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**Documento de trabajo**

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Tourism Flows to Spain**

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No.9815

Septiembre 1998

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## An econometric model for international tourism flows to Spain

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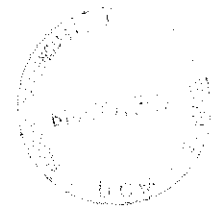
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September 1998



### ABSTRACT

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The purpose of this study is to measure the impact of the economic determinants of the international demand for tourist services in Spain. We use a panel data set of seventeen countries over the period 1985-1995. By using appropriate panel data techniques we estimate the effects of real per capita income, exchange rates, and real prices on the demand for Spanish tourist services. The estimated elasticities are +1.40, +0.50, and -0.30, respectively. The negative effect of the Gulf War is also detected, with a coefficient of -0.15. These results are comparable to previous empirical studies for other countries.

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n.c.: X-53-331938-1

N.E.: 5310296351

## 1. INTRODUCTION

It is difficult to model tourism demand because tourism involves a diverse set of activities. However, for some countries it is important to establish the determinants of the flows of visitors, given the weight of the tourist sector in their economies and the importance of tourism as a source of hard currency. This is the case of Spain, since in 1997 tourism was 10.5% of gross domestic product and the tourist sector represented 9.5% of total employment. Spain was the third country by tourist receipts with 28 billion USD, following the USA with 77 billion and Italy with 30 billion.

These reasons justify the interest in improving the knowledge of the international demand for tourist services in Spain. A better knowledge of the demand for international tourism to Spain would be of assistance to policy makers in planning strategies for this important industry.

However, in contrast with the important role of the tourist sector in the Spanish economy, little attention has been paid to its quantitative analysis. Most of the empirical studies of the international tourism demand in Spain are based upon non-causal forecasting techniques (time series models) in which tourism is analyzed without reference to the factors which might affect its behavior (Almagro, 1979; Padilla, 1988). Even recognizing the usefulness of these methods for short term forecasting (Martin and Witt, 1989), the use of demand models is advisable for estimating elasticities and analyzing the effects of alternative policies and scenarios. There exist a large set of studies of this type: Bakkal, 1991; Loebb, 1982; Summary, 1987; Syriopoulos and Sinclair, 1993; Witt and Martin, 1987. However, for the case of Spain, empirical studies on international tourism demand using econometric models are scarce (Almagro, 1982). And this is the object of the present paper.

The rest of the paper is organized as follows. In Section 2, we present the model and the data. Section 3 contains the empirical results and their interpretation. Finally, Section 4 presents a summary and conclusions.

## 2. THE MODEL AND THE DATA

This study models the foreign demand of tourist services in Spain like the demand for any other good or service from abroad. We use an unbalanced panel data set consisting of 17 routes of tourism over a period of 11 years (1985-1995). The unbalanced panel allows us to have a different number of observations for the different countries. This allows us to incorporate more information than if we had to restrict ourselves to a balanced panel in which all the countries had the same number of years and in the same dates. Annual data are used in order to avoid seasonality problems and due to the availability of some of our data. The list of countries of the sample is shown in Table I of the Appendix.

With respect to the theoretical model, it is well known that the volume of exports (demand from abroad) for any good depends on:

1) The income of the importer country. In fact, the larger the purchasing power of the countries potential demanders, the more likely it is that their citizens can afford to purchase a good or service from abroad, all other thing being equal.

2) The price of the good or service in the exporter country.

3) The exchange rate. People are concerned with the price of the good in terms of its own currency. That price depends not only on the price of the good in the origin country but also on the exchange rate.

4) The transportation costs. One of the components of the final price that consumers have to pay for the product are the transportation costs. One could anticipate that an increase in transportation costs would result in a decline in demand, all other things being equal.

5) The population. It seems reasonable to assume that the larger the population of the potentially demander countries the larger the demand, all other things being equal.

In order to apply the above reasoning to the specific case of the exports of tourist services from Spain, we present the variables which are going to be used as proxies for each of the determinants of the tourism demand as well as for the dependent variable.

For measuring the volume of tourism there exist several alternatives. One is the volume of earnings generated by foreign visitors. A second one is the number of nights spent by visitors from abroad. A third one is the number of foreign visitors. Each of these measures has advantages and disadvantages. If Spain wants to maximize foreign exchange earnings, it could be argued that the relevant variable is the volume of earnings, but data on this variable are not available by country of origin. Among the other two measures of tourism, number of visitors and number of nights, it seems reasonable to choose the number of nights as dependent variable because it takes into account the length of the stay.

