Demand for Tourism in Portugal: A Panel Data Approach

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Demand for Tourism in Portugal: A Panel Data Approach

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Abstract

The tourism activity in Portugal is responsible for about 8% of the national product and employs 10% of the total labour force. In addition, the receipts from tourism contribute substantially in financing the current account deficit of the balance of payments in this country. These are convincing arguments to justify the analysis of the determinants of the demand for tourism in Portugal and might constitute an important guide-line for the policy making institutions.

Empirical studies on this field for Portugal have shown little attention in modelling appropriately the demand function for tourism and identifying the main sources of tourism flows. The majority of studies take into account the demand side determinants of tourism, usually proxied by income and price measurements, and little attention has been given to the supply factors which might influence substantially the tourism performance. Factors such as infrastructures in networks and accommodation capacity in the hosting country have been ignored in such studies. Furthermore, the empirical analysis is mainly concentrated in time-series estimations for separate countries being potential suppliers of tourism and panel data estimations are exceptional.

The purpose of this study is to bring into account the above elements to which little attention has been given in the empirical literature. First, we use a combination of time series and cross sectional data (panel data techniques) to estimate the demand function of tourism in Portugal by considering four main countries as the basic tourism suppliers, Spain, Germany, France and the U.K., responsible for almost 90% of the total tourism inflows in this country. Second, in the demand function we introduce both the demand factors (per capita income, relative prices) and the supply factors (public investment ratio, accommodation capacity) to explain tourism performance in Portugal. Third, dynamic panel data techniques are used to estimate the demand function of tourism, avoiding misspecification errors, estimation inconsistency and overall explaining the adjustment process of tourism flows.

Our empirical analysis shows that per capita income is the most important demand determinant and accommodation capacity the most important supply determinant explaining thus the tourism movement in Portugal. The dynamic panel data estimation highlights the importance of the accommodation capacity as the most important factor in attracting more tourism to Portugal. It is also shown that the adjustment process is slow and given the status quo it is difficult to attract more tourism flows at the above mention countries.

Keywords: Tourism demand, supply and demand determinants, panel data estimation, adjustment mechanism.

JEL Codes: C23, D12, L83.
1. Introduction

Tourism is a sector that involves a multiplicity of economic activities responding to differentiated demands with specific characteristics at the national and international levels. The complexity and interaction of the tourism activities justify its consideration as a special sector that integrates a set of economic activities related mainly to travelling and accommodation services. The combination of demand (travel decision) and supply (accommodation provision) characteristics at the national and international levels creates some difficulties in modelling the tourism activity as a whole. However, the increasing importance of the tourism sector in terms of its contribution to the national product, the employment and the balance of payments creates the need to investigate the determinants of tourism flows within a specific country, and especially for countries with great dependence on this sector, as Portugal.

The tourism activity in Portugal generates about 8% of the gross domestic product, represents 10% of the total employment and contributes decisively to attenuate the current account deficit of the balance of payments. The substantial contribution of tourism in the Portuguese economy justifies the interest in explaining the determinants of tourism demand and, therefore, the factors which influence the decision of tourists to choose this country as a destination place. A better knowledge of the factors that explain the tourist’s preferences to choose Portugal as a destination place will help the policy makers to design more adequate strategies in order to develop farther this sector.

Although the importance of tourism in the Portuguese economy is widely recognised, little attention has been given to explain systematically its determinants. Empirical studies in explaining the international demand of tourism in Portugal are limited and the majority of these studies only consider demand factors (personal income and relative prices) as the main explanatory variables of the tourism demand. The supply factors have been systematically ignored when the demand for tourism equation is estimated. Factors, such as, infrastructure networks and accommodation capacity have not been considered as potential arguments in attracting more tourism inflows. The econometric models mainly used consider cross-section or time series data and rarely a panel data approach.

The purpose of this study is to provide an empirical analysis that contemplates the weaknesses that have been observed with regard the demand function of tourism in Portugal. More specifically, we introduce into the demand function supply factors as well and we adopt a panel data estimation approach which allows for specific country
effects. A dynamic estimation approach is also used to capture the long term tendencies of tourism movements.

