International Research Journal of Finance and Economics
ISSN 1450-2887 Issue 96 (2012)

http://www.internationalresearchjournaloffinanceandeconomics.com

Forecasting Tourism Expenditure and Growth:A VAR/VECM Analysis for Greece at both Aggregated and Disaggregated Levels

Andreas G. Georgantopoulos
Corresponding Author, PhD, Panteion University, 136 Sygrou Ave. 176 71, Athens, Greece
E-mail: ageorgantos@yahoo.com
Tel: +30-210-9228605; Fax: +30-210-9219209

Abstract

Tourism is one of the most important factors in the productivity of the Greek economy with significant multiplier effects on the country's economic activity. This study tests for the existence and direction of causality between output growth and tourism expenditure using a trivariate model with real effective exchange rate, analysed as a whole and in sub-categories respectively for the period 1988-2011. Results from the aggregated model indicate that all variables return to their long-run equilibrium relationships and unidirectional causal relationship is reported from tourism expenditure to real output in the short-run. Moreover, results from the disaggregated model imply strong bidirectional causal links between growth and business travel and tourism spending (BTS) in the long-run and unidirectional causal links from leisure travel and tourism spending (LTS) to growth and to BTS. Forecasts for the period 2012-2020 indicate increasing total tourism expenditure and particularly for the case of BTS.

Keywords: Tourism Expenditures, Economic Growth, Cointegration, VECM, Greece.
JEL Classification Codes: C22, E00, F43.

1. Introduction

In recent years, the academic community has shown considerable interest in the relationship between tourism and economic growth. These studies strive to empirically investigate the significance of the so-called tourism-led growth hypothesis (TLGH) supporting a direct effect from tourism activity to growth and suggesting in general that tourism increases foreign exchange income, creates employment opportunities, and therefore triggers overall economic growth. This hypothesis derives directly from the export-led growth hypothesis (ELGH) which states that the economic growth of countries can be generated not only by increasing the amount of labour and capital within the economy, but also by expanding exports.

Previous literature between tourism (and its components; accommodation, package travel, food and drinks, transport, sporting activities, shopping) and economic growth, although various measures of tourism activity have been employed (e.g. total tourism expenditure, tourism arrivals, international visitor consumption, domestic tourism expenditure), suggests that tourism is a key factor for economic growth especially for the cases of low income and/or small countries. Some of the most influential studies on this topic are those of Louca (2006) for the case of Cyprus, Noriko and Motosugu (2007) for the Amami Islands in Japan, Gani (1998) for South Pacific economies and Kim et al. (2006) for Taiwan, which all concluded that significant relationship exists between tourism expenditure and growth. Similarly, Proença and Soukiazis (2005) examine the impact of tourism for Portuguese regions and Shan and Wilson (2001) study the causality between tourism and trade. In their analysis conducted on Turkish economy, Zortuk (2009) and Gunduz and Hatemi-J (2005) concluded that the increase in tourism income effects economic growth. Brida et al. (2009) found unidirectional causal links from tourism expenditures to real GDP per capita for the case of Colombia. In addition, Oh (2005) found that the hypothesis of tourism-led economic growth could not be verified in the case of the Korean economy. The results of Oh's Granger causality test imply the existence of a one-way causal relationship in terms of economics-driven tourism growth. On the other hand, Dritsakis (2004) for Greece, Durbarry (2004) for Mauritius and Balaguer and Cantavella-Jorda (2002) for Spain empirically proved the existence of a bidirectional relationship between the two variables. In addition, Eugenio-Martin and Morales (2004) confirm the validity of tourism-led growth hypothesis for low and middle income countries in Latin America, while they assert that the situation is different for high income countries. Lee and Chang's study (2008), containing thirty two selected economies including both OECD countries and non-OECD countries, found that there is a unidirectional relationship from tourism to growth for OECD countries, whereas a bidirectional causality relationship exists for non-OECD countries, while Kasimati (2011) found no causal links between tourism arrivals and real output for the case of Greece.

Thereupon, the central objective of this study is to empirically investigate the causal links between tourism expenditure (TE) and economic growth, as measured by real GDP (RGDP) for a European Union (EU) and European Monetary Union (EMU) member country, Greece, for the period 1988-2011. This study's empirical work is partially influenced from the seminal work of Dritsakis (2004) and Kasimati (2011) for Greece. These studies present contradictory evidence; Dritsakis' study employed VECM approach concluding that bidirectional causal links exist between tourism expenditure and growth. On the other hand, Kasimati (2011) used tourism arrivals as a proxy of Greece's tourism activity and suggested that although a cointegrating relationship exists between tourism and growth, no causal links exist between them. Within this context, the present study not only updates the evidence for Greece, but also provides exhaustive evidence from the application of multivariate cointegration with real effective exchange rate, vector auto-regression (VAR) with an error-correction mechanism, causality testing, innovation accounting, variance decomposition and finally generates forecasts within the framework of the VAR/VEC approach not only at aggregate (i.e. Tourism Expenditure, TE) but also at disaggregate levels (i.e. Leisure Travel and Tourism Spending, LTS and Business Travel and Tourism Spending, BTS).

This study is motivated by a number of factors; first, there are very few published studies dealing with the causal links between tourism expenditure and economic growth for Greece. Dritsakis (2004) and Kasimati (2011) are the only relevant empirical sources for this country to the best of our knowledge. Therefore, the present study is the only empirical study that employs aggregated and disaggregated models for Greece and one of very few in general. Second, it enriches the existing literature on tourism economics not only by investigating the causal links between TE and real output but also by providing forecasts for the period 2012-2020 based on VAR/VEC approach. Third, it covers a period which includes some of the most important economic, political and social transformations leading to a more development oriented and therefore more tourism-depended Greek economy. Moreover, considering the severe sovereign debt crisis of 2008 which emerged in Greece, it is crucial to further investigate the tourism-growth nexus in an effort to trace economic sectors that boost growth under the deep recession that threatens Greece's 20 years efforts towards European economic integration and long-term prosperity. Therefore, strong tourism-growth links should urge policy-makers in Greece to further promote the flourishing of the tourism industry through domestic and foreign investments by providing tax incentives for FDI, subsidies supported by European Union funds for domestic touristic business, further simplify and accelerate licencing procedures and to fight structural problems of the Greek public sector, such as exhaustive bureaucratic conditions and corruption of public officials in order for the economy to recover and return to positive growth rates.

