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## **DETERMINANTS OF TOURISM DEMAND IN GREECE: A PANEL DATA APPROACH**

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**Summary:** This paper aims at investigating the determinants of tourism demand in Greece over eight years (2004-2011). Tourism is the main industry of Greece as its share in the Greek economy varies from 15% to 20% of GDP whether measured directly or indirectly respectively. We opted for a macroeconometric approach and, in particular, building on the existing literature we used panel data estimation techniques with disaggregated data on the country (or area) of origin combined with macroeconomic aggregates, indicators and (relative) price indices. The specific econometric techniques used take into account both the statistical properties of variables and the differences between the various cross sections. The main conclusion of the paper is that the macroeconometric panel data approach to explaining tourist receipts provides a rather satisfactory model fit, with explanatory variables explaining a significant part of the variability of the dependent variable. Our findings also suggest that certain policy directions identified by Greek governments (both in the present and past), such as enhancing competitiveness and the outward orientation of the economy, may indeed affect positively the prospects of the Greek tourism sector.

**Keywords:** tourism demand, panel data, macroeconometric approach.

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### **1. Introduction**

This paper aims at investigating the plausible determinants of tourism receipts in Greece in order to use it both for forecasting purposes and for identifying potential economic policy directions so as to improve the prospects of the specific sector. The latter could prove a crucial element in policy making, given the significance of the tourism sector for the Greek economy (accounting for approximately for 15-20% of total economic activity, both directly and indirectly). On the other hand, improved forecasting techniques would render overall macroeconomic forecasting more efficient at a time when a bottom-up approach in forecasting (from sectoral to

national level) is being debated and, in fact, recommended by many international organizations. Building on the existing literature, panel data estimation techniques are used, with explanatory variables including selected macroeconomic variables and indicators and (relative) price indices. The main innovations of the paper are:

(a) regarding the cross section dimension of the sample, disaggregated data based on the country (or area) of origin are used, and

(b) the “intensity” of spending (spending per day of stay) is also explored. This kind of analysis would be extremely useful in designing a “targeted” tourism policy (e.g. targeting, through marketing campaigns and policies, countries of origin or categories of tourists who tend to spend more).

The time-span of the data is the 2004–2011 period, with the specific econometric techniques used taking into account the statistical properties of variables as well as the differences between the various cross sections. The main conclusion of the paper is that the macroeconomic approach to explaining tourist arrivals provides a satisfactory model fit, with explanatory variables explaining a significant part of the variability of the dependent variable. Thus, a sound basis for more reliable forecasting in the medium term is secured; also, we may safely conclude that certain policy directions identified by Greek governments (both in the present and past), such as enhancing competitiveness and the outward orientation of the economy, may indeed affect positively the prospects of the Greek tourism sector.

The structure of the paper is as follows: section 2 provides an overview of the relevant literature, also justifying the choice of the specific model and data structure described in section 3. In section 4, data sources and definitions are provided, followed by the empirical estimates of the model (section 5). The statistical properties of the variables are discussed in section 6, while section 7 concludes.

## **2. Links to the existing literature**

The literature examining tourism issues is rather extensive, with this fact being mainly explained by the characteristics of the specific sector. More specifically, as Stabler et al. [2010] have highlighted, the tourism “product” consists of distinct goods and services, bought at the same time or in sequence but, in any case, with the demand for one definitely affecting the demand for the other. The problem becomes more complex as these goods and services are affected by a variety of different factors, thus rendering the aggregation process of determining factors a very demanding task. Most of the papers on the subject, however, fall into one of the broad categories Wanhill [2007] has indentified: the structure of the sector, macroeconomic impact assessment, demand modeling, tourism governance, supply issues, data analysis and statistical analysis. Papers on any of these issues were very scarce until the 1970s, since when the literature has been growing at a fast pace. Useful surveys include Sheldon [1990], Eadington and Redman [1991], Wahab and Cooper [2001], Lew at al. [2004], Hall and Page [2006].

