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The valuation of different island destinations using gravity models

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Abstract

Islands are one of the most important destinations for tourism and leisure. However, islands exhibit different levels of attractiveness in the course of time and comparing with other islands.

The objective of this paper is to analyze this subject for the Archipelago of the Azores, using gravity models. The study aims to understand different performances along time and between islands caused by changes in the travel costs and in the supply side (e.g. number of hotel beds, island of destination, etc.).

The study concludes that the main factors of the tourism of the Azores are the distance to the source countries, the economic product of those countries, the number of beds of each island, the particular characteristics of each island and the competition with other tourist destinations.

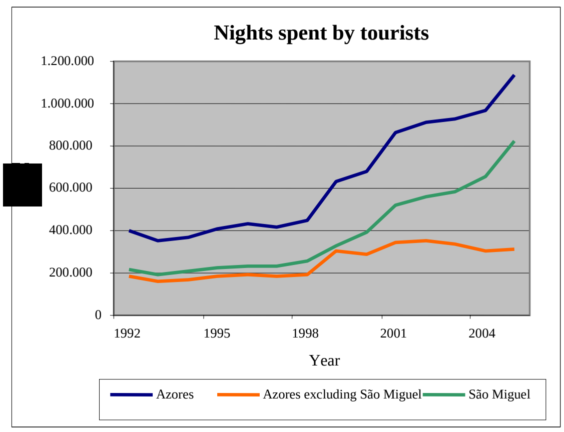
1. Introduction

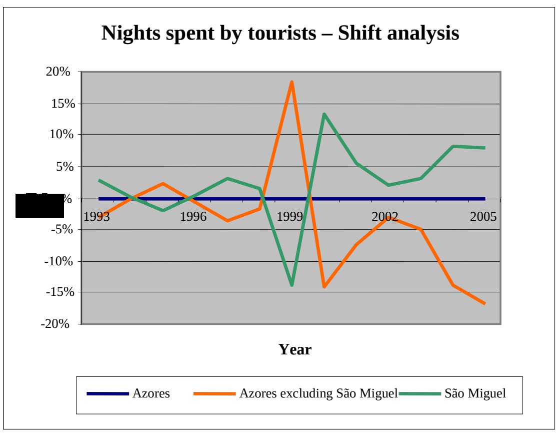
Tourism, materialized as flows of people and goods, is currently a strategic sector for development of societies. At a European and world scale, tourism assumes an importance only exceeded by sectors with decades of globalization, as the financier or the industrial sector (Albino and Perna, 2003).

For the International Scientific Council for Island Development - INSULA (1998), islands are the most representative tourist destination, after the historical cities. According to Baum (1997, cited in Correia, 2002), the attractiveness exerted by island destinations becomes related with factors as the sensation of separation, difference and adventure, and for being faced with calm and small places that provide to the visitors a psychological sensation of domain.

The archipelago of the Azores, mainly after 1999, has registered a significant evolution in the number of tourists, with consistently higher rates of growth then the portuguese average.

However, this general trend hides important asymmetries. In fact, as illustrated in Graphs 1 and 2, it is possible to visualize that the growth of the tourism in the Region is narrowly related with the evolution in the island of São Miguel, being clear the increase of relative competitiveness of this island in the set of the archipelago from 2000 onwards (Graphic 2).

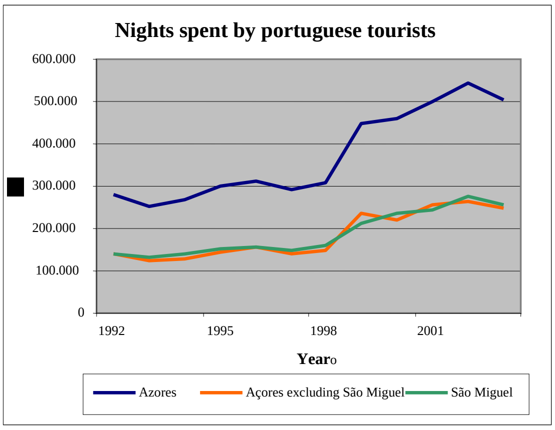


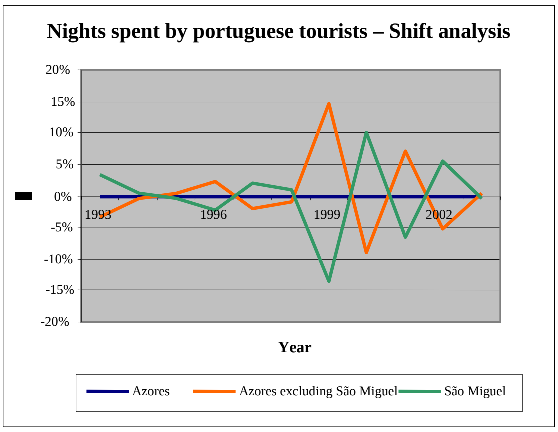


Graphic 1 – Nights spent by tourists in the Azores (1992 – 2005)
Source: SREA

Graphic 2 – Shift analysis

However, removing the analysis tourists with other provenience that is not the Portuguese mainland, it becomes clear that the number of nights spent in São Miguel evolves in parallel with the remaining islands, even after 1999 (Graphics 3 and 4).