Considering Hellenic Statistical Authority (HELSTAT) data, tourism contribution to GDP is estimated up to 15% in 2011 (from approximately 8% in 2001), and Greece welcomed in 2011 more than 20,000,000 tourists (almost two times the country's population). The vast majority of tourists in the country are from within the European Union (more than 90%), followed by tourists from the Americas, Asia, Oceania and Africa. Moreover, in the last years, there has been a significant increase in number of tourists from Israel, because of the crisis between Israel and Turkey and sharp upward trend presents the arrival of tourists from China.

The rest of the paper is organized as follows. Section 2 introduces the empirical model, econometric methodology and data sources used in this study. Section 3 presents the results and empirical analysis. Section 4 summarises the main findings and provides the concluding remarks.

2. Data Analysis and Methodology

This study employs data that consist of annual observations during the period 1988-2011. Tourism expenditure (TE), Business Travel and Tourism Spending (BTS) and Leisure Travel and Tourism Spending (LTS) data are obtained from World Travel and Tourism Council (WTTC), available online at: http://www.wttc.org/research/economic-data-search-tool; Real Effective Exchange Rate (REER) data are obtained from the World Bank World Development Indicators (WDI) available online at: http: //www.worldbank.org; Real Gross Domestic Product (RGDP) is calculated by dividing nominal GDP by the GDP deflator, both taken from the WDI. All data sets are transformed into logarithmic returns in order to achieve mean-reverting relationships, and to make econometric testing procedures valid.

On the empirical framework of this study, in order to investigate the relationship between tourism expenditure and real output at aggregate level with real effective exchange rate the following model is specified:

$$U = (LRGDP_t, LTE_t, LREER_t) \qquad \text{(Model 1)}$$

Furthermore, this study employs a disaggregated model by investigating the causal links between real growth, Business Travel and Tourism Spending, Leisure Travel and Tourism Spending and real effective exchange rate. Therefore, the following model is formed:

$$U = (LRGDP_t, LLTS_t, LBTS_t, LREER_t) \qquad \text{(Model 2)}$$

This study's econometric methodology firstly examines the stationarity properties of the univariate time series. Augmented Dickey-Fuller (ADF) test is employed to test the unit roots of the concerned time series variables (Dickey and Fuller, 1979). It consists of running a regression of the first difference of the series against the series lagged once, lagged difference terms, and optionally, by employing a constant and a time trend. This can be expressed as:

$$\Delta y_t = \alpha_1 y_{it-1} + \sum_{j=1}^{p_i} \beta_{ij} \Delta y_{it-j} + x_{it}^{'}\delta + \varepsilon_t \qquad \text{(Model 3)}$$

The test for a unit root is conducted on the coefficient of (y_{t-1}) in the regression. If the coefficient is significantly different from zero then the hypothesis that (y) contains a unit root is rejected. Rejection of the null hypothesis implies stationarity. Moreover, Phillips-Perron (PP) test (Phillips and Perron, 1988) and Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) test (Kwiatkowski et al., 1992) are employed in order to formally discern the unit root properties of the series.

Furthermore, the time series has to be examined for cointegration. Cointegration analysis helps to identify long-run economic relationships between two or several variables and to avoid the risk of spurious regression. Cointegration analysis is important because if two non-stationary variables are cointegrated, a Vector Autoregression (VAR) model in the first difference is misspecified due to the effect of a common tend. If a cointegration relationship is identified, the model should include residuals from the vectors (lagged one period) in a dynamic Vector Error Correcting Mechanism (VECM) system. In this stage, the Johansen (1988, 1991) cointegration test is utilized to identify a cointegrating relationship among the variables. Within the Johansen multivariate cointegration framework, the following system is estimated:

$$\Delta z_t = \Gamma_1 \Delta z_{t-1} + \ldots + \Gamma_{k-1} \Delta z_{t-k-1} \Pi z_{t-1} + \mu + \varepsilon_t : \qquad \text{(Model 4)}$$

where, Δ is the first difference operator, z′ denotes a vector of variables, $\varepsilon_t \sim$ n iid $(0,\sigma^2)$, μ is a drift parameter, and Π is a (p x p) matrix of the form Π = αβ′, where α and β are both (p x r) matrices of full rank, with β containing the r cointegrating relationships and α carrying the corresponding adjustment coefficients in each of the r vectors. The Johansen approach can be used to carry out Granger causality tests as well. In the Johansen framework, the first step is the estimation of an unrestricted, closed p-th order VAR in k variables. Johansen (1988) suggested two tests statistics to determine the cointegration rank. The first of these is known as the trace statistic:

$$N\{trace(r_0 / k) = -T \sum_{i=r_0+1}^{k} \ln(1-\hat{\lambda}_i) \qquad \text{(Model 5)}$$

where $\hat{\lambda}_i$ are the estimated eigenvalues $\lambda_1 > \lambda_2 > \lambda_3 > \ldots > \lambda_\kappa$ and r_0 ranges from zero to k-1 depending upon the stage in the sequence. This is the relevant test statistics for the null hypothesis $r \leq r_0$ against the alternative $r \geq r_{o+1}$. The second test statistic is the maximum eigenvalue test known as λ_{max}; we denote it as λ_{max} (r_0). This is closely related to the trace statistic, but arises from changing the alternative hypothesis from $r \geq r_{o+1}$ to $r = r_{o+1}$, thus improving the power of the test by limiting the alternative to a cointegration rank, which is just by one more than the null hypothesis. The λ_{max} test statistic is:

$$\lambda_{max}(r_0) = - T \text{ in } (1 - \lambda_i) \text{ for } i = r_0 + 1 \qquad \text{(Model 6)}$$