The remaining of the paper is organized as follows. Section 2 provides a review of the literature on the demand of tourism explaining the theoretical and empirical aspects. Section 3 explains the specification of the demand function of tourism to estimate and analyses the data. Section 4 presents the results from the panel estimations of the demand function of tourism and discusses policy implication issues. Section 5 estimates the dynamic demand function of tourism and explains the adjustment process of the tourism inflows. The final section concludes.

2. The Demand Function of Tourism. A Literature Review

2.1. How to Define Tourism Demand

According to the literature, the underlying theory that explains the tourist flows between the origin and the destination country is based on the demand function. The product resulting from the demand of tourism is an aggregate amount of the individuals desire to travel within a specific time of period. From the receiving country point of view, tourism demand represents the set of goods and services that the visitors - residents and non residents- acquire during a specific period of time of their permanence.

Song and Witt (2000) define tourism demand as the amount of a set of tourist products that the consumers are willing to acquire during a specific period of time and under certain conditions which are controlled by the explanatory factors used in the demand equation. In these lines, Stucka (2002) reveals that the majority of empirical studies try to model the flows of tourism between the receiving and the supplying countries by specifying a demand function of the type \( Q = f(Y, P) \), where \( Q \) stands for tourist consumption in the receiving country, \( Y \) is income per capita of the supplying country as a measure of its purchasing power capacity and \( P \) is a relative price index to measure price levels between the origin and the destination countries. Some other studies also include a price-substitution effect to compare price levels between different destination places.

The literature review on the econometric modelling of tourism demand shows that there is not any standard measure of tourism flows universally acceptable. In fact, the majority of the empirical studies in this area define international tourism demand by using one of the following measures: the number of foreign visitors crossing the borders; the number of nights spent by visitors from abroad; the receipts originated from
the visitors spending; or the stay-length of tourists visiting a country. None of these measures is fully satisfactory in encompassing all the aspects which characterize the demand for tourism in a specific location.

González and Moral (1995), in a study about the international tourism demand in Spain, refer that one of the main problems in analysing the potentialities of the tourist sector is to find a precise indicator to measure the external demand. Bearing in mind that the demand for tourism is a variable not directly observable it is necessary to find a suitable proxy to represent it. The authors use tourists spending as the dependent variable, defined as the product of three factors: the number of tourists, the length of their stay and the daily average spending. This is a more complete definition than using the number of entrances to express tourism demand. The latter does not take into account the stay-duration and spending behaviour. Cunha (2001) also argues that the number of entrances is not a good approximation to express tourism demand since it ignores one of the most important aspects in this sector: the demand of goods and services that tourists require during their permanence.

Mello and Sinclair (2002), alternatively, use the share of tourism spending of the origin country to other destination countries to study tourism demand in the U.K. The authors argue that this variable captures the consumption behaviour of the tourists and explains the spending component of this economic activity. It is possible to observe an increase in the tourism inflow accompanied by a reduction in spending explained by higher domestic inflation and shorter length of stay. For this reason the expenditure approach is preferable to the inflows approach to study the demand for tourism behaviour from the point of view of the hosting country.

Rodriguez and Ibanez (2001) use the number of visitors lodged in the destination country as the dependent variable to study the demand for tourism in a panel data approach. The choice of this variable to express tourism demand (in comparison with the number of tourist entrances) has the advantage to consider the length of the stay and to exclude tourists that are hosted to family or friends houses.

According to the literature review, the most appropriate variable to be used as the dependent variable in the demand for tourism equation is tourism receipts from the point of view of the receiving country or tourism spending from the point of view of the supplying country (Tse, 1999; Lathiras and Siriopoulos, 1998). However, according to Crouch and Shaw (1992), almost 70% of the studies that estimated tourism demand functions have used the number of visitors (entrances) as the dependent variable (Qui
and Zhand, 1995; Morris, Wilson and Bakalis, 1995; Kulendran, 1996; Akis, 1998). The main reason for this choice has been the unavailability of data on tourism spending.