The dependent variable in this study will be the number of per capita overnight stays in hotels in Spain by country of origin of tourists. By using the population of each country of origin in the denominator of the dependent variable we implicitly assume a unit elasticity of the volume of tourism to the population. The source

of these data is INE<sup>1</sup> (1995). However, the variable selected as proxy for the dependent variable has some limitations. One is that only a fraction (57.4% during 1994) of the tourists arriving in Spain checks into registered hotels. Another problem with this variable is that it includes all types of tourists (business and recreation)<sup>2</sup> and does not allow us to distinguish the impact of changes in the explanatory variables on each type of travelers.

The level of income in the country of origin is measured by the Gross National Product (GNP). In order to homogenize the values of this variable and make them comparable across countries, the Purchasing Power Parities (PPP) are used. Then, after having all the GNP's of the different countries expressed in US constant dollars of 1990, we divide them by the population of each country and obtain their values in per capita terms.

Another explanatory variable is the price of the tourism services in Spain. The tourism price index elaborated by INE is used. This index is converted into real terms by dividing it by the consumer price index (CPI) of each country. The data source for the GNP, exchange rates and population is International Financial Statistics Yearbook of the IMF (1997). The data on Purchasing Power Parities are from National Accounts of the OECD (1997).

Transportation costs are not included as an explanatory variable in this work due to lack of adequate data<sup>3</sup>. However, a time trend was included in the model to capture the steady decline in transportation costs but came out insignificant. A dummy variable to capture the effect of the Gulf War is called D91.

The log linear<sup>4</sup> model is the following:

$$L TOUR_{it} = \alpha_i + \beta_1 L GNP_{it} + \beta_2 L EX_{it} + \beta_3 L PR_{it} + \beta_4 D91_{it} + u_{it}$$

Where the subindex  $i$  is for countries,  $t$  is for time and  $L$  denotes natural logarithms (log). And:

$L TOUR_{it}$  is the log of the number of nights spent in Spanish hotels by tourists from country  $i$  during year  $t$ . In per capita terms.

$\alpha_i$  a constant term for each country which takes into account the individual specific characteristics of the country as well as possible omitted variables.

$L GNP_{it}$  log of the Gross National Product (in PPP dollars) of country  $i$  during year  $t$ . Expressed in per capita terms.

<sup>1</sup> INE: Instituto Nacional de Estadística; National Statistical Institute.

<sup>2</sup> In 1994, 76% of foreign tourists came to Spain on vacation.

<sup>3</sup> Most studies have eliminated this variable from the analysis for two reasons: (a) it is difficult to obtain accurate data on transportation costs and (b) in those studies where a transportation cost variable was incorporated, insignificant statistical results were obtained. (Gray, 1966; Little, 1980).

<sup>4</sup> In terms of functional form there appears to be agreement that the multiplicative (i.e., log-linear) form is superior to the additive (i.e., linear) form (Crouch, 1994).

$L EX_{it}$  log of the number of pesetas per unit of currency of country  $i$  during year  $t$ .

$L PR_{it}$  log of the price index of tourist services in Spain divided by the CPI of each country.

$D91_{it}$  dummy variable for the Gulf War that takes the value 1 in 1991 and 0 elsewhere.

$u_{it}$  Random error term.

Since the model is in double logs, the estimated coefficients can be considered elasticities (except for the dummy). The expected signs for those coefficients are:

$$\beta_1 > 0, \beta_2 > 0, \beta_3 < 0, \beta_4 < 0$$

### 3. EMPIRICAL RESULTS

In this study we use a panel data set that covers 11 years (1985-1995) for a group of 17 routes of tourism. The utilization of this pooled time-series/cross-sectional data set has several advantages when compared to the use of time series or cross sectional data, such as a larger number of degrees of freedom, reduced multicollinearity, higher precision of the estimates and reduction of omitted variable bias (Hsiao, 1986).