The null hypothesis is that there are r cointegrating vectors, against the alternative of r + 1 cointegrating vectors. Johansen and Juselius (1990) indicated that the trace test might lack power relative to the maximum eigenvalue test. Based on the power of the test, the maximum eigenvalue test statistic is often preferred. According to Granger (1969), Y is said to "Granger-cause" X if and only if X is better predicted by using the past values of Y than by not doing so with the past values of X being used in either case. In short, if a scalar Y can help to forecast another scalar X, then we say that Y Granger-causes X. If Y causes X and X does not cause Y, it is said that unidirectional causality exists from Y to X. If Y does not cause X and X does not cause Y, then X and Y are statistically independent. If Y causes X and X causes Y, it is said that feedback exists between X and Y. Essentially, Granger's definition of causality is framed in terms of predictability. To implement the Granger test, a particular autoregressive lag length k (or p) is assumed and Models (7) and (8) are estimated:

$$X_t = \lambda_1 + \sum_{i=1}^{k} a_{1i} X_{t-i} + \sum_{j=1}^{k} b_{1j} Y_{t-j} + \mu_{1t} \qquad \text{(Model 7)}$$

$$Y_t = \lambda_2 + \sum_{i=1}^{p} a_{2i} X_{t-i} + \sum_{j=1}^{p} b_{2j} Y_{t-j} + \mu_{2t} \qquad \text{(Model 8)}$$

Moreover, a time series with a stable mean value and standard deviation is called a stationary series. If d differences have to be made to produce a stationary process, then it can be defined as integrated of order d. Engle and Granger (1987) state that if several variables are all $I_{(d)}$ series, their linear combination may be cointegrated, that is, their linear combination may be stationary. Although the variables may drift away from equilibrium for a while, economic forces are expected to restore equilibrium. Thus, they tend to move together in the long run irrespective of short run dynamics. The definition of Granger causality is based on the hypothesis that X and Y are stationary or $I_{(0)}$ time series. Therefore, the fundamental Granger method for variables of $I_{(1)}$ cannot be applied. In the absence of a cointegration vector, with $I_{(1)}$ series, valid results in Granger causality testing are obtained by simply first differentiating the VAR model. With cointegration variables, Granger causality will require further inclusion of a VEC term in the stationary model in order to capture the short term deviations of series from their long-term equilibrium path. The VAR in the first difference can be written as:

$$N\left\{\Delta X_t = \lambda_1 + \sum_{i=1}^{k}\alpha_{1i}\Delta X_{t-i} + \sum_{j=1}^{k} b_{1j}\Delta Y_{t-j} + \mu_{1t}\right. \quad \text{(Model 9)}$$

$$N\left\{\Delta Y_t = \lambda_2 + \sum_{i=1}^{p}\alpha_{2i}\Delta X_{t-i} + \sum_{j=1}^{p} b_{2j}\Delta Y_{t-j} + \mu_{2t}\right. \quad \text{(Model 10)}$$

In addition, innovation accounting analysis is used to trace the dynamic responses of the variables. The impulse response function is based on a moving average representation of the VAR model and the dynamic responses of one variable to another are evaluated over various horizons. This method ascertains the effect of a shock of an innovation of an endogenous variable on the variables in the VAR. Variance decomposition provides information concerning the relative importance of each innovation towards explaining the behavior of endogenous variables. This study employs the generalized forecast error variance decomposition technique attributed to Koop et al. (1996) and Pesaran and Shin (1998), as the findings of this method are not sensitive to the ordering of the variables in the VAR model.

3. Empirical Results

Table 1 presents the results from the unit root tests. The lag selection of the ADF test is based on Schwartz Information Criterion (Schwartz, 1978) with a lag length of 1. The tests have been performed on the basis of 5 percent significance level using the MacKinnon (1991, 1996) critical values (C.V) and the null hypothesis is that of no stationarity. The PP test is estimated based on Bartlett Kernel with Newey-West bandwidth (Newey and West, 1987ab). The results of the ADF, PP and KPSS approaches imply that the logarithmic forms of the variables under study (i.e. LRGDP, LTE, LLTS and LBTS) are not stationary at conventional levels at any accepted level of significance (i.e. 5 percent significance level or above). Furthermore, the null hypothesis is not rejected even at first differences for the variables under study presenting similar results with the test at levels. However, when the variables were tested in 2nd differences, the null hypothesis was strongly rejected in the case of ADF and PP test, while the KPSS test failed to reject the null hypothesis of stationarity even at 2nd differences. So, it is concluded that results indicate that all variables are integrated of order two i.e. $I_{(2)}$ for the case of Greece. Therefore, we are allowed to proceed with the cointegration test, since the selected variables appear to have stationarity properties.

Table 1: Augmented Dickey – Fuller and Phillips-Perron Unit Root Test Results

Variables	ADF test	PP test	KPSS test
LRGDP	(a) -0.5959 (b) -2.5510 (c) -4.8992***	(a) -0.7616 (b) -2.6046 (c) -5.2127***	(a) 0.6701** (b) 0.1605 (c) 0.2052
LTE	(a) -2.0410 (b) -4.5809*** (c) -5.7501***	(a) -1.8813 (b) -3.9406*** (c) -8.1465***	(a) 0.1546 (b) 0.3219 (c) 0.1946
LREER	(a) -2.1658 (b) -3.1040** (c) -6.4190***	(a) -2.0876 (b) -3.1041 (c) -6.4988***	(a) 0.3014 (b) 0.1787 (c) 0.0825
LLTS	(a) -1.8053 (b) -3.5191** (c) -4.8273***	(a) -1.8053 (b) -3.3240** (c) -10.2537***	(a) 0.6660** (b) 0.1922 (c) 0.5000**
LBTS	(a) -2.5130 (b) -4.0799*** (c) -5.2092***	(a) -2.2126 (b) -4.2324*** (c) -14.1626***	(a) 0.1979 (b) 0.3167 (c) 0.4332**

Note: The variables in log levels are labeled (a), in 1st differences are labeled (b) and in 2nd differences are labeled (c). *, **, *** indicates significance at 10%, 5% and 1% respectively. This note also applies to the subsequent tables.