Graphic 3 – Nights spent by portuguese tourists in the Azores (1992-2003)
Source: SREA

Graphic 4 – Shift analysis

In this study we intend to evaluate the evolution of the relative attractiveness of the different islands throughout the years, using gravity models. Beyond the introduction and the conclusions, the study is divided in three distinct parts: revision of the literature on the different types of models used to analyse tourist flows (2); description of the model (3); and its application to the islands of the Azores (4).

2. Literature Review

The answer to the questions related with the origin and the destination of tourist flows, and with the respective explicative factors involves some complexity and appeals to different perspectives and approaches. Santos (2004) systemizes explanatory models for tourism in three main groups: theoretical models, statistical models and gravity models. These, in turn, can assume different types that translate various perspectives to analyze and to interpret the tourist phenomena.

Theoretical models are subdivided in:

- Spatial approach theoretical models: those whose main constituent elements are of spatial character. Normally they concentrate its attentions in the relation between origin and destination or in the displacement of tourists between origin and destination;

- Systemic approach theoretical models: those that try to represent the different elements that make up the tourist system, its inter-relations and its relations with the external environment. Normally these models are composed by elements related with the supply side but, in some cases, they also consider elements related to the demand, namely through its interaction with the supply.

Theoretical models (Sirakaya and Woodside, 2005), although consistent and easy to understand, present problems related to the level of precision and practical implementation, being difficult to use them as management instruments.

In turn, the statistical models can assume the following typologies:

- Time series models: they are based on the occurred variations throughout the time. They are sufficiently common in the study of tourism, given the seasonable character of this activity. In this scope we can identify different methodologies as trend projection, univariable structural models, auto-regression and ARMA models (auto-regression and mobile average);
- Causal Models: they try to know the behaviour of the problem studied through its relation with a set of explanatory factors. They can assume the form of a linear or log-linear function. They can be univariable causal models, multivariable causal models, models with qualitative variables, auto-regressive causal models, models of distributed phase displacement and multivariable structural models of time series.

Linear regression model, factor and principal component analysis, and analysis of variance are, in this order, the three most frequently used techniques (Palmer et. al. ,2005). The statistical models are characterized for its precision, convenience and scope in terms of the explanatory factors of tourism. However, they are less consistent in theoretical terms limiting their contribution for the understanding of the dynamics underlying tourism flows.

Finally, the gravity models (Hanink and Stutts, 2002) look for to study the tourism flows origin-destination, assuming as basic hypothesis that the spatial interaction (Tij) between two entities is directly related to the attributes of the origin (Ai) and the destination (Bj) and indirectly related to the distance that separates them F(cij) (Dentinho, 2002):

$$Tij = A(i)\, B(j)\, F(cij)$$

Although the great variety of distance functions, most of these functions of attrition (Crowther and Echenique, 1969) belongs to the same family, whose general formula can be adapted according to the value of the parameters (α, β, θ):

$$F(cij) = cij^{\alpha} \exp(-\beta\, cij^{\theta})$$

José Coelho shows (1983) that theoretical explanations of gravity models can be systemize into three types:

- The statistical interpretation, that deduces that gravity models translates the most likely distribution of the spatial interaction compatible with the origin and destination restrictions;
- The macroeconomic approach, which shows that the gravity model is the result of the maximization of the demand surplus, according the origin and destination restrictions;
- The microeconomic approach, according to which the model of spatial interaction derives from the application of the theory of random utility to the choice of the localization.

Currently, the application of the gravitational models extends to innumerable areas of knowledge, including social sciences, being its success attributed to the simplicity of its mathematical form and the intuitive character of its basis.

According to Santos (2004) the theoretical and statistical models are incapable to provide an ample, clear and precise explanation of tourism flows. On the contrary, gravity models, beyond presenting an easy theoretical and practical approach, present a great adequacy to the problem of tourism.