2.2. Factors that Influence the Demand for Tourism

According to Crouch (1994a) there is a huge number of potential factors explaining tourism demand and the specification of the demand function varies according to the countries or regions used, the time period of the study, the type of the data (time series or panel data) and the nature of tourism (holidays, business trips, visits to family or friends, etc.). The choice of the explanatory variables to be included in the models is sensitive to problems, such as, the degree of freedom loss, data reliability, collinearity problems, omitted variable bias or endogeneity inconsistency.

Cunha (2001) identifies a set of potential determinants that can influence the decision to travel classified into the following categories: socioeconomic factors, such as, income level, relative prices between the origin and the destination places, demography, urbanization and length of the leisure time; technical factors related to easier communications and transport facilities; psychological and cultural factors reflecting personal preferences and the style of life of the potential travellers; and random factors related to unexpected events, like political instability, weather conditions, natural disasters, epidemic diseases, etc.

- The Income Factor

Income (per head) is pointed out as the most important factor to influence the decision of people to travel. It has been shown in the empirical literature that the demand for tourism and the length of staying are directly related to the level of income (level of personal wealth) of the potential travellers and inversely related to the domestic cost of living. Therefore, the purchasing power position of the potential travellers is the dominant factor in explaining tourist flows and the causality is expected to be strong (Crouch, 1994b).

Some different variables have been used to proxy the level of wealth of the sending country: the Gross National Product (Garín-Munoz and Amaral, 2000; Qui and Zhang, 1995) or the Gross Domestic Product (Kulendran and Wilson, 2000; Lathiras and Siriopoulos, 1998) in real or nominal terms but, above all, in per capita terms. Some other studies use the Industrial Production Index (González and Moral, 1995) and the families disposable income as measures of economic wealth. Most studies use the real
per capita income as the most appropriate indicator to measure peoples living standards of the sending country.

According to Witt and Witt (1992) tourism is a luxury good with an expected income elasticity of demand higher than one and this is what normally occurred in most studies. On the other hand, Crouch (1995), in an attempt to review the empirical findings on this subject concludes that income elasticities of the demand for tourism are specific to each country and no generalization can be made about its value.

- The Price Factor
The inclusion of the price variable in the tourism demand function results from some theoretical considerations. Tourism is a consumption good and has its own price differentiated along different competing places of destination. Subject to his income constraint the household of a specific country has to decide first to consume tourist products or other type of consumption goods, specially durables. After his decision made in favour of travelling he chooses the place to visit taking into account (among other factors) the overall cost of his journey, trying to maximize his utility. However, tourist demand does not only depend on its own price but also on the price of other alternative goods and services as well as the general price level of the domestic market. Here we have to distinguish two different situations: from the point of view of the sending country, the increase in domestic price level reduces the purchasing power of the potential travellers and, therefore, their demand for tourism; on the other hand, an increase in the price level of the destination country discourages tourists to move to this place or reallocate their demand to other cheaper competing places. In this context two types of prices have to be considered in the demand function of tourism: the first one is relative price between the receiving and the sending country; the second is relative price between different competing destination places which originates the substitution price effect1.

The relative price variable which is normally used in the demand for tourism function is the ratio of the consumer price indexes between the receiving and the sending countries adjusted by the bilateral exchange rate (Kulendran and Wilson, 2000; Lathiras and Siriopoulos, 1998). In addition, some authors (Turner, Reisinger and Witt, 1

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1 The substitution effect can be twofold: households can choose to travel inside or outside the country they live or to choose between alternative places of destinations.
1998; Lathiras and Siriopoulos, 1998) introduce the same ratio between different competing destinations to count for the price substitution effect.

- Other Factors
In some studies, total population of the sending country is used as an explanatory variable in the demand for tourism function to count for the market size. The rationale behind this variable is that large countries constitute a potential market for supplying tourists and, therefore, more economies to scale can be explored.

A trend variable is also used to capture specific households behaviour, such as, inertia, consumers preferences and habits in this sector. The same variable can also capture cyclical effects, demographic changes in the sending country or supply improvements in the receiving country.