Tables 2 and 3 provide the results from the application of the Johansen cointegration test in order to verify whether the selected variables are cointegrated. The testing hypothesis is the null of non-cointegration against the alternative that there is a cointegrating relationship. Table 2 tabulates the results for the aggregate model (LRGDP, LTE and LREER) indicating that there is a long-run relationship between the variables, since both the trace and the maximum eigenvalue tests reject the hypothesis of no cointegration at the 5 percent significance level according to critical value (C.V.) estimates. The results shown in Table 2 suggest that the number of statistically significant cointegrating vectors is equal to 1. Moreover, the coefficients' estimates in equilibrium relationships, which are essentially the long-run estimated elasticities relative to the logarithmic form of real GDP, suggest that both variables are statistically significant (figures in brackets are t-statistics) and inelastic to the economic growth of Greece. Furthermore, Table 3 presents the results from the application of the disaggregate model (LRGDP, LREER, LLTS and LBTS). These findings also imply that the number of cointegrated vectors is equal to 1. On the other hand, although all variables are statistically significant, only LLTS appears inelastic to the real output. Therefore, LREER and LBTS coefficient estimates suggest that these variables are elastic to RGDP.

Table 2: Johansen Cointegration Test Results for (LRGDP, LREER and LTE)

Trace test			
Null Hypothesis	**Alternative Hypothesis**	**Test Statistic**	**P-value**
r* = 0	r ≤ 1	27.9629**	0.0164
r = 1	r ≤ 2	6.9259	0.3325
r = 2	r ≤ 3	1.6968	0.2264
Max. eigenvalue test			
Null Hypothesis	**Alternative Hypothesis**	**Test Statistic**	**P-value**
r = 0	r = 1	21.0370**	0.0157
r = 1	r = 2	5.2291	0.4456
r = 2	r = 3	1.6968	0.2264
Cointegrating Vector: LRGDP = + 0.5448 LTE*** - 0.6095 LREER*** [3.496] [-4.2198]			

Note: * r is the number of cointegrating vectors under the null hypothesis. Figures in brackets are t -statistics. This note also applies to Table 3.

Table 3: Johansen Cointegration Test Results for (LRGDP, LREER, LLTS and LBTS)

Trace test			
Null Hypothesis	**Alternative Hypothesis**	**Test Statistic**	**P-value**
r* = 0	r ≤ 1	50.9801***	0.0029
r = 1	r ≤ 2	207.650	0.1301
r = 2	r ≤ 3	67.151	0.3544
Max. eigenvalue test			
Null Hypothesis	**Alternative Hypothesis**	**Test Statistic**	**P-value**
r = 0	r = 1	30.2151***	0.0067
r = 1	r = 2	140.499	0.1678
r = 2	r = 3	67.054	0.2762
Cointegrating Vector: LRGDP = - 1.6763 LREER*** + 0.1491 LLTS*** + 3.5855LBTS*** [-3.5397] [3.8863] [3.9658]			

Moreover, after determining that the logarithms of the variables are cointegrated for both cases of the aggregate and disaggregate models, estimation of VAR model arises that includes a mechanism of an error-correction (VECM). In such a case, the long-run cointegration relationships are of the following forms:

$$\Delta LRGDP = lagged(\Delta LTE_t, \Delta LREER_t) + \lambda u_{t-1} + V_t \quad \text{(Model 11)}$$

$$\Delta LRGDP = lagged(\Delta LBTS_t, \Delta LLTS_t, \Delta LBTS) + \lambda u_{t-1} + V_t \quad \text{(Model 12)}$$

Where, (Δ) is reported to differences of the variables, (u_{t-1}) are the estimated residuals from the cointegrating equation (i.e. long-run relationship), (λ) is the short-run parameter and (V_t) is the white noise disturbance term.

Table 4 reports the results from the application of the aggregated VAR model. Assuming there is indeed only one cointegrating relationship, the empirical evidence suggest that the error correction term (ECT) is strongly significant for the cases of LTE and LREER, implying that all variables return to the long-run equilibrium whenever there is a deviation from their cointegrating relationship, although this model failed to support long-run relationships between TE and RGDP. However, results indicate unidirectional causal links from total TE to RGDP in the short-run documenting the significance of the tourism-growth nexus for the case of Greece in the short-run. These findings are in line with previous results of Zortuk (2009), Gunduz and Hatemi (2005) and Brida et al. (2009).

Table 4: Granger Causality Results based on VECM for (LRGDP, LREER and LTE)

Dependent Variable	Sources of Causation			
	Short run		Long run	
	ΔLRGDP	ΔLREER	ΔLTE	ECT
ΔLRGDP	-	0.476 (1.8968)	-0.172 (-2.419)**	-0.084 (-1.553)
ΔLREER	-1.001 (-2.897)***	-	-0.134 (-2.157)**	-0.205 (-4.341)***
ΔLTE	-1.122 (-0.530)	4.344 (3.234)***	-	-0.590 (-2.036)**

Note: ECT is the error-correction term. Figures in parentheses are t-statistics. This note also applies to Table 5.