3. Methodology

The analysis of the problematic mentioned in the introduction is implemented in this study by using to the methodology developed for Allen Wilson (1970). The interaction between an origin i and a destination j as a function of a set of quantitative variables and attributes that constitute the repulsive forces of the origin and the attractiveness of the destination and the attrition associated with the distance between the considered spaces.

$$F_{ijn} = k.O_i^{\beta}.D_j^{\alpha}.\Pi_i[\exp(U_iW_i)].\ \Pi_j[\exp(U_jW_j)].\ \Pi_n[\exp(Y_nV_n.).\exp(-\beta d_{ij})$$

Where:

F_{ijn} – interaction between an origin i and the destination j for the year n;

K – constant of the model;

O_i – repulsive force of the origins;

D_j – attractive force of the destinations;

W_i – dummy variables (0,1) related to the origin with the coefficients U_i;

W_j – dummy variables (0,1) related to the destination with the coefficients U_j;

V_k - dummy variables (0,1) related to the years of the analysis with the coefficients Y_k;

d_{ij} – distance between the origin i and the destination j;

β,α - coefficients of other dependent variables;

Converting the previous function in a logarithmic one, we obtain a model with the log-linear form:

$$\ln F_{ijn} = \ln k + \beta \ln O_i.+ \alpha \ln D_j + \Sigma.\ [U.W_i]+ \Sigma_j\ [U_jW_j]+ \Sigma_n\ [Y_nV_n] - \beta d_{ij}$$

4. Application to the Azorean Islands

The application of the model presented in the previous point to the case of the Islands of the Azores considers a set of stages that we start to describe:

- Identification and definition of the variables considered in the model;
- Gathering of the necessary data for the estimation of the model and respective adaptation to its functional form;
- Estimation of the parameters;
- Statistic analysis of the results;
- Economic analysis of the results.

About the variables, we consider as independent variable the number of guests in the hotel establishments of the Region, constituting dependent variables: the number of beds of the destination, the GDP of the origin at constant prices of 2000, the distance between the origin and the destination and the dummy variables representing the qualitative attributes associated to the origin, the destination and the years. Thus, we have:

$$F_{ijn} = k.O_i^{\beta}.D_j^{\alpha}.\Pi_i[\exp(U_iW_i)].\ \Pi_j[\exp(U_jW_j)].\ \Pi_n[\exp(Y_nV_n.).\exp(-\ \beta d_{ij})$$

Where:

F_{ijn} – number of guests per year for each pair origim/destination;

K – constant of the model;

O_i – GDP value for each origin country;

D_j – number of beds in each destination island;

W_i – dummy variables (0,1) related to the origin country with the coefficients U_i;

W_j – dummy variables (0,1) related to the destination island with the coefficients U_j;

V_k - dummy variables (0,1) related to the years of the analysis with the coefficients Y_k;

d_{ij} – distance between each pair origin/destination;

$U_i, U_j, Y_n, \beta, \alpha$ - coefficients of the independent variables of the model..

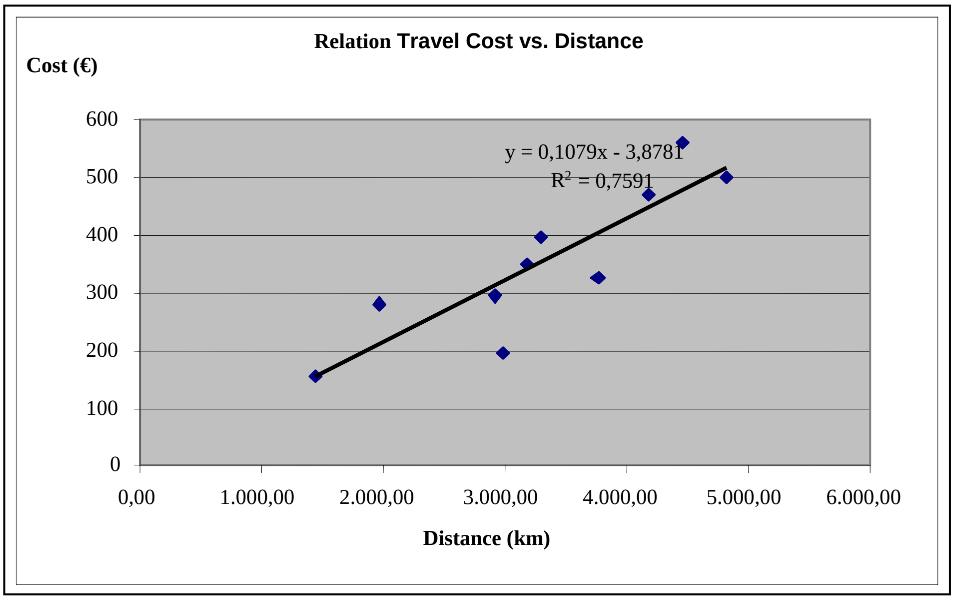
In the analysis we analyse the data from twelve years, beginning in 1992 and ending in 2003. In what concerns the origins, we include in the model the emitting markets discriminated in publications of the Serviço Regional de Estatística dos Açores (SREA): Portugal Mainland, Germany, Belgium, Canada, Spain, United States, France, Holland, United kingdom, Switzerland and Nordic Countries. These countries, in set, have been responsible for 91,75% of the guests in hotel establishments of the Region in 2003. As destinations we consider the nine islands that constitute the Azores archipelago: Santa Maria, São Miguel, Terceira, Graciosa, São Jorge, Pico, Faial, Flores and Corvo.