The lagged dependent variable in the tourism demand function is normally included for two reasons: first, to introduce dynamics into the demand function and second, to capture persistence effects of the tourists behaviour. In general, tourists are adverse to risk, preferring to spend holidays in places that are already familiar to them or they had heard something positive about the places they plan to visit (Sinclair and Stabler, 1997).

Witt and Witt (1995) give another possible explanation for the inclusion of an autoregressive term in the demand function of tourism: a certain rigidity from the supply side behaviour. Supply factors related to accommodation capacity, transportation facilities, human capital qualifications and generally the provision of efficient services are long term issues involving structural changes and better reallocation of resources in the sector. Long term or medium term contracts of the operating agencies can be another source of rigidities as Carraro and Manente (1994) point out.

2.3. Specification and Estimation Issues
The empirical literature suggests that the most commonly specifications used for estimating the demand function of tourism are linear and log linear functions. Witt and Witt (1995) in a review article conclude that 75% of the analyzed models used a double-log functional form, 18% a linear specification and the remaining are probit-logit models or semi-log specifications. The preference given to the double log specification is due to more satisfactory estimation results obtained and easy interpretation of the estimated coefficients through the demand elasticities (Kulendran, 1996; Morley, 1994).
There is a wide variety of model estimation techniques applied to the demand function of tourism. Using time series data the problem of no stationary data was recognized, cointegration analysis and ECM estimation techniques were used to ensure long term properties and non spurious causality between the relevant variables. The estimated techniques range from ARIMA and Holt-Winters univariate Modelling (Kim, 1999) to 2SLS and 3SLS (Tse, 1999) and ECM estimation models (Kulendran and Wilson, 2000; Lathiras and Siriopoulos, 1998). On the other hand, panel data estimations are relatively rare in the empirical literature, especially involving dynamics. We want to apply this recent technique to the Portuguese case were empirical studies have not explored yet this alternative methodology.

3. Sample and Model Specification
The purpose of this paper is to study the international demand for tourism in Portugal as a destination place for four main tourism sending countries, Spain, Germany, France and the U.K. which count for about 90% of the total tourist inflows in Portugal. A panel data approach is used to estimate the demand function of tourism in Portugal with respect to its main clients for a period of 25 years (1977-2001). Annual data is preferable in order to avoid seasonality problems which are dominant in this sector.

The empirical analysis follows the approach proposed by Carraro and Manente (1994) where no distinction is made between different travelling motivations. Holidays motivation is assumed to be the principal scope for travelling.

With respect to the theoretical model we assume that the tourism inflows that Portugal receives represent “export receipts” for this country and analogically “import expenses” for the sending country. Accordingly, export receipts (tourism inflows) will depend positively on the purchasing power of the sending (importing) country and negatively on the relative price (expressed in a common currency) between the receiving (exporting) and the sending (importing) countries. In fact, the higher the purchasing power of the sending country the higher the demand for tourism of its citizens; and the higher the price level of the receiving country (relatively to the sending country) the lower the demand for tourism for the receiving country as a destination place. Relative prices have to be expressed in local currency of the receiving country. People that are travelling abroad they concern about the amount of goods and services they can acquire with their own currency in terms of local prices.
Accordingly, the estimated demand function for tourism in Portugal involves the following variables:

- **The Dependent Variable**

We use an expenditure approach to define the demand for tourism in Portugal. We define tourism demand as the share of the expenditures of each sending country to the total expenditures on tourism in the receiving country (Portugal):

$$w_{it} = \frac{\text{Tourism Spendings of the Sending Country}}{\text{Total Tourism Spendings in the Destination Country}}$$

with $i = 1,..,4$ (the four main sending countries, Spain, Germany, France and the U.K.) and $t = 1977,.....,2001$. The source of the data is INE (National Institute of Statistics), Tourism Statistics, several years.