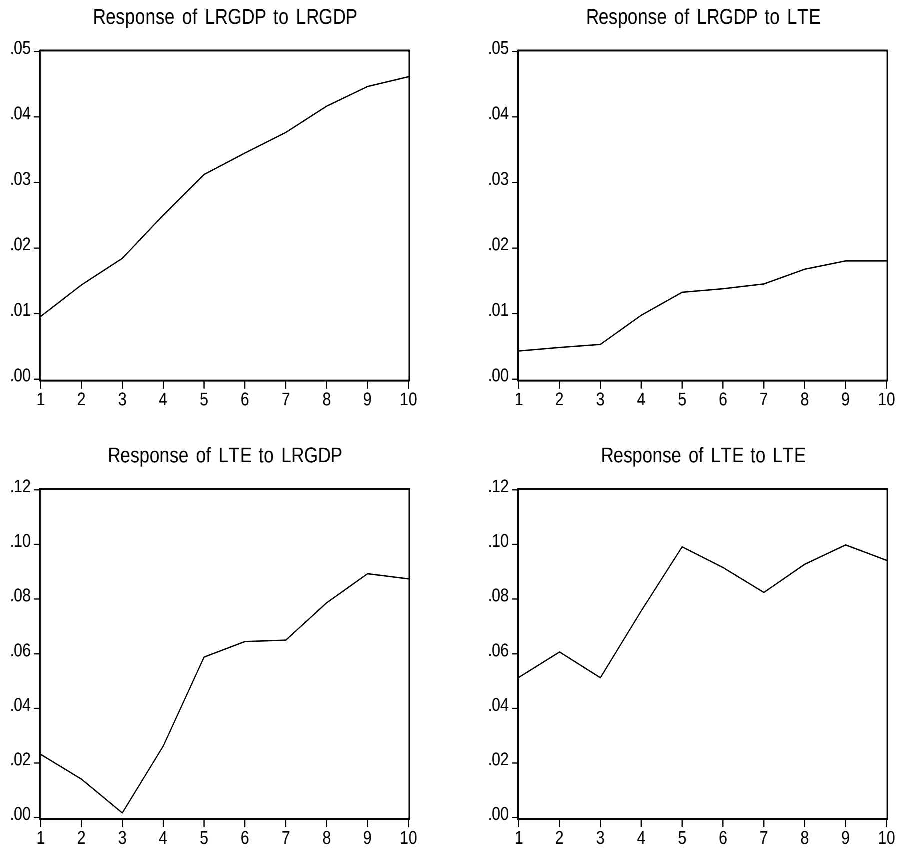
Results for the disaggregated model (LRGDP, LREER, LLTS and LBTS) are presented in Table 5. Robust empirical evidence imply that there are bidirectional causal links between LBTS and real growth in the long-run, since ECT for these variables are statistically significant. Furthermore, in the short-run, estimations imply unidirectional causal relationships from LLTS to RGDP and from LLTS to LBTS. These findings suggest that Leisure Travel and Tourism Spending promote Greece's economic growth. Moreover, the links between LLTS and LBTS could suggest that leisure tourism impacts positively and therefore promotes business tourism. These results could be interpreted on the basis that promotion of leisure tourism in Greece (which in Greece is by far larger than the business tourism sector according to Hellenic Statistical Authority data) can be seen as a "cross-selling instrument" for the further development of the business tourism sector too.

Table 5: Granger Causality Results based on VECM for (LRGDP, LREER, LLTS and LBTS)

	Sources of Causation				
	Short run				Long run
Dependent Variable	ΔLRGDP	ΔLREER	ΔLLTS	ΔLBTS	ECT
ΔLRGDP	-	-0.988 (-3.023)***	0.195 (3.001)***	-0.008 (-0.371)	0.153 (3.095)***
ΔLREER	-0.181 (-0.535)	-	0.054 (0.566)	-0.068 (-2.101)**	-0.126 (-1.740)
ΔLLTS	2.004 (1.098)	-0.654 (-0.254)	-	-0.088 (-0.499)	0.186 (0.477)
ΔLBTS	1.148 (0.523)	-7.628 (-2.462)**	1.331 (2.156)**	-	1.115 (2.372)**

After determining the directions of causality from the application of the VAR/VEC aggregated and disaggregated models, Figure 1 shows how a shock to one variable affects another variable and how long the effect lasts. For this purpose, this study employs the generalised impulse responses following Koop et al. (1996) and Pesaran and Shin (1998) innovative studies. Impulse responses of the variables are illustrated for a ten year period. Impulse responses of the variables are presented for 10 years. These graphs indicate for the case of Greece that an unexpected shock to total tourism expenditure leads to a jump in LRGDP from the 3rd period and continues to grow over the period under study. This is consistent with the hypothesis that economic growth in Greece is tourism-dependent. Similarly, an unanticipated shock to LRGDP results to a jump in LTE, which continues to rise significantly from the 3rd period over the entire horizon.

Figure 1: Impulse Responses between (LRGDP and LTE)



The evidence provided in Figure 2 reveals that in response to a shock to both LLTS and LBTS respectively, there is an initial jump in LRGDP which continues to grow during the whole period. Indeed, the response of LRGDP is very similar. In response to a shock to LRGDP, both variables (i.e. LLTS and LBTS) are levelling up from the beginning until the end of the period under study following the same direction, although with different magnitudes.

Figure 2: Impulse Responses between (LRGDP, LLTS and LBTS)