The number of guests comes from the publications of SREA "Statistical Series 1992-2002" and "Statistical Series 1993-2003". We considered the number of guests in the period 1992-2003 in hotel establishments for each one of the nine islands and with origin in the mentioned countries.

The same publications contain the number of beds in each island, which constitute a measure of the dimension of tourism supply of the archipelago.

The Gross domestic product (GDP) associated to the emitting countries, indicator of the dimension of the markets that compose the demand, was obtained from series published for the OECD. As a consequence of being expressed at current prices and American dollars (USD), we were forced to deflation this variable using the price index for the United States (2000 = 100), which means that we assume that the rate of relative inflation is implicit in the exchange rate. We work, in such a way, with the GDP at constant prices of 2000.

The distance between each pair origin/destination was calculated on the basis of the geographic coordinates associated to the airport of the capital of the emitting country of tourists; to the Airport of Portela, in Lisbon; and then to the airport of each one of the azorean islands. In this study we consider that the linking to the archipelago always takes place via Lisbon. The use of the physical distances instead of transport cost is justified for the relative difficulty to get all the costs of transport for the period of analysis (1992-2003). Although this analysis can be made with advantage in the pursuing of this work, the use of distances as a proxy of the transport cost has some support, as we can see in the regression presented in Graphic 5. In fact, although the limitation of the data collected with respect to the time scope and to the geographic covering, the analysis allows to identify a strong relation between the transport cost and distance.



Graphic 5 – Relation between travel cost / distance

We use ten dummy variables associated to the origin markets, one for each country, excluding Portugal; eight dummy variable associated to the destinations, one for each island, excluding São Miguel; eleven dummy variables associated to the years, with exclusion of 1992. We intend, in such way, to catch the influence of the qualitative variables, as well as the relative competitiveness of the islands.

Data are presented in the Annex I. For the purpose model estimation, we proceed to the logaritmization of data presented in the matrices, with exception to the matrix of the distances, in accordance with the methodology presented in point 3.

We start estimating models that result of different combinations of the independent variables described in the previous pages, as observed in Table 1. Estimates using all the variables were not fulfilled due to multicolinearity that appears whenever dummies of origin and destination and distance are joined.

	K	GDP	Beds	Distance	Dummies Origin	Dummies Destination	Dummies Years
Model 1		x	x		x	x	x
Model 2		x	x	x		x	x
Model 3		x	x		x	x	
Model 4		x	x	x	x		x
Model 5	X	x	x	x			x
Model 6		x	x	x		x	
Model 7		x	x	x	x		
Model 8	X	x	x	x			

Table 1 – Models to estimate

Using the application SPSS, we got the results synthesised in Table 2.

Models 5 and 8, that explicit the constant K, have a R^2 significantly lower than the other models. That can happen due to the large number of dummy variables that, together, explain the constant K.

Models 1 and 3 are significant, but they do not include distances. Such fact affects the essence of the gravitational models that try to show the impact of distance in the interregional flows. Notice that, in these models, the distance becomes represented by the combination of the dummy variables of origin and destination but its interpretation is less clear.

Models 6 and 7 are interesting but they do not consider the years. And the years explain not only the evolution along time, but also the dynamics of competitiveness of the tourism of the Azores in comparison with other destinations.