The results obtained with different estimation techniques are presented in Table I. The estimations are performed with TSP and the program DPD, of Arellano and Bond (1988). The results in column (1), correspond to the pooled model estimated by ordinary least squares (OLS) and restrict the coefficients to being the same for each country of origin of tourists. This model thus assumes that all countries react in the same manner after a change in the values of the explanatory variables and that the non-observable individual characteristics,  $\alpha_i$ , are the same for all routes of tourism. This assumption is very restrictive and usually rejected by the data, as in our case.

The coefficients in columns (2) and (3) differ in the assumptions on the non-observable individual effects. In (2), the individual effects are treated as fixed, whereas in (3) they are considered random and form part of the error term. Under the fixed effects assumption, the within groups estimator is the best unbiased estimator of  $\beta$ , while under the random effects hypothesis the most efficient unbiased estimator is the generalized least squares estimator (GLS), provided that the specific individual random effects,  $\alpha_i$ , are uncorrelated with the explanatory variables. When this is not the case, the GLS estimator becomes inconsistent, and one must resort to an estimator which both eliminates the permanent effects and permits consistent estimation of the coefficients of the other regressors.

In this case it is likely that the individual specific effects,  $\alpha_i$ , which capture the effects of the non-observable and omitted variables<sup>5</sup>, are correlated with some of the explanatory variables. Therefore we prefer to use an estimator which eliminates the permanent effects, that is (2) or (4). For choosing between (2) and (3)

<sup>5</sup> For instance, one of the non-observable effects may be the number of employees in the industrial sector, or the education level of the country. And those variables are clearly correlated with GNP.

we have also used the Hausman test as well as the comparison of the predictive abilities of both equations by using 1995 data which are available for several countries. The results indicate a better predictive behavior of the fixed effects model (2) for all the countries.

**Table 1**

Equation of the number of nights spent in Spanish hotels by foreign tourists (in per capita tems): *L TOUR*

| Explanatory variables             | (1)<br>OLS       | (2)<br>Within groups       | (3)<br>GLS       | (4)<br>First differences |
|-----------------------------------|------------------|----------------------------|------------------|--------------------------|
| <i>Constant</i>                   | -0.23<br>(-0.23) |                            | -0.13<br>(-0.15) |                          |
| <i>L GNP</i>                      | 1.55<br>(4.22)   | 1.41<br>(5.84)             | 1.32<br>(5.79)   | 0.97<br>(2.09)           |
| <i>L EX</i>                       | 0.09<br>(1.55)   | 0.50<br>(2.63)             | 0.26<br>(2.09)   | 0.30<br>(1.65)           |
| <i>L PR</i>                       | -0.24<br>(-0.30) | -0.30<br>(-1.71)           | -0.14<br>(-0.94) | 0.09<br>(0.24)           |
| <i>D91</i>                        | -0.24<br>(-0.59) | -0.15<br>(-2.59)           | -0.18<br>(-3.07) | -0.05<br>(-0.80)         |
| Wald test of joint significance   |                  | 50.72<br>$\chi^2$ DF= 4    |                  | 11.33<br>$\chi^2$ DF= 4  |
| Adjusted R <sup>2</sup>           | 0.13             | 0.98                       | 0.10             |                          |
| Significance of indiv. dummies    |                  | 8220.16<br>$\chi^2$ DF= 16 |                  |                          |
| Autocorrelation 1st and 2nd order |                  | 6.82<br>2.11               |                  | -1.17<br>0.57            |

Note: numbers in parentheses are t-ratios. 1985-1995: unbalanced panel with 165 observations

The differences between columns (2) and (4) of Table 1 are due to the different methods used for controlling for the non-observable effects. In (2), the individual effects are eliminated by subtracting from each observation the temporal average corresponding to that country, while in (4), the individual effects are removed by taking first differences.

The two estimation procedures, (2), and (4), have the same objective of estimating the slopes while controlling for the individual non-observable characteristics of each country of origin of tourists. We prefer (2) because it has significant individual coefficients with the right signs, a higher value of the Wald test of joint significance and there is no reason to believe that the data are non-stationary, therefore the need for a difference is not apparent. In fact, the graphs of the dependent as well as the explanatory variables show no sign of integration or cointegration.

After selecting model (2), we comment on the main results. As in most previous empirical studies, income appears to be the single most important determinant of international tourism demand. The estimated income elasticity is +1.41 which is between 1.0 and 2.0, the range found in most empirical studies. This value above unity suggests that foreign travel demand to Spain is a luxury.