- **Explanatory Variables**

1) **Demand Factors**

As we explained in the theoretical section, the most important factor influencing the decision of households to travel abroad is their real personal income. As a measure of the households wealth we use real per capita income of the sending country defined by the following ratio:

$$Y_{it} = \frac{GDP_{it}}{CPI_{it} \cdot POP_{it}}$$

where, GDP, POP and CPI are Gross Domestic Product, Total Population and Consumer Price Index of the sending country, respectively. The source of the data is OECD (2003), National Accounts.

A second important determinant of the demand for tourism is relative price between the receiving and the sending countries. Relative price is given by the ratio of the price index level of the receiving country (Portugal) and the sending country adjusted by the bilateral exchange rate:

$$P_{it} = \frac{CPI_{it}}{CPI_{it} \cdot EX_{it}}$$

where, CPI_P and CPI_i are the Consumer Price Indexes in Portugal and the sending country, respectively; and $EX_i$ is the real effective exchange rate of the sending country.
with respect to Portugal. The source of the Portuguese data is INE and OECD for the other variables.

2) Supply Factors

Supply conditions from the point of view of the hosting country are important factors in attracting more tourism inflows. Having into consideration the availability of the data, we introduce two main supply measures.

The first is accommodation capacity \( A \) measured by the number of beds available each year to host the tourists who visit Portugal. The data are collected from INE, Tourism Statistics, several years.

The second is a more general supply measure related to infrastructures (airports, roads, railways, hospitals, telecommunications, among others) which we believe may have welfare effects on the daily live of the tourists that visit Portugal. The ratio of public investment to GDP \( (IP) \) is used as a proxy to capture the welfare effects emanated from public infrastructure networks. The data for the public investment ratio in Portugal is collected from the OECD (2003), National Accounts.

Finally, a dummy variable \( (D86) \) is used to capture the effects of the Portuguese integration in the EU. The dummy variable takes the value of one in the years followed the accession to the EEC (since 1986) and zero in the years before the accession. The idea is to check if the border openness with the accession of Portugal in the EEC provoked a higher inflow of tourists into the country.

Having defined the variables to include in the model we are now able to present the full specification of the demand function of tourism in Portugal in a log linear form:

\[
\ln w_{it} = \alpha + \beta_1 \ln Y_{it} + \beta_2 \ln P_{it} + \beta_3 \ln A_i + \beta_4 \ln IP_i + \beta_5 D86_i + u_{it},
\]

where, \( w_{it} \) is the tourism spending ratio in the host country;

\( Y_{it} \) is real per capita income of the sending country;

\( P_{it} \) is relative price between the host and sending countries;

\( A_i \) is accommodation capacity in the host country;

\( IP_i \) is public investment ratio in the host country;

\( D86_i \) is dummy variable to capture the integration effects;

\( u_{it} \) is the stochastic error.
The data are organized in a panel form with \( i = 4 \) and \( t = 25 \) giving a total of 200 observations.

4. Estimation of the Demand Function of Tourism in Portugal

Panel data estimation techniques are used to estimate the demand function of tourism in Portugal. The conjunction of time series and cross sectional data allows for higher degrees of freedom in the estimation process, has the advantage to include specific country effects, gives more data information, reduces the multicolinearity effects and allows for dynamic specification.

Equation (4) is estimated by using the usual panel data estimation methods\(^2\) and the results are reported in Table 1. Column (1) presents the OLS estimation results obtained by pooling the data and column (2) reports the results from the Fixed Effects estimation by using individual dummies for each of the sending country. With this way, differences in structures between the sending countries are captured in the constant term. Column (3) gives the results from the Random Effects estimation by using the GLS method. In this case, differences in structures in the sending countries are assumed to be stochastic and, therefore, they are introduced in the error term. In all methods of estimations the presence of first order serial autocorrelation was detected, for this reason the maximum likelihood method of estimation was used to remove serial autocorrelation and to obtain efficient estimators.