	K	**GDP**	**Beds**	**Dist.**	**Dummy Origin**	**Dummy Destin.**	**Dummy Years**	**R^2**	**F**
Model 1		**t** 17,305 **Coef.** 0,601	**t** 0,414 **Coef.** 0,36		**t** Sig. **Coef.** Negativo	**t** Sig. **Coef.** Negativo	**t** Sig./ Not Sig. **Coef.** Negative/ Positive	0,982	1.783,77
Model 2		**t** 7,677 **Coef.** 0,336	**t** 2,478 **Coef.** 0,282	**t** -11,288 **Coef.** 0,000		**t** Sig. **Coef.** Negative	**t** Sig./ Not Sig. **Coef.** Negative/ Positive	0,92	541,647
Model 3		**t** 14,266 **Coef.** 0,454	**t** 5,370 **Coef.** 0,411		**t** Sig. **Coef.** Negative	**t** Sig. **Coef.** Negative		0,98	2.523,05
Model 4		**t** 7,066 **Coef.** 0,165	**t** 45,456 **Coef.** **1,233**	**t** -2,710 **Coef.** **-0,001**	**t** Sig./ Not Sig. **Coef.** Negative		**t** Sig./ Not Sig. **Coef.** Negative/ Positive	0,987	1.616,99
Model 5	**t** -4,872 **Coef.** -5,536	**t** 4,730 **Coef.** **0,273**	**t** 25,571 **Coef.** **1,186**	**t** -9,741 **Coef.** 0,000			**t** Not Sig. **Coef.** Negative/ Positive	0,428	55,535
Model 6		**t** 6,758 **Coef.** 0,282	**t** 4,188 **Coef.** **0,436**	**t** -10,806 **Coef.** **0,000**		**t** Not Sig. **Coef.** Negative		0,918	1.070,49
Model 7		**t** 6,739 **Coef.** **0,155**	**t** 45,584 **Coef.** **1,233**	**t** -2,621 **Coef.** -0,001	**t** Sig./ Not Sig. **Coef.** Negative			0,973	2,946,60
Model 8	**t** -5,094 **Coef.** **-5,699**	**t** 4,776 **Coef.** **0,274**	**t** 25,838 **Coef.** 1,186	**t** -9,802 **Coef.** **0,000**				0,423	257,33

Table 2 – Most important results estimated for each model

The remaining models are 2 and 4. Model 2 takes into account the dummies for destination but, symptomatically, reduces the clarifying effect of the number of beds. Model 4 uses the dummies for origins but reduces the meaning of distances. However some of dummies of origin are not significant, maybe because some of the clarifying effect of these dummies will be already present in the Gross Domestic Product of the country of origin and in the distance if we had data on travel costs. Most probably the availability of data on travel cost could lead to better results. However these data are sufficiently more difficult to get then the ones that are used in this work.

Notice that, in model 2, dummies of the intermediate years are not significant, but that comes from the fact of these dummies, in the intermediate point, loses explaining capability when express for dummies in years. It opted not to remove the trend from the data so that we could not only identify the trend in dummies of the years but also politics alterations, and changes in competitiveness.

According to the results, the quality of the statistical indicators and in the possibilities of analysis offered by each model, we selected Model 2 for a more detailed analysis.

Applying the collected data to the gravity model we conclude that, statistically:

- The independent variable explains 92,0% of the model, in accordance with the value of the coefficient of determination (R^2) presented in the summary of the results (Table 3). Adjusting this coefficient for the number of variables incorporated in the model (adjusted R^2) we obtain a value of 0,918, what strengthens the relative conclusions to the explanatory capacity of the model;

R	0,959
R^2	0,920
Adjusted R^2	0,918
Standard Error	1.61941
Observations	1.056

Table 3 – Summary of model 2

- The analysis of variance, presented in Table 4, certifies the capacity of the model to explain the relation between independent and dependent variables, for a level of significance of 5%;

	Df	SS	MS	F	Sig.
Regression	22	31250	1420	541	0,000
Residual	1034	2711	2.623		
Total	1056	33962			

Table 4 – ANOVA

- The value of test t indicates that some of the dummies of the years are not significant. However, all the remaining variables are significant. (Table 5).

	Coef.	Standard Error	Standardized Coefficients	t	Sig	Lower Bound	Upper Bound
GDP	0.336	0.044	1.214	7.677	0.000	0.250	0.422
BEDS	0.282	0.114	0.289	2.478	0.013	0.059	0.505
DIST	-0.000394	0.000035	-0.296210	-11.287512	0.000000	-0.000463	-0.000326
SMA	-2.757	0.336	-0.170	-8.201	0.000	-3.416	-2.097
TER	-1.178	0.217	-0.073	-5.425	0.000	-1.604	-0.752
GRA	-3.560	0.442	-0.210	-8.057	0.000	-4.427	-2.693
SJO	-2.040	0.341	-0.126	-5.984	0.000	-2.709	-1.371
PIC	-1.489	0.256	-0.093	-5.811	0.000	-1.992	-0.986
FAI	-0.897	0.250	-0.056	-3.585	0.000	-1.387	-0.406
FLO	-2.593	0.300	-0.162	-8.641	0.000	-3.182	-2.004
COR	-4.473	0.659	-0.106	-6.790	0.000	-5.766	-3.181
A93	-0.169	0.245	-0.009	-0.690	0.490	-0.649	0.311
A94	-0.217	0.247	-0.011	-0.880	0.379	-0.701	0.267
A95	-0.050	0.246	-0.003	-0.205	0.838	-0.533	0.432
A96	-0.096	0.247	-0.005	-0.390	0.697	-0.580	0.388
A97	-0.071	0.250	-0.004	-0.285	0.776	-0.561	0.419
A98	-0.050	0.250	-0.003	-0.201	0.841	-0.540	0.440
A99	0.290	0.253	0.015	1.147	0.252	-0.206	0.785
A00	0.352	0.248	0.018	1.423	0.155	-0.134	0.838
A01	0.392	0.250	0.020	1.569	0.117	-0.098	0.883
A02	0.414	0.254	0.021	1.628	0.104	-0.085	0.913
A03	0.471	0.253	0.024	1.862	0.063	-0.025	0.967