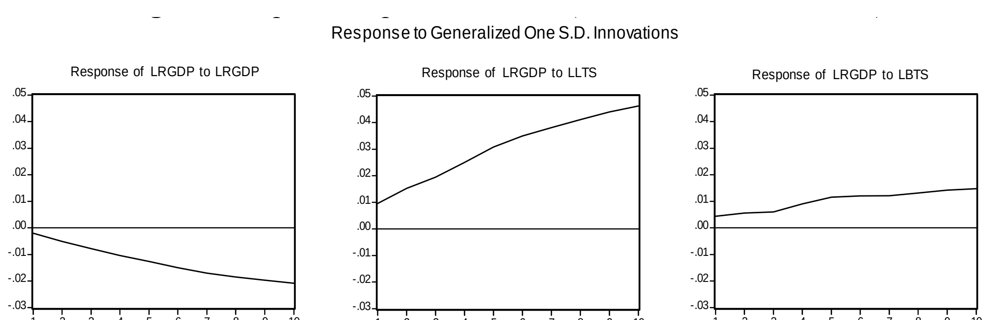
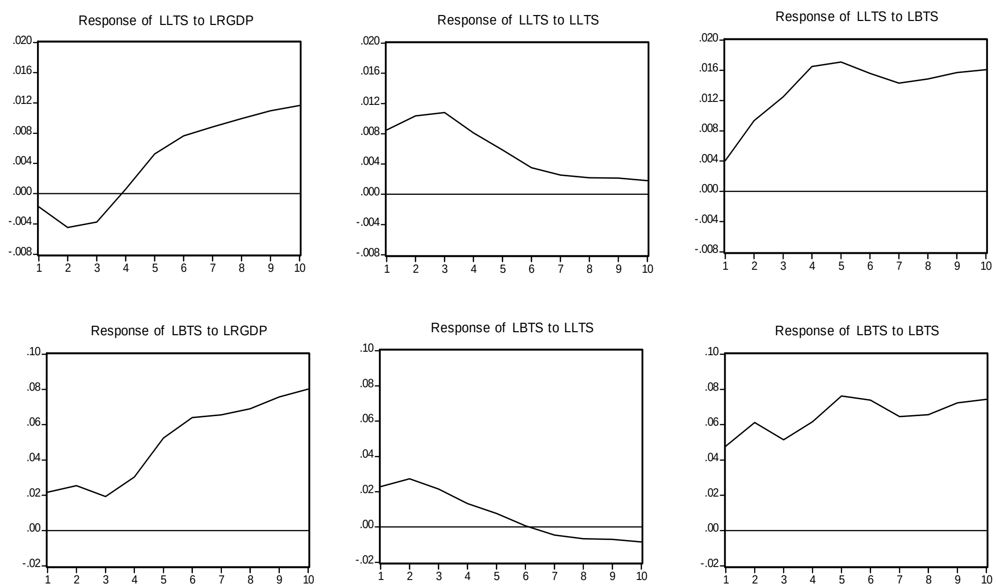


Figure 2: Impulse Responses between (LRGDP, LLTS and LBTS) - continued



The next level of this study's analysis is tabulated in Table 6, which presents the estimates for the variance decomposition of the aggregate model (LRGDP, LREER and LTE). The evidence indicates that LTE explains little of the future variation of LRGDP and that this weak explanatory variable remains during the period under research, reaching only 7% at the end of the forecasting period. However, real output explains a considerable percentage of the LTE's future variation from year 1 (20.3%). Moreover, although presenting a drop-off until year 5, the explanatory power of LRGDP increases significantly from year 7 and climbs to 53.6% by the tenth year. In other words, by the end of the 10 year period, the real output explains almost the same of LTE's variation than LTE alone.

Table 6: Variance Decompositions for Model (LRGDP, LREER and LTE)

Variance decomposition for LRGDP				
Period	**Standard Error**	**LRGDP**	**LREER**	**LTE**
1	0.010	100.000	0.000	0.000
5	0.049	94.855	4.326	0.819
10	0.107	92.870	6.082	7.048
Variance decomposition for LTE				
Period	**Standard Error**	**LRGDP**	**LREER**	**LTE**
1	0.008	20.281	25.283	54.436
5	0.037	17.289	9.982	72.729
10	0.059	53.620	3.269	55.111

In table 7, with respect to LRGDP, Leisure Travel and Tourism Spending accounts only for the 8.7% percentage of real output's future variability showing minimal results with insignificant variations until year 6. However, as the forecast period widens, the explanatory power increases leading to the considerable 22.2% by year 10. Further analysis shows that although LBTS presents weak explanatory power from year 1, it increases significantly reaching 29.9% in year 5 and 29.2% by year 10. Moreover, the real output accounts for a considerable 17.8% of LLTS's future variability, which shows a small drop-off thereafter resulting to 16.1% by the end of the 10-year period. Finally, concerning LBTS, the explanatory power of RGDP is reasonably stable fluctuating between 18% and 23% over the 10-year horizon. Thus, the variance decomposition method provides evidence reporting that economic growth has forecasting properties for growth in tourism in both the total tourism expenditure and in sub-categories (i.e. LLTS and LBTS) and vice versa.

Table 7: Variance Decompositions for Model (LRGDP, LREER, LLTS and LBTS)

Variance decomposition for LRGDP					
Period	**Standard Error**	**LRGDP**	**LREER**	**LLTS**	**LBTS**
1	0.008	100.000	0.000	0.000	0.000
5	0.042	59.962	7.477	8.702	29.859
10	0.065	59.582	9.042	22.214	29.161
Variance decomposition for LLTS					
Period	**Standard Error**	**LRGDP**	**LREER**	**LLTS**	**LBTS**
1	0.011	4.363	71.072	24.564	0.000
5	0.042	17.788	60.062	21.044	6.106
10	0.060	16.077	61.786	22.927	5.211
Variance decomposition for LBTS					
Period	**Standard Error**	**LRGDP**	**LREER**	**LLTS**	**LBTS**
1	0.061	18.211	1.083	6.938	73.769
5	0.170	20.395	10.511	22.229	46.864
10	0.236	19.145	17.923	19.129	43.803

The presentation and analysis of the empirical results ends by providing forecasts generated using the VAR models, estimated for total tourism expenditure and sub-categories of tourism spending respectively. This study also attempts to forecast real output. The forecast horizon is 9 years (2012-2020) and results are tabulated in Table 8 (in bill. USD) and Table 9 (in percentage growth).

The forecasts of total tourism expenditure suggest that it will grow at an annual average rate of 5.9%. This is remarkably similar to a corresponding rate of 5.8% in the previous period (2003-2011). In other words, this study's forecasts suggest that the annual rate of tourism expenditure will not change significantly the remainder of the 2010 decade. Moreover, our findings from this model indicate that RGDP will grow at half the rate of total tourism expenditure. These findings support the results from our long-run cointegrating vector for this model in Table 2, which indicated that the elasticity of output with respect to total tourism expenditure was 0.54.