The results obtained from the three alternative methods of estimation do not reveal significant differences. The degree of explanation of the explanatory variables is very satisfactory (\( \bar{R}^2 = 0.95 \)) and the DW statistic indicates absence of serial autocorrelation. In all methods of estimation the per capita income variable (from the demand side) and accommodation capacity (from the supply side) are the only explanatory variables with statistical significance. The income elasticity of the demand for tourism is higher than one, confirming other studies findings that tourism is a luxury good. The relative price variable has the expected negative sign in the Fixed and Random Effects estimations but without statistical significance in all cases. This can be taken as evidence that the relative cost of living between the host and the sending countries is not a determinant factor in the decision of tourists to choose Portugal as the destination place. This is an expected result since the four most important clients of

\(^2\) The estimations have been made by using the econometric program RATS.
Table 1. Estimation of the Demand Function of Tourism in Portugal, 1977-2001

<table>
<thead>
<tr>
<th>Explanatory Variables</th>
<th>(1) Pooled (OLS)</th>
<th>(2) Fixed Effects (LSDV)</th>
<th>(3) Random Effects (GLS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-31.783 (-5.715)*</td>
<td>-33.714 (-5.584)*</td>
<td></td>
</tr>
<tr>
<td>D1</td>
<td></td>
<td>-33.723 (-5.583)*</td>
<td></td>
</tr>
<tr>
<td>D2</td>
<td></td>
<td>-33.542 (-5.419)*</td>
<td></td>
</tr>
<tr>
<td>D3</td>
<td></td>
<td>-34.128 (-5.464)*</td>
<td></td>
</tr>
<tr>
<td>D4</td>
<td></td>
<td>-33.714 (-5.411)*</td>
<td></td>
</tr>
<tr>
<td>lnY</td>
<td>1.307  (2.134)*</td>
<td>1.553</td>
<td>1.536</td>
</tr>
<tr>
<td>lnP</td>
<td>0.004 (-0.028)</td>
<td>-0.018 (-0.104)</td>
<td>-0.010 (-0.060)</td>
</tr>
<tr>
<td>lnA</td>
<td>1.379</td>
<td>1.347</td>
<td>1.340</td>
</tr>
<tr>
<td>lnIP</td>
<td>-0.069 (-0.373)</td>
<td>-0.084 (-0.449)</td>
<td>-0.081 (-0.439)</td>
</tr>
<tr>
<td>D86</td>
<td>0.039</td>
<td>0.046</td>
<td>0.045</td>
</tr>
<tr>
<td>ρ</td>
<td>0.903 (0.442)</td>
<td>0.854</td>
<td>0.858</td>
</tr>
<tr>
<td>( \bar{R}^2 )</td>
<td>0.951</td>
<td>0.951</td>
<td>0.947</td>
</tr>
<tr>
<td>DW</td>
<td>1.845</td>
<td>1.806</td>
<td>1.832</td>
</tr>
</tbody>
</table>

Notes:
OLS is Ordinary Least Squares estimation with pooled data; LSDV is Least Squares Dummy Variable estimation with fixed effects; GLS is Generalized Least Squares estimation with random effects. The values in parentheses are t-ratios. \( \rho \) is the autoregressive parameter. (*) Indicates that the estimated coefficient is statistically significant at the 5% significance level.

Portugal have higher standards of living, so what matters more in their decision to travel is their personal income and not the relative cost of living.
Public investment ratio in the hosting country has not any significance in the demand for tourism in Portugal and carries a wrong negative sign. This shows that tourists care more about their personal accommodation facilities than the welfare gains derived from public services. On the other hand, the dummy variable introduced to capture the consequences of border openness after the accession of Portugal in the EEC shows also no statistical significance but carries the expected positive sign. This is evidence that the four main clients (Spain, Germany, France and the U.K.) are traditionally visiting Portugal for holidays and that the integration of Portugal to the EU did not change their attitude.

Finally, the statistical significance of the individual dummies and the almost equal value of their coefficients show that differences between the four sending countries are significant but influence in a similar way the demand for tourism in Portugal. Therefore, a common constant term can be accepted in the estimated demand equation.