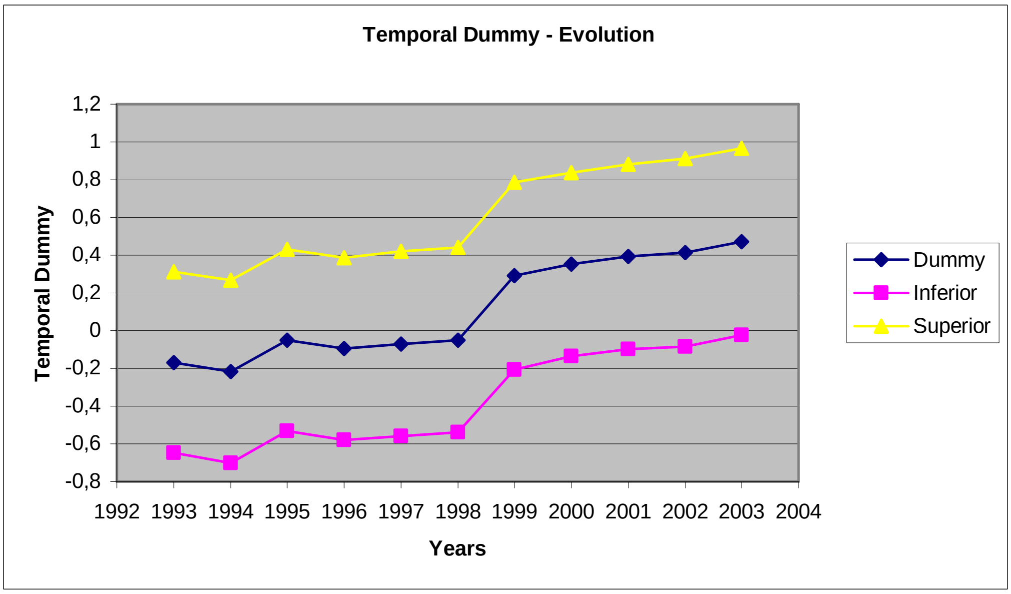
Table 5 - Coefficients

Proceeding to an analysis from the economic perspective, it is possible to remove the following conclusions from the estimated model:

- The model accuses a positive relation between the number of guests and the gross domestic product of the native countries of the tourists. This variable indicates the dimension of the market. The estimated elasticity is 0,336, indicating that an increase of 1% in the product of source countries induces an increase of tourism in the Azores of 0,3%.

- The model also accuses a positive relation between the number of guests and the number of existing beds in each island. In fact the estimated elasticity is 0,282. This indicates that an increase of 1% in the number of beds stimulates an increase in number of guests of about 0,3%. This effect results from of the relative reduction of the price caused by an increase in the supply. To know if the increase of the number of beds guarantees the occupation of these same beds it would be necessary to analyze the evolution of the number of guests and nights spent by tourists in the region, which is beyond the scope of this essay.

- The model also indicates that the distance, a proxy of the travel cost, has a significant but negative impact. The elasticity, in this case, is obtained multiplying the estimated coefficient and the distance. Being thus, for 1.500 kilometres, that is the average distance to the Portuguese mainland, the elasticity will be -0,591, indicating that an increase of 10% in the transport costs originates a reduction of 6% of the tourist flow, according to the analysed data. On the other hand, for the 4.000 kilometres which is the average distance to Germany, the elasticity of the number of guests related with the transport cost is -1,576 demonstrating that an increase of 10% in the transport cost is reflected in a reduction of 16% of the tourist flow.
- On the other hand the dummy variables for the several islands of the archipelago allow us to rank the islands in function of its relative competitiveness, taking as reference the island of S. Miguel. In this perspective, it is clear that all the remaining eight islands present inferior levels of attractiveness compared with São Miguel. Among these, the attractiveness ranking can be defined by the following order: Faial, Terceira, Pico, São Jorge, Flores, Santa Maria, Graciosa and Corvo. The three most attractive islands correspond to the location of the three gateway airports, the fourth island is Pico, with a great proximity and easiness of linking by sea to Faial. Besides, these four islands constitute, equally, the traditional Azorean tourist circuit.
- The dummy variables for the years allow us to analyse the capacity of the Azores to compete with other tourist destinations. We observe that, in the period 1999-2003, these variables present positive and increasing coefficients, which shows a consistent increase of the international competitiveness of the archipelago. This period corresponds to the change of the regulation in the connections between the Azores and the Portuguese mainland, with a significant reduction in the price of the tickets.