The estimated price elasticity is -0.30, significant at the 9% level. This suggests that this demand is price inelastic. The comparison of this result with those of previous studies is not straightforward. The reason is that different studies have used different measures of price and that explains that the estimates of the price elasticities vary considerably.

To explore the possibility that prices have not only an instantaneous effect but also that past prices affect current tourist flows we have estimated the same model adding lagged price as a regressor, which turned out insignificant, suggesting that the impact of prices is confined to the current period. This conclusion is in line with the work of Gray (1982) who concludes that lagged effects are likely to occur only when the considered countries are geographically very distant. However, in the sample used in this study most routes are between countries which are geographically close.

The estimated exchange rate elasticity is +0.50 and statistically significant. The positive sign means that an increase in the amount of pesetas per unit of foreign currency (devaluation of the peseta) will increase the international tourist flows to Spain. Again, empirical research findings have varied considerably. For example, Lin and Sun (1983) found international tourism to Hong Kong to be highly exchange rate elastic. By contrast, Chadee and Mieczkowski (1987) found, in a study of Canadian tourism, that the effect of exchange rates was offset by other factors.

D91 is a dummy variable that we use to capture the effect that the Gulf War between Irak and an alliance of countries led by the US might have had on Spanish tourism. We estimate a coefficient of -0.15 with a t statistic of -2.59, which suggests a significant negative effect on Spanish tourism. The effect of other special events such as the Expo92 in Sevilla and the Olympic Games in Barcelona in 92, was found insignificant.

Finally, some authors have suggested that tourism presents a great deal of inertia, which could be captured by a dynamic model. Accordingly, we have estimated a dynamic version of model (2) with a lagged dependent variable with the following results:

$$L TOUR_{it} = \alpha_i + 0.91 L GNP_{it} + 0.25 L EX_{it} + -0.10 L PR_{it} + -0.09 D91_{it} + 0.56 L TOUR_{it-1} + u_{it}$$

(2.45)            (1.13)            (-0.40)            (-1.91)            (2.40)

The t statistics are below each coefficient in parentheses. This dynamic model was estimated by DPD, using an orthogonal deviations transformation, see Arellano and Bover (1995) and instrumental variables, with instruments: the regressors of model (2), one lag of the regressors, the country dummies and D91.

In this model the lagged dependent variable is significant with a coefficient of 0.56 and a t-statistic of 2.40, suggesting the possible existence of dynamics. The rest of the coefficients lose some significance and should be interpreted now as short run elasticities. The long run elasticities, more comparable to those of the static model (2), would be respectively 2.07, 0.57, -0.24 and -0.21, although three of them are insignificant. The point estimates of the coefficients are not too different from those of the static model, which could be taken as an indication of the robustness of the estimates of the static model. The choice between the static and dynamic

models is clearly favorable to the static model since three of the coefficients of the dynamic model are insignificant. However should the quantity and quality of the data improve, the dynamic model might merit more attention.

#### 4. CONCLUSIONS

The results of this study show that income, price, exchange rate as well as the Gulf War were significant in the determination of international tourist flows to Spain. The estimated values for the static model (2) are: Income elasticity, +1.41; own-price elasticity, -0.30; exchange rate elasticity, +0.50, Gulf War effect, -0.15. All these estimates are in line with the results of previous empirical studies and are not contradicted by the dynamic model, which is estimated with little precision. However, the use of dynamic models looks promising, should the data allow a more efficient estimation.

However, care is required in interpreting such estimates. First, the models presented above must be considered an approximation, since only four explanatory variables (plus the population) have been taken into account. Improvement in the empirical results may be achieved by including other important factors such as income distribution, price of alternative destinations, disposable leisure time, age structure and educational level of the population.

Second, the data used do not discriminate between different motives of the travel (business or recreation) and, as is well known, a model seeking to explain tourist flows to a particular destination will be improved if it considers the type of travel involved. Empirical literature has consistently found lower elasticities for business than for recreational tourism. Then, a possible line of future research will be the estimation of the demand for each of the types of tourism when the data become available.

In any case, when consideration is given to the existence of potential pitfalls, the utilization of the econometric model described above can prove useful in constructing some explanations for long term developments of tourism flows to Spain.