5. Dynamic Estimation of the Demand Function of Tourism in Portugal

The detection of error autocorrelation when estimating equation (4) can be interpreted (according to Hendry’s methodology) as evidence of dynamic misspecification. In order to insert dynamics into the demand function of tourism in Portugal, we introduce a lagged dependent variable as an explanatory factor to capture persistence effects of the tourists’ behaviour. The introduction of a lagged dependent variable also allows to explain the adjustment process of the actual variation in the demand for tourism to its desired level, through the well known partial adjustment principle. The dynamic specification of the demand function for tourism with an autoregressive term takes the following form:

\[
\ln w_{i,t} = \alpha_i + \beta_1 \ln Y_{i,t} + \beta_2 \ln P_{i,t} + \beta_3 \ln A_i + \beta_4 \ln IP_i + \beta_5 D86_i + \beta_6 \ln w_{i,t-1} + u_{i,t},
\]

\[u_{i,t} = \varepsilon_{i,t} + \nu_{i,t}\] (5)

\[3 \text{ The partial adjustment principle admits the following hypothesis: } (\ln w_i - \ln w_{i-1}) = \delta(\ln w_i^* - \ln w_{i-1})\]

which states that the actual variation of the dependent variable \((\ln w_i - \ln w_{i-1})\) is a fraction of the desired variation \((\ln w_i^* - \ln w_{i-1})\) with \(\ln w_i^*\) the desired level (not observable) and \(0 < \delta < 1\) the partial adjustment coefficient, revealing the speed of adjustment: \(\delta \rightarrow 0\) implies \(\ln w_i \rightarrow \ln w_{i-1}\) a slow speed of adjustment (or stagnation) and \(\delta \rightarrow 1\) implies \(\ln w_i \rightarrow \ln w_i^*\) a high speed of adjustment or instantaneous adjustment within the same period.
where, the error term, $u_{it}$, is decomposed into two elements: an individual-specific effect, $\varepsilon_i$, and a random effect, $\nu_{ij}$.

However, with this new dynamic specification (5) we face a statistical problem: the correlation between the lagged dependent variable and the error term $\varepsilon_i$, $	ext{Cov}(\varepsilon_i, \ln w_{it-1}) \neq 0$. Because of this regressor-error correlation the fixed effect (OLS) and random effect (GLS) estimations would not be appropriate since the obtained estimates would be biased and inconsistent, specially in small samples estimations. One way to solve this problem is to use instrumental variables (IV) estimation techniques. Then the problem is to find suitable instruments which are highly correlated with the endogenous regressor but uncorrelated with the individual-specific error term.

Doornik, Arellano and Bond (2002) suggested an alternative method to estimate dynamic panel data models based on the Generalised Method of Moment estimation (GMM) which is a generalisation of the (IV) method of estimation. The idea is to estimate equation (5) by first-differencing all variables (to remove the individual effect) and then use as instruments all the lagged variables used in the model. Doornik et al., (2002) developed a Dynamic Panel Data (DPD) estimation approach in Ox to estimate dynamic panel data models by using the GMM method.

The dynamic specification of the demand function of tourism in Portugal, equation (5), has been estimated by the GMM method by using orthogonal deviations in the variables, as has been suggested by Arellano and Bover (1995). The instrumental variables used in the estimation were all the predetermined variables, two lag periods of the variables $A$ and $IP$, the individual country dummies and the dummy D86. The estimated results obtained are the following:

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4 For more technical details see Greene (2000), chapter 14.
5 The programming procedures to estimate dynamic panel models are available in www.nuff.ox.ac.uk/Users/Doornik/.
6 The orthogonal transformation of the variables consists in defining the difference of each value in relation to the average of future values (at each moment) in a way to remove the individual effect without compromising the orthogonally of the transformed terms of the disturbances, i.e.,

$$x_{it}^* = x_t - \frac{x_{i(t+1)} + \ldots + x_{i(T)}}{T-t} \left( \frac{T-t}{T-t+1} \right)^{\frac{1}{2}}, \quad t = 1, \ldots, T-1.$$  