Graphic 6 – Evolution of the temporal dummy

5. Conclusions

In this study we intend to evaluate the evolution of the relative attractiveness of the different islands throughout the years, using gravity models.

The results indicate that the island of São Miguel presents higher levels of attractiveness when compared whit the remaining eight islands, being followed by the islands of Faial and Terceira. These islands constitute the three gateways of the archipelago and the pillars of the traditional Azorean touristic circuit.

The results show, equally, an increase of the international competitiveness of the archipelago from 1999, as consequence in change in the air connections between the islands and the Portuguese mainland.

The model does not explain however the mechanisms of the charter flights that justify, since 2002, the divergence between the tourism dynamics of the island of São Miguel comparing with the remaining islands (Graphical 2). To analyse this phenomenon it would be necessary that the variable distance was substituted by the trip cost what was not made in this work. The continuation of this research will, of course, originate the elaboration of the same analysis with data referring to the effective costs of trip.

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ANNEX 1: Data

		Destination									
		SMA	**SMG**	**TER**	**GRA**	**SJO**	**PIC**	**FAI**	**FLO**	**COR**	**TOT**
Origin	**POR**	5.481	87.970	38.253	3.411	6.126	14.469	22.255	3.094	246	**181.305**
	ALE	289	7.742	1.175	64	566	1.547	1.276	600	2	**13.261**
	BEL	13	460	164	6	90	244	180	27	0	**1.184**
	CAN	48	1.745	596	3	27	40	118	5	0	**2.582**
	ESP	57	2.396	652	12	103	325	648	63	2	**4.258**
	EUA	225	4.027	2.728	56	244	298	668	142	0	**8.388**
	FRA	111	3.846	1.275	32	716	1.821	1.460	173	2	**9.436**
	HOL	13	732	403	6	96	264	332	27	0	**1.873**
	RU	60	2.149	2.098	4	368	671	912	159	0	**6.421**
	SUI	25	1.322	383	10	64	354	420	121	0	**2.699**
	PNO	30	32.472	676	13	96	377	988	231	0	**34.883**
	TOT	**6.352**	**144.861**	**48.403**	**3.617**	**8.496**	**20.410**	**29.257**	**4.642**	**252**	**266.290**

Table 6 – Origin / Destination matrix for the number of guests in the Azores in 2003

Source: SREA

The matrix represented in Table 6 contains, as an example, the flows origin-destination for the year of 2003. Identical matrices exist for each year of the series considered in the study.

Tables 7, 8 and 9 present, respectively, the matrices related to the gross domestic product of the emitting countries (repulsive force), to the number of beds in each island (attractive force) and the distance between each pair origin-destination (attrition).