#### APPENDIX

TABLE I: Countries of the sample by their importance as sources of tourism to Spain

|                   |       |              |      |
|-------------------|-------|--------------|------|
| 1. Germany        | 34.45 | 10. Portugal | 1.10 |
| 2. United Kingdom | 28.33 | 11. Japan    | 0.80 |
| 3. France         | 6.67  | 12. Denmark  | 0.75 |
| 4. Italy          | 5.25  | 13. Ireland  | 0.67 |
| 5. Belgium        | 4.90  | 14. Norway   | 0.59 |
| 6. Netherlands    | 4.03  | 15. Canada   | 0.17 |
| 7. United States  | 1.77  | 16. Greece   | 0.17 |
| 8. Switzerland    | 1.50  | 17. Mexico   | 0.16 |
| 9. Sweden         | 1.19  |              |      |

Source: self-constructed. Measure of tourism: percentage of participation of each country in the total number of nights spent in Spanish hotels. The 17 countries of the sample represent 92.50% of the total tourism. The figures correspond to 1994, the last year for which we have data for all countries.

The countries and years of the sample that are missing are the following: 1985 and '86 for Belgium, Canada, Denmark, Greece, Holland, Ireland, Mexico, Norway, US and Sweden, and 1995 for Belgium and Greece.

#### References

- Almagro, J. (1979): "Aplicaciones del enfoque Box-Jenkins a series del turismo español". *Cuadernos económicos del ICE*, vol. 11-12, 53-107.
- Almagro, J. (1982): "Ingresos por turismo: un análisis en un contexto multivariante". *Papeles de Economía Española*, vol. 11, 69-100.
- Arellano, M. and S. Bond (1988) "Dynamic Panel Data Estimation Using DPD. A Guide for Users", Institute for Fiscal Studies, Working Paper 88/15, London.
- Arellano, M. and O. Bover (1995): "Another look at the instrumental variable estimation of error component models". *Journal of Econometrics*, vol. 68, n. 1, 29-51.
- Bakkal, I. (1991): "Characteristics of West German demand for international tourism in the northern Mediterranean region". *Applied Economics*, vol. 23, 295-304.
- Chadee, D. and Z. Mieczkowski (1987): "An empirical analysis of the effects of the exchange rate on Canadian tourism". *Journal of Travel Research*, vol. 26 (1), 13-17.
- Crouch, G. I. (1994): "The study of international tourism demand: A survey of practice". *Journal of Travel Research*, vol. 32 (4), 41-55.
- Esteban, A. (1996): "La demanda turística internacional" in *La actividad turística española en 1994*. Edited by AECIT. Madrid.
- Gray, H. P. (1966): "The demand for international travel by the United States and Canada". *International Economic Review*, vol. 7 (January), 83-92.
- Gray, H. P. (1982): "The contributions of economics to tourism". *Annals of Tourism Research*, vol. 9, 105-125.
- Hsiao, C. (1986): *Analysis of Panel Data*. Cambridge University Press. Cambridge.
- IMF (1997): *International Financial Statistics Yearbook*.
- INE (1995): *Encuesta mensual de Movimiento de Viajeros en Establecimientos Hoteleros*.
- Lin, T. B. and Y. W. Sun (1983): "Hong Kong" in *Tourism in Asia: The economic impact*. Edited by E. A. Pye and T. B. Lin. Singapore: Singapore University Press, 1-100.
- Little, J. S. (1980): "International Travel in the U.S. Balance of Payments". *New England Economic Review*, (May/June), 245-256.
- Loeb, P. D. (1982): "International Travel to the United States: an econometric evaluation". *Annals of Tourism Research*, vol. 9, 7-20.
- Martin, C. A. and S. F. Witt (1989): "Forecasting tourism demand: a comparison of the accuracy of several quantitative methods". *International Journal of Forecasting*, vol. 5, 7-19.
- OECD (1997): *National Accounts*.
- Padilla, R. (1988): "La demanda de servicios turísticos en España". Universidad Complutense de Madrid, PhD Dissertation.
- Syriopoulos, T. C. and M. T. Sinclair (1993): "An econometric study of tourism demand: the AIDS model of US and European tourism in Mediterranean countries". *Applied Economics*, vol. 25, 1541-1552.
- Summary, R. (1987): "Estimation of tourism demand by multivariable regression analysis: evidence from Kenya". *Tourism Management*, december.
- Witt, S. F. and Martin, C. A. (1987): "Econometric models for forecasting international tourism demand". *Journal of Travel Research*, winter.