7 The Sargan test allows to test the validity of the instruments used in the estimation (accepting the null hypothesis means the use of valid instruments).
\[ \ln w_{i,t} = \alpha_i + 0.091 \ln Y_{i,t} - 0.121 \ln P_{i,t} + 0.920 \ln A_i - 0.425 \ln IP_t - 0.003 D_{86} + 0.785 \ln w_{i,t-1} \]

\[t - \text{Stat.} \quad (0.103) \quad (-0.530) \quad (2.06) \quad (-1.45) \quad (-0.129) \quad (11.0)\]

\[\text{Standard Error} = 0.004, \quad \text{RSS} = 0.341, \quad T \cdot N = 88, \quad Sargan Test^7 = 50.03 [1.000]\]

In this dynamic estimation the most significant variable is the lagged dependent variable, suggesting strong adjustment dynamics in the behaviour of tourists coming to Portugal. The short run income elasticity of demand for tourism looses its significance but the accommodation capacity preserves its statistical significance. Therefore, the dynamic estimation of the demand function of tourism in Portugal suggests that accommodation facilities is the most important supply factor influencing the decision of tourists to choose Portugal as the destination place.

The value of the adjustment coefficient\(^8\) (\(\delta = 22\%\)) gives evidence of a rather low adjustment process between the actual variation of the demand for tourism and the desired long-run level. This means that the number of tourists visiting Portugal each year does not differ substantially from the previous years giving evidence of some kind of inertia or rigidity in the tourism inflows. This is an expected result since tourism demand in Portugal is concentrated mainly in four European countries (Spain, Germany, France and the U.K.). The attraction of more tourists from these countries is a hard task without improving the quality of the accommodation capacity. Portugal has to develop new policies to reduce its relative dependence from these four European countries and to explore new markets characterized by higher standards of living.

5. Concluding Remarks

The basis aim of this study was to estimate the demand function of tourism in Portugal with respect to four main tourism suppliers (Spain, Germany, France and the U.K.) that count for 90% of the total tourism inflows in this country. A panel data estimation approach was used to identify the main determinants of the tourism demand in Portugal over the period 1977-2001.

The demand for tourism equation was specified in a way to include both demand and supply factors as the potential determinants in explaining tourism inflows in

\(^8\) From the partial adjustment mechanism \((lw_{i,t}-lw_{i,t-1})=\delta(lw_{i,t}^{*} - lw_{i,t-1})\) we get \(lw_{i,t} = \delta lw_{i,t}^{*} + (1-\delta)lw_{i,t-1}\) and substituting the long-run equilibrium relation \(lw_{i,t}^{*} = b_0 + b_1y_{i,t} + b_2IP_{i,t} + b_3A_i + b_4IP_t + b_5D_{86}\) we derive the short-run model \(lw_{i,t} = b_0 + \delta b_1y_{i,t} + \delta b_2IP_{i,t} + \delta b_3A_i + \delta b_4IP_t + \delta b_5D_{86} + (1-\delta)lw_{i,t-1}\). The coefficient of adjustment \(\delta\) is taken from the estimated coefficient of the lagged dependent variable \(lw_{i,t-1}\).
Portugal. The panel data estimation approach by using a static specification provides evidence that per capita income is the most significant explanatory factor from the demand determinants and accommodation capacity the most significant factor from the supply determinants. The income elasticity of the demand for tourism higher than one confirms the usual finding that tourism is a luxury good. The relative cost of living between the receiving and the sending country and public investment ratio in the hosting country do not influence significantly the decision of tourists to choose Portugal as a place of holidays destination. On the other hand, the border openness due to accession of Portugal in the EEC does not seem to constitute a favourable factor in inducing more tourism inflows into the country.

The dynamic panel data estimation of the demand of tourism function highlights the importance of the accommodation capacity as the main determinant in explaining tourism inflows in Portugal. The adjustment process between the actual and the desired variation in the demand for tourism is shown to be slow reflecting some kind of inertia or rigidity in the tourism movement in Portugal. As a policy recommendation, Portugal has to reinforce the accommodation capacity by providing more qualified services in this sector. In addition, Portugal has to explore alternative markets (countries or regions) characterized by higher standards of living and higher demand for tourism in the international market.
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