Furthermore, an examination of the forecasts for the two-sector model suggests that LTS and BTS will grow at average annual rates of 0.8% and 3.5% respectively for the period under forecast, presenting controversial results, since the previous period (2003-2011) LTS showed a significantly higher average growth of 8.4% and BTS a much lower one, reaching only 0.42% on average. In addition, this model predicts that real output will grow at 4% annually, a much higher percentage comparing to the 1.8% reported during the previous period of 2003-2011.

An attempt to interpret these forecasts indicates that both models imply that real output will grow at a higher rate than in the previous period, which is reasonable considering the severe sovereign debt crisis that emerged in Greece since 2008 and the following recession that Greece faces until present. Total tourism expenditure presents a steady growth on average compared to the period 2003-2011, showing signs of positive growth and implies that Greece has significant potential in this sector as a whole and therefore tourism can become a key driver of development supporting the country's efforts towards long-term stability. Finally, it is of special interest the very small growth rate that LTS forecasts present (only 0.8%) compared to the 8.38% of the previous period and the significant increase of BTS from 0.42% on average for the period 2003-2011 to 3.5% for the period under forecast. Therefore, these results imply a swift of tourism growth in Greece from the leisure sector towards the business tourism sector.

Table 8: Forecasts of (RGDP, TE, LTS and BTS) in bill. USD

Year	**VAR (LRGDP, LREER and LTE)**		**VAR (LRGDP, LREER, LLTS and LBTS)**		
	TE	**RGDP**	**LTS**	**BTS**	**RGDP**
2012	25,004	159,815	30,834	1,969	162,355
2013	20,426	158,73	39,605	2,177	177,391

Table 8: Forecasts of (RGDP, TE, LTS and BTS) in bill. USD - continued

2014	19,561	160,745	37,152	2,379	188,879
2015	23,523	174,621	32,079	2,269	183,556
2016	28,129	182,593	32,339	1,787	180,351
2017	29,139	187,639	40,215	1,671	189,517
2018	30,785	192,862	53,799	2,238	207,551
2019	34,63	198,651	59,291	2,728	221,028
2020	37,371	203,115	52,243	2,321	220,142

Table 9: Forecasts of (RGDP, TE, LTS and BTS) in Growth (%)

	VAR		**VAR**		
	(LRGDP, LREER and LTE)		**(LRGDP, LREER, LLTS and LBTS)**		
Year	**TE**	**RGDP**	**LTS**	**BTS**	**RGDP**
2012	-	-	-	-	-
2013	-18,3	-0,7	2,8	10,6	9,3
2014	-4,2	1,3	-0,6	9,3	6,5
2015	20,3	8,6	-1,4	-4,6	-2,8
2016	19,6	4,6	0,1	-21,2	-1,7
2017	3,6	2,8	2,4	-6,5	5,1
2018	5,6	2,8	3,4	33,9	9,5
2019	12,5	3,0	1,0	21,9	6,5
2020	7,9	2,2	-1,2	-14,9	-0,4
Av.Growth	5,9	3,1	0,8	3,5	4,0

4. Summary and Concluding Remarks

This study focuses on the impact of tourism on the economic growth of Greece for the period 1988-2011 by utilizing models at aggregated and disaggregated levels. To assess these relationships at aggregate level, a trivariate model was formed consisting of total tourism expenditure (TE) and real output (RGDP) with real effective exchange rate (REER). Furthermore, in order to investigate the impact of leisure and business tourism in the real output of Greece, a disaggregated model was employed by assuming two significant sources of tourism in Greece; leisure and business tourism. A second model was employed, which treated leisure travel and tourism spending (LTS), business travel and tourism spending (BTS), RGDP and REER as separate inputs. Within this framework, multivariate cointegration techniques and innovation accounting were employed. The study provided exhaustive empirical evidence from the application of unit root tests (ADF, PP and KPSS), Johansen cointegration test, VAR model with an error-correction mechanism, impulse responses, variance decomposition and finally forecasts for real output and total tourism expenditure (and its components; LTS and BTS) on the basis of the VAR/VEC models.

The empirical results indicated that all variables are integrated of order two and that a long-run relationship exists between tourism expenditure (in total and broken sectors) and real GDP. Moreover, it was noted that all variables return to the long-run equilibrium whenever there is a deviation from their cointegrating relationship. Furthermore, this study documented the significant bidirectional causal links between real output and BTS in the long-run implying that business tourism emerges as a significant factor of Greece's tourism sector. Short-run dynamics support the unidirectional granger causal relationship from total tourism expenditure to RGDP (aggregate model) implying that the economy of Greece is strongly tourism-depended, which is in line with Dritsakis' (2004) conclusions for Greece. However, in contrast to Dritsakis (2004) and in line to Kasimati (2011), this study fails to support the bidirectional causal relationships between TE and RGDP from the application of the aggregate model. In addition, we documented one-way causalities from LTS to real output and to BTS in the short-run, implying the significant impact of leisure tourism on growth and that leisure tourism could affect positively the growth of business tourism in Greece respectively. These findings were further supported from the application of impulse responses, since graphs support the similar behaviour of TE and RGDP from unanticipated shocks to each other and similar results occur from the application of impulse responses in the cases of LTS, BTS and real output. The generated forecasts based on the VAR/VEC models for the period 2012-2020 verify that TE will continue to grow at a steady pace in comparison to the previous period of 2003-2011. Furthermore, these calculations verified the elasticity of RGDP to TE (which was found equal to 0.54) supporting the results from the long-run cointegrating vector. LTS will grow at the minimal rate of 0.8 presenting slower average growth. On the contrary, BTS presents rapid average growth rate, evidence which could imply a swift of international tourism in Greece from leisure to business tourism sector. Finally, both models' forecasts (aggregate and disaggregate) imply that Greece will show higher positive growth rates on average in the period 2012-2020 than in the previous period, which was marked by the severe recession emerged since 2008.