Regarding the modeling of tourism demand, starting from the 1960s, an extensive literature exists, with useful surveys including Crouch ([1994, reviewing more than 300 publications), Witt and Witt [1995], Lim [1999; 2006], Song and Li [2008]. The strand of literature based on demand modeling on panel data is somewhat more recent, starting from Naude and Saayman [1985], Van der Merwe et al. [2007], Saayman and Saayman [2008]. We opted for this type of analysis following the conclusions of Stabler et al. (2010), as the quantity and quality of data are enhanced, data are more informative, the degrees of freedom increase and estimates tend to be more efficient while suffering less from multicollinearity. However, the main innovation of this paper is the cross section dimension of the sample, by making use of disaggregated data on tourism inflows to Greece per country (or area) of origin, combined with the corresponding macroeconomic aggregates of the country (or area).

### 3. Description of the model

Building on the above mentioned literature review and the aforementioned advantages, we have opted for a single equation approach to be estimated with panel data. Our basic equation includes the main variables that recent research suggests (see, for example [Stabler et al.; Dwyer et al. 2010; Zaki 2008]):

- The income in the country of origin: the purchasing power of people in one country positively affects their ability and inclination for both internal and international tourism.
- The cost of living at the destination relative to the origin: given the fact that tourists incur specific costs at the place of their destination, it is natural to assume that they compare prices between the destination and their home country; as a result, their decision on whether or not to visit a destination depends on the relative costs of living (see, among others, Dwyer et al. 2010).
- The cost of living at other (competitive) destinations: given that a degree of substitutability between alternative destinations exists (although country-specific characteristics may limit it), a rise in prices in one destination is expected to boost the number of visitors to substitute destinations; in fact, we assume that tourists are in the process of considering a range of competing destinations before making their final choice.
- Transportation costs: this is actually part of the overall cost of traveling to a destination, so it is straightforward to assume that it affects travelers' decisions. The difficulty of deciding on the right proxy for transportation costs has led many researchers to omit this variable altogether. This difficulty pertains, among others, to the fact that often alternative ways of traveling exist (surface travel, air travel, sea transport) and, what is more important, for each one of these a variety of classes / fares are available (the pricing practices of airlines resulting in a multitude of fares is a good example in this respect).

- The degree of openness of countries of origin which would be expected to affect travel expenses (and, therefore, travel receipts for the destination country) positively.
- The level of human capital in the countries of origin in order to test the hypothesis that more “educated” citizens (in the sense of possessing more human capital) tend to be more open-minded and willing to expand their horizon by traveling more. Also, we should take into account the fact that Greece is, to a significant degree, a destination visited for cultural purposes and, as a result, that it could be a destination more attractive to individuals with more human capital.

#### 4. Data sources and definitions

In this section a brief description of data sources and definitions is provided. The dependent variable is represented by the revenue (in real terms) from tourist arrivals from specific countries / areas, while we also try an “intensity of spending” variable (i.e. real spending per day of stay in the destination country). The source for both these variables is the Bank of Greece and relevant data are deflated for all countries using the CPI obtained by ELL.STAT. The sample of countries includes Austria, Belgium, France, Germany, Spain, Italy, Cyprus, the Netherlands, Denmark, the UK, Romania, Sweden, the Czech Republic, Albania, Australia, Switzerland, the USA, Canada, Russia, the EU-27 and the euroarea<sup>1</sup>. The time frame is the period from 2004 to 2011.

The proxy we opted for the purchasing power of other countries’ residents is GDP per capita at constant prices and purchasing power parities (source: OECD). For non-OECD members, we used the same variable from Penn World Tables (ver. 7.3, 2011).

Following the standard practice in the literature, we used effective exchange rates (relative to the effective exchange rate of Greece) in order to grasp the effect of relative prices. Again, the source for this variable is OECD, while the AMECO database was also used for the EU-27 and the euroarea aggregates. The same variable was used in order to construct a (non-weighted) average of relative prices for competing countries. The countries chosen for this purpose were Turkey, Cyprus, Spain, Portugal and Malta<sup>2</sup>.

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<sup>1</sup> These are the countries the Bank of Greece provides data for. Our panel is limited, both in the cross section and the time dimensions, by data availability. We have only excluded some of the aggregates (e.g. EU-27 excluding the euroarea), for which the construction of relative prices and purchasing powers would be to a significant degree arbitrary. In some of the specifications we tried, the sample may also be truncated by data limitations.

<sup>2</sup> These Southern European / Mediterranean countries offer tourist “products” which are directly comparable to that of Greece.