	1991	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
POR	113.058.725,49	97.593.537,51	100.284.761,39	116.446.596,88	119.430.976,61	111.482.712,00	116.494.770,56	117.601.438,69	106.457.000,00	107.083.361,81	116.021.919,18	138.538.590,32
GER	2.386.804.703,59	2.267.744.125,27	2.378.083.345,34	2.739.247.708,81	2.598.509.243,97	2.264.434.615,83	2.264.335.098,94	2.190.274.556,29	1.900.221.000,00	1.846.472.478,00	1.937.358.566,62	2.296.483.324,24
BEL	268.248.420,18	250.970.165,30	267.858.527,88	308.740.172,87	293.497.788,91	261.405.678,47	264.458.449,51	259.341.759,74	231.934.000,00	226.211.563,44	241.673.304,48	291.473.072,37
CAN	660.027.545,66	627.571.928,00	615.660.768,30	631.612.952,27	644.008.737,81	657.765.713,27	629.114.881,88	665.394.872,63	714.453.000,00	688.483.434,07	695.102.734,14	803.890.069,79
SPA	708.982.430,96	576.843.879,76	570.791.459,37	647.998.740,39	663.251.105,55	600.135.201,70	622.847.843,44	631.373.190,15	580.673.000,00	594.043.492,27	658.443.776,93	828.566.054,06
USA	7.276.220.457,86	7.472.026.429,23	7.775.537.113,16	7.972.788.081,48	8.271.404.976,29	8.647.563.749,17	9.012.469.810,21	9.417.066.018,17	9.764.800.000,00	9.838.881.348,32	9.997.600.790,78	10.269.276.349,20
FRA	1.587.511.863,15	1.461.668.571,17	1.512.627.006,90	1.704.991.747,38	1.677.617.347,75	1.494.121.346,15	1.526.605.371,45	1.487.543.298,56	1.327.964.000,00	1.308.234.627,82	1.398.638.208,85	1.682.685.615,39
HOL	403.049.697,92	382.507.608,58	402.260.362,77	469.706.380,58	457.630.134,80	411.935.480,49	425.322.110,85	424.652.845,19	386.510.000,00	391.226.357,06	420.176.389,86	505.651.699,55
UK	1.240.232.864,98	1.088.854.695,83	1.153.828.766,44	1.231.040.698,43	1.269.413.394,43	1.390.832.486,14	1.477.218.496,37	1.496.903.961,50	1.442.777.000,00	1.401.142.477,71	1.508.021.036,27	1.698.298.564,74
SUI	288.729.427,56	274.363.877,04	297.912.488,50	341.839.682,06	322.426.341,31	274.848.291,11	278.971.318,40	270.656.094,50	246.044.000,00	244.456.053,67	265.088.626,79	303.511.032,52
NOC	754.666.558,64	616.618.959,80	657.789.941,39	772.612.170,44	793.938.941,87	734.256.338,23	729.998.030,54	730.214.474,75	689.553.000,00	658.029.079,48	709.192.810,05	848.321.137,68

Table 7 – GDP matrix for each country of origin for the period 1992-2003, expressed in thousands of USD, at constant prices of 2000.

Source: OECD

	92	93	94	95	96	97	98	99	00	01	02	03
SMA	100	100	171	171	171	125	125	103	103	120	120	360
SMG	1.360	1.503	1.506	1.745	1.715	1.809	1.809	1.918	1.976	2.632	3.201	3.587
TER	612	609	674	632	731	742	742	735	638	826	1.081	1.367
GRA	84	84	85	85	85	85	85	85	85	85	83	83
SJO	114	96	129	129	129	129	197	230	215	221	227	193
PIC	301	317	317	347	389	363	395	469	469	522	514	520
FAI	409	411	411	411	426	426	586	564	587	654	696	660
FLO	108	108	108	108	118	118	118	246	246	274	264	277
COR	0	0	0	0	0	0	0	14	14	14	14	14

Table 8 – Matrix of the number of beds in each destination island in the period 1992-2003

Source: SREA

		Destination								
		SMA	**SMG**	**TER**	**GRA**	**SJO**	**PIC**	**FAI**	**FLO**	**COR**
Origin	**POR**	1.421,08	1.450,62	1.556,67	1.633,59	1.650,81	1.675,09	1.699,43	1.896,85	1.893,57
	GER	3.729,65	3.759,19	3.865,24	3.942,16	3.959,38	3.983,66	4.008,00	4.205,42	4.202,14
	BEL	3.143,68	3.173,22	3.279,27	3.356,19	3.373,41	3.397,69	3.422,03	3.619,45	3.616,17
	CAN	6.811,49	6.841,03	6.947,08	7.024,00	7.041,22	7.065,50	7.089,84	7.287,26	7.283,98
	SPA	1.935,08	1.964,62	2.070,67	2.147,59	2.164,81	2.189,09	2.213,43	2.410,85	2.407,57
	USA	7.163,76	7.193,30	7.299,35	7.376,27	7.393,49	7.417,77	7.442,11	7.639,53	7.636,25
	FRA	2.893,13	2.922,67	3.028,72	3.105,64	3.122,86	3.147,14	3.171,48	3.368,90	3.365,62
	HOL	3.269,84	3.299,38	3.405,43	3.482,35	3.499,57	3.523,85	3.548,19	3.745,61	3.742,33
	UK	2.966,50	2.996,04	3.102,09	3.179,01	3.196,23	3.220,51	3.244,85	3.442,27	3.438,99
	SUI	3.048,47	3.078,01	3.184,06	3.260,98	3.278,20	3.302,48	3.326,82	3.524,24	3.520,96
	NOC	4.315,69	4.345,23	4.451,28	4.528,20	4.545,42	4.569,70	4.594,04	4.791,46	4.788,18

Table 9 – Matrix of distances between origin-Lisbon-destination expressed in km