References

[1] Balaguer, J. and M. Cantavella-Jordà, 2002. "Tourism as a Long-run Economic Growth Factor: The Spanish Case", *Applied Economics* 34, pp. 877-884.

[2] Brida, G.J., S.J. Pereyra, A.D. Riso, S.J.M. Devesa and S.J. Aguirre, 2009. "The Tourism-led Growth Hypothesis: Empirical Evidence from Colombia", *Tourismos: An International Multidisciplinary Journal of Tourism* 4, pp.13-27.

[3] Dickey, D.A. and W.A. Fuller, 1979. "Distribution of the Estimators for Autoregressive Time Series with a Unit Root", *Journal of the American Statistical Association* 74, pp. 427-431.

[4] Dritsakis, N., 2004. "Tourism as a Long-run Economic Growth Factor: An Empirical Investigation for Greece using Causality Analysis", *Tourism Economics,* 10, pp. 305-316.

[5] Durbarry, R., 2004. "Tourism and Economic Growth: The Case of Mauritius", *Tourism Economics* 10, pp. 389-401.

[6] Engle, R.F. and C.W.J. Granger, 1987. "Co-integration and Error-correction: Representation, Estimation and Testing", *Econometrica* 55, pp. 251-256.

[7] Eugenio-Martin, J.L., and N.M. Morales, 2004. "Tourism and Economic Growth in Latin American Countries: A Panel Data Approach", *Social Science Research Network Electronic Paper*.

[8] Gani, A., 1998. "Macroeconomic Determinants of Growth in the South Pacific Island Economies", *Applied Economics Letters* 5, pp.747-749.

[9] Granger, C. W. J., 1969. "Investigating Causal Relations by Econometric Models and Cross-spectral Methods", *Econometrica* 37, pp. 424-438.

[10] Gunduz, L., and A. Hatemi-J., 2005. "Is the Tourism-led Growth Hypothesis Valid for Turkey?", *Applied Economics Letters* 12, pp. 499-504.

[11] Johansen, S., and K. Juselius, 1990. "Maximum Likelihood Estimation and Inference on Cointegration with Applications for the Demand for Money", *Oxford Bulletin of Economics and Statistics* 52, pp. 169-210.

[12] Johansen, S., 1988. "Statistical Analysis of Cointegrating Vectors", *Journal of Economic Dynamics and Control* 12, pp. 231-254.

[13] Johansen, S., 1991. "Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models", *Econometrics* 59, pp. 1551-1580.

[14] Kasimati, E., 2011. "Economic Impact of Tourism on Greece's Economy: Cointegration and Causality Analysis", *International Research Journal of Finance and Economics* 79, pp. 79-85.

[15] Kim, H. J., M. Chen, and S. Jan, 2006. "Tourism Expansion and Economic Development: The Case of Taiwan", *Tourism Management* 27, pp. 925-33.

[16] Koop, G., M.H. Pesaran, and S.M. Potter, 1996. "Impulse Responses Analysis in Non-linear Multivariate Models", *Journal of Econometrics* 74, pp. 119-147.

[17] Kwiatkowski, D., C.B..P. Peter, P. Schmidt and Y. Shin, 1992. "Testing the Null Hypothesis of Stationary against the Alternative of a Unit Root", *Journal of Econometrics* 54, pp. 159-178.

[18] Lee, C.C., and C.P. Chang, 2008. "Tourism Development and Economic Growth: A Closer Look at Panels", *Tourism management* 29, pp. 180-192.

[19] Louca, C., 2006. "Income and Expenditure in the Tourism Industry: Time Series Evidence from Cyprus", *Tourism Economics* 12, pp. 603-617.

[20] MacKinnon, J.G., 1991. "*Critical Values for Cointegration Tests*, Chapter 13 in R. F. Engle and C. W. J. Granger (eds.), *Long-run Economic Relationships: Readings in Cointegration*, Oxford University Press, Oxford.

[21] MacKinnon, J.G., 1996. "Numerical Distribution Functions for Unit Root and Co-integration Tests", *Journal of Applied Econometrics* 11, pp. 601-618.

[22] Newey, W. and W. Kenneth, 1987a. "Hypothesis Testing with Efficient Method of Moments Estimation", *International Economic Review* 28, pp. 777–787.

[23] Newey, W. and W. Kenneth, 1987b. "A Simple Positive Semi-Definite, Heteroskedasticity and Autocorrelation Consistent Covariance Matrix", *Econometrica* 55, pp. 703–708.

[24] Noriko, I. and F. Mototsugu, 2007. "Impacts of Tourism and Fiscal Expenditure to Remote Islands: The Case of the Amami Islands in Japan", *Applied Economics Letter* 14, pp. 661- 666.

[25] Oh, C., 2005. "The Contribution of Tourism Development to Economic Growth in the Korean Economy", *Tourism Management* 26, pp. 39-44.

[26] Pesaran, H.H. and Y. Shin, 1998. "Generalised Impulses Response Analysis in Linear Multivariate Models", *Economics Letters* 58, pp. 17-29.

[27] Phillips, P. and P. Perron, 1988. "Testing for Unit Root in the Time Series Regression", *Biometrika* 75, pp. 336-340.

[28] Proença, S. and E. Soukiazis, 2005. "Tourism as an Alternative Source of Regional Growth in Portugal: A Panel Data Analysis at NUTS II and III levels", *Portuguese Economic Journal* 6, pp. 121-135.

[29] Schwartz, R., 1978. "Estimating the Dimension of a Model", *Annuals of Statistics* 6, pp. 461-464.

[30] Shan, J. and K. Wilson, 2001. "Causality between Trade and Tourism: Empirical Evidence from China", *Applied Economics Letters* 8, pp. 279-283.

[31] Zortuk, M., 2009. "Economic Impact of Tourism on Turkey's Economy: Evidence from Cointegration Tests", *International Research Journal of Finance and Economics* 25, pp. 231-239.