Given the fact that Greece is accessible by almost all alternative ways of traveling (at least from many European countries of origin), we opted for a more general proxy for the transportation cost, i.e., the international price of oil which would be expected to affect the costs of all of them (although admittedly not necessarily in a uniform way). The fact that we use panel data to a certain degree justifies this choice, as factors (such as distance from the country of origin) is a constant in each of the cross sections for all years; as a result, the cost of traveling to Greece is actually affected by factors changing over time (most notably, oil prices).

The degree of openness is captured by the average value of exports and imports over GDP; the source is Eurostat, except for Canada, Switzerland, Russia and Australia for which OECD data are used (retaining the same definition of the variable).

In order to test the effect of human capital, the Barro-Lee (2010) database is used with average years of schooling being the relative proxy of interest.

## 5. Empirical results

In this section we present our empirical estimates for the determinants of tourism receipts in Greece and the intensity of spending (per day of stay in Greece). The model specifications eventually chosen with statistical / econometric criteria are presented in Tables 1-3. We should note that, before concluding, various alternatives were tried, pertaining to: (i) the combination of variables, (ii) data sources, (iii) econometric methods.

Regarding the latter, eventually the equation was estimated using Panel EGLS, with country weights and diagonal correction of standard errors for heteroscedasticity and autocorrelation (using the methodology of White). Specifications with both fixed and random effects were tried, but their performance was relatively inferior based on the usual statistical / econometric criteria. Also, apart from allowing for a different residual variance for each cross section (captured by the country weights), there is no indication that the data structure is characterized by period specific heteroskedasticity, contemporaneous covariances, and between-period covariances (given, in any case, the relatively small time dimension).

The overall fitness of both models is very good, with independent variables explaining a significant part of the variance of the dependent variable (as shown by the corrected  $R^2$  and the test on its statistical significance using the F-statistic).

For the first specification, all but two estimators (the Olympic Games variable and human capital) are statistically significant at conventional significance levels and have the expected sign, i.e.:

(a) improving standards of living in other countries (as depicted by real GDP per head – PPP corrected) result in increasing tourism outflows from these countries and, therefore, increasing tourism spending in Greece (among other destinations),

**Table 1.** Determinants of tourism inflows in Greece

Dependent Variable: Tourism receipts in real terms  
 Method: Panel EGLS (Cross-section weights)  
 Periods included: 8 (2004 – 2011)  
 Cross-sections included: 20  
 Linear estimation after one-step weighting matrix  
 White cross-section standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	-9.842529	5.807140	-1.694901	0.0933
Real GDP	0.000176	6.38E-05	2.764370	0.0068
Relative real effective exchange rate	3.508916	1.132252	3.099058	0.0025
Competitors real effective exchange rate	0.072983	0.035127	2.077704	0.0404
Oil price	-0.021209	0.007081	-2.995448	0.0035
Economic crisis dummy	-0.533176	0.112755	-4.728641	0.0000
Dummy for 2004	0.253679	0.258871	0.979945	0.3296
Human capital	-0.147776	0.383156	-0.385680	0.7006
Openness	0.080914	0.035716	2.265465	0.0257

  

Weighted Statistics			
R-squared	0.949938	Mean dependent var	6.731693
Adjusted R-squared	0.937036	S.D. dependent var	5.067136
S.E. of regression	1.116527	Sum squared resid	120.9234
F-statistic	73.62420		
Prob(F-statistic)	0.000000		

  

Unweighted Statistics			
R-squared	0.953417	Mean dependent var	5.357588
Sum squared resid	208.6799		

Source: authors' estimates.

**Table 2.** Determinants of spending per day in Greece

Dependent Variable: Tourism receipts per day of stay

Method: Panel EGLS (Cross-section weights)

Periods included: 7 (2004 – 2011)

Cross-sections included: 18

Linear estimation after one-step weighting matrix

White cross-section standard errors &amp; covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	-1.083728	1.107551	-0.978491	0.3299
Real GDP	1.60E-05	5.93E-06	2.701606	0.0080
Relative real effective exchange rate	0.581279	0.199680	2.911052	0.0043
Competitors real effective exchange rate	0.014445	0.006210	2.326114	0.0218
Oil price	-0.002795	0.001357	-2.060111	0.0417
Economic crisis dummy	-0.085496	0.025590	-3.341011	0.0011
Dummy for 2004	0.042084	0.058170	0.723459	0.4709
Human capital	-0.089584	0.082350	-1.087846	0.2790
Openness	-0.007252	0.007458	-0.972360	0.3329

  

Weighted Statistics				
R-squared	0.697952	Mean dependent var		0.040689
Adjusted R-squared	0.648685	S.D. dependent var		0.128629
S.E. of regression	0.111558	Sum squared resid		1.418753
F-statistic	6.047757			
Prob(F-statistic)	0.000002			

Source: authors' estimates.

