated coefficients are short-run demand elasticities. In order to obtain long-run elasticities, some transformations will have to be made. If the long-run equilibrium is assumed, the following expression should be true: lnQ = lnQ_{t−1}; the elasticities then have to be obtained by dividing each of the estimated coefficients by (1−β_t). The long-run parameters are shown at the bottom of Table 2.

The results of Table 2 show that the lagged dependent variable has a significant effect on the demand of inbound tourism in all of the models. This suggests that the word-of-mouth effect and consumer persistence are important features in the demand for Canary Islands tourism. The major implication of this finding for the tourism industry is that provision of high quality services is crucial for attracting new and repeat tourists to the Canary Islands. According to these results, it can also be said that tourism to the Canary Islands is significantly dependent on price, cost of travel and the economic conditions of the origin markets. The negative effects of the international crisis after the terrorist attacks have also been corroborated by the data in the case of the Canary Islands. On the other hand, it should be noted that, except for the income elasticity, short-run elasticities estimated in the dynamic model are very similar to the elasticities obtained by the within groups estimator of the static model (Eq. (4)).

The short-run elasticities to relative prices suggest that tourism arrivals to the Canary Islands are not very responsive to price changes. In fact, according to the estimated value, a 1% increase in prices would lead in the short-run to a 0.66% decrease in the number of arrivals. However, in the long-run, tourism demand to the Canary Islands can be considered as very sensitive to price changes with an estimated value of −1.85. According to this result, care must be taken by the industry in order to maintain or improve price competitiveness. In this respect, there are several competitor destinations that are making major efforts to improve the quality/price relationship of their supply. This is the case of countries like Turkey, Bulgaria, Croatia and Tunisia.

In contrast to other studies of tourism demand, the price of travel is also a significant determinant of tourism demand to the Canary Islands. A possible explanation for this difference may be the large share...
that travel represents in the total expenditure of vacations to the islands. The estimated short- and long-run values of this elasticity are $-0.13$ and $-0.22$, respectively.

The results suggest that per capita income of the country of origin is the most important variable for explaining tourism demand to the Canary Islands. The estimated short- and long-run values of this elasticity are $1.17$ and $2.92$. An income elasticity greater than one would indicate that tourism demand is a luxury good for the consumers. As a result of this finding, it can be considered that the number of tourists arrivals and, consequently, industry revenues are very dependent on the economic situation of the main markets of origin of this tourism. That would explain the decreasing number of tourist arrivals from Germany during the final years of the sample. In this sense, a good strategy for entrepreneurs and policymakers would be to try to diversify the risk by attracting tourists from other markets.

The dummy variables representing the impact of the terrorist attacks, $d_{2001}$ and $d_{2002}$, have the expected negative signs and both are significant. In fact, after those events, the tourist behaviour of people in general has changed. In the new situation, an increase in domestic tourism (people stay in their own country, visiting friends and family) and a decrease in long-haul destinations (reachable by air) have been observed. The higher absolute value of $d_{2002}$ can be explained because the crisis began at the end of the summer 2001 and only affect the last quarter of the year. Furthermore, people travelling to the islands usually buy their packages several months in advance and this dissuades customers from cancelling their trips.

5. Conclusions and further research

On the basis of an international tourism demand model, a dynamic panel data model has been estimated for Canary Islands. Inclusion of the lagged dependent variable as regressor biases the conventional estimators (OLS and WG). Estimators based on generalised method of moments (GMM), which are consistent for $N \to 4$ and $T$ fixed were used.

The preferred GMM estimator in this case is the GMM-DIFF of Arellano and Bond. Since the model is in differences, the problems stemming from possible non-stationarity are avoided and this method will give us confidence in the reported coefficients and standard errors. The Balestra–Nerlove estimator, which gives values of the parameter estimates very close to ours, is included for comparison. As a starting point, the static version of the model is also included.

The dynamic model used in this study provides short- and long-run elasticities of the variables of interest. This is an additional advantage over most studies of tourism demand, which are based on static models and then only estimate long-run elasticities. This is a substantial improvement, since these causal models are only valid for short-term predictions.

One of the main conclusions of the study is the significant value of the lagged dependent variable ($0.60$), which may be interpreted in terms of high fidelity of consumers to the destination and/or as an important word-of-mouth effect on consumers decision in favour of this destination. Similar values have been obtained in previous studies on the case of Spain (Garin-Munoz & Perez-Amaral, 2000). The policy implication of this result is that, in order to attract more tourists to the Canary Islands, the suppliers of tourism products/services should improve their service quality and upgrade the brand image.

The estimated values of the income elasticity are in line with the results of previous studies. The results from all alternative models suggest that the economic conditions of the country of origin are the most important factor in determining tourism demand. Therefore, it is important for policymakers to closely monitor the economic cycles in the major source markets. In order to improve the model results, it would be advisable to include some measure of income distribution. Obviously, people from countries with a similar average per capita GDP may behave in very different ways depending on the degree of concentration of that average. The cost of tourism in the Canary Islands is also an important factor in determining tourism demand. According to the selected model, the estimated short-run elasticity is $-0.74$ and long-run elasticity $-1.85$. Thus, suppliers must be careful with prices in order to maintain the competitiveness of their products.

Tourism to the Canary Islands is also very sensitive to the costs of travel. The reason may be that the cost of travel accounts for a significant share of the total costs of the vacation.

Finally, just as in other studies, external shocks (e.g., political instability) may have an impact on tourism demand. For instance, in situations of political instability people tend to substitute long-haul by short-haul destinations, and destinations accessible by car are preferred to destinations involving air travel.

The results (estimated elasticities) obtained for the case of the Canary Islands may be representative of holiday destinations in general, given that most tourism to the islands is essentially vacation tourism. This kind of tourism is very sensitive to price and income variations (on the contrary, business tourism is less sensitive to price and income).

Another way to improve the results would be to include advertising expenditure as another determinant factor. However, this variable has not been included because of lack of data.
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References