(b) the increase in relative prices in other countries (with Greece as the denominator) favours tourism inflows (and spending) in Greece and the same holds for the increase of relative prices in competitor countries,

(c) the increase in the cost of traveling abroad negatively affects tourism flows in general and travel receipts in Greece,

(d) the recent economic crisis affected tourism inflows and receipts in an adverse way which goes beyond, for example, the simple income effect (captured by the change in GDP per head).

(e) the openness of economies positively affects spending in traveling abroad.

As for the second specification involving real spending per day of stay, the results are identical to the first specification with openness also being statistically insignificant. As the inclusion of the openness and human capital variables in this case may be counterintuitive, we also tried a specification without them which is presented in Table 3.

**Table 3.** Determinants of spending per day in Greece

Dependent Variable: Tourism receipts per day of stay

Method: Panel EGLS (Cross-section weights)

Periods included: 8 (2004 – 2011)

Cross-sections included: 18

Linear estimation after one-step weighting matrix

White cross-section standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	-1.536921	0.613831	-2.503816	0.0136
Real GDP	3.58E-05	9.19E-06	3.899993	0.0002
Relative real effective exchange rate	0.550558	0.122473	4.495353	0.0000
Competitors real effective exchange rate	0.009428	0.004740	1.988767	0.0489
Oil price	-0.002071	0.000705	-2.939477	0.0039
Economic crisis dummy	-0.092277	0.016737	-5.513448	0.0000
Dummy for 2004	0.048747	0.024494	1.990161	0.0408
Weighted Statistics				
R-squared	0.971809	Mean dependent var		1.055910
Adjusted R-squared	0.966080	S.D. dependent var		0.984675
S.E. of regression	0.196167	Sum squared resid		4.733211
F-statistic	169.6059			
Prob(F-statistic)	0.000000			

Source: authors' estimates.

In this case, all variables have the expected sign and are statistically significant at conventional significance levels; more specifically at the 1% significance level, with the exception of the Olympic Games variable which is significant at the 5% significance level.



## 6. Stationarity concerns

In this section, test results for stationarity are presented for the series used in the regressions of the previous section in order to ensure that the spurious correlation problem has been avoided. Should this be the case, estimators could be inconsistent, rendering t-statistics unreliable<sup>3</sup>.

These test results are depicted in Table 4. More specifically, the results of the Levin, Lin & Chu [2002] test assuming one unit root for the panel series, along with the results of the Im, Pesaran and Shin [2003] and Maddala, Wu [1999] – Choi [2001] tests, based on which the ADF – Fisher Chi-square and PP – Fisher Chi-square statistics are computed. These last three statistics are based on the assumption that a distinct unit root exists for each unit of the panel. In most cases, the test results coincide with the rejection of the hypothesis of a unit root at conventional levels of statistical significance. In those cases where the test results are contradictory, following Maddala, Wu [1999], the results of the Fisher-type tests are adopted.

**Table 4.** Results of Panel Unit root tests

	Levin, Lin & Chu test*	Im, Pesaran and Shin W-stat	ADF – Fisher Chi-square	PP – Fisher Chi-square
Real receipts	-3.16	-0.12	14.18	27.94
Marginal probability of rejection of $H_0$	0.00	0.45	0.28	0.00
Real GDP per capita	-5.10	-0.48	35.68	55.27
Marginal probability of rejection of $H_0$	0.00	0.32	0.48	0.02
Relative prices	0.60	2.10	5.56	50.89
Marginal probability of rejection of $H_0$	0.73	0.98	0.99	0.04
Index of competitors' prices	-0.16	0.37	26.34	172.56
Marginal probability of rejection of $H_0$	0.44	0.64	0.92	0.00
International oil prices	-5.59	1.73	17.31	41.19
Marginal probability of rejection of $H_0$	0.00	0.96	0.63	0.00
Human capital	-1.67	-7.69	64.14	79.82
Marginal probability of rejection of $H_0$	0.05	0.00	0.00	0.00
Openness	-7.20	-1.29	47.44	74.25
Marginal probability of rejection of $H_0$	0.00	0.09	0.06	0.00
Expenditure per day of stay	-3.48	-0.81	23.40	34.57
Marginal probability of rejection of $H_0$	0.00	0.21	0.18	0.01

Source: Authors' estimates.

<sup>3</sup> However, in any case, according to Phillips and Moon [1999] the problem of spurious correlation is less likely to occur when using panel data vs. time series data.

The overall conclusion is that the empirical results of this section are valid and that there is no issue of a spurious relationship.

## 7. Conclusion

In this paper we aimed at investigating the determinants of tourism inflows in Greece from a macroeconometric perspective. Using panel data for 22 countries / regions for a time span of eight years, we evaluated the explanatory power of GDP per head (in PPP terms), relative prices, the prices in the main competing countries, the cost of traveling abroad (using the price of oil as a proxy), extraordinary circumstances (such as major events hosted by the country or the economic crisis – both captured by dummy variables), human capital and the outward orientation of economies. Also, we explored whether all these variables (or, as it turned out, a subset of them) can explain the real spending per day in Greece.

The fit of both models comprising these variables (or a subset of them) was very satisfactory and robust both to the specification and the estimation methods; moreover, the statistical properties of the variables were properly tested and accounted for. Given the fact that the forecasts for the main independent variables are readily available, this would facilitate the forecasting process for the specific sector of the Greek economy; this in turn, would render macroeconomic forecasting more credible, at least if estimates for idiosyncratic factors for every period are possible.

What is more important however, is something else that our estimates show: that pursuing policy targets such as enhancing the competitiveness of the Greek economy or its outward orientation could very well improve the prospects of the tourist sector in Greece, thus improving the overall growth prospects of the economy (given the significance of the tourist sector accounting for approximately 20% of GDP). In this case, an economic policy mix emphasizing these policy goals would be pro-growth, both in macroeconomic and microeconomic (sectoral) terms. On the other hand, our second specification, featuring spending per day, could motivate the elaboration of a “targeted” tourism policy aimed at attracting those who would be willing (and able) to spend more for each day they spend in Greece.

Future lines of research primarily include the expansion of the model to facilitate short-term forecasting, using lower frequency data (quarterly or even monthly data) and statistical techniques appropriate for explaining short-term developments. Incorporating other variables such as marketing expenditure and the marginal propensity to consume in origin countries, along with trying alternative proxies for human capital, would also be additional directions to go forward in (a) explaining tourist inflows, and (b) formulating economic policy recommendations which would enhance the prospects of the tourist sector and the Greek economy in general.

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## **DETERMINANTY POPYTU TURYSTYCZNEGO W GRECJI: ANALIZA DANYCH PANELOWYCH**

**Streszczenie:** Niniejsza praca ma na celu zbadanie determinant popytu turystycznego w Grecji w ciągu ośmiu lat (2004-2011). Turystyka stanowi główny nurt greckiej gospodarki. Udział turystyki w gospodarce waha się tu od 15 do 20% PKB, odpowiednio dla pomiaru wykonywanego bezpośrednio i pośrednio. W artykule zastosowano podejście makroekonometryczne, a przede wszystkim na podstawie istniejącej literatury wykorzystano techniki estymacji danych panelowych dla danych szczegółowych dla kraju (lub regionu), będących kombinacjami składników makroekonomicznych, wskaźników oraz (względnych) wskaźników cen. W użytych specyficznych technikach ekonometrycznych wzięto pod uwagę zarówno właściwości statystyczne zmiennych, jak i różnice przekrojowe między nimi. Głównym wnioskiem przeprowadzonego badania jest to, że podejście wykorzystujące makroekonomiczne dane panelowe do wyjaśnienia wpływów z turystyki prowadzi do stworzenia modelu raczej dobrze dopasowanego, w którym zmienne niezależne dobrze opisują zmienną zależną. Wnioski sugerują również, że określone kierunki polityki kolejnych rządów Grecji (zarówno teraźniejszych, jak i poprzednich), które wskazywały na poprawę konkurencyjności oraz orientacji gospodarki na zewnątrz, mogą rzeczywiście wpłynąć pozytywnie na perspektywy greckiego sektora turystycznego.

**Słowa kluczowe:** popyt turystyczny, dane panelowe, podejście makroekonometryczne.