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Economic Impact of Tourism on Greece's Economy: Cointegration and Causality Analysis

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Abstract

Tourism is one of the growing service sectors in Greece. In 2011 the direct and indirect contribution of the Greek tourism industry to total GDP and employment is expected to reach 15.8% and 18.4% respectively (WTTC, 2011). The objective of this paper is to analyse the role of tourism in the Greek economic growth. We use a trivariate model of real Gross Domestic Product (GDP), international tourist arrivals and real effective exchange rate to investigate the relationship between tourism and economic growth. By using annual data for Greece for the period of 1960-2010, our results reveal that there is a cointegrating relationship between tourism and economic growth. However, contrary to the literature our results using Granger Causality Test based on Vector Error Correction Model (VECM) indicate that there is no directional impact between tourism and GDP growth in Greece.

Keywords: Tourism Arrivals; Economic Growth; Cointegration; VECM; Greece

1. Introduction

In recent years, researchers have been interested in the relationship between tourism and economic growth, empirically supporting a direct effect from the first to the second. A general consensus has emerged that it increases foreign exchange income, creates employment opportunities, stimulates the growth of the tourism industry and therefore triggers overall economic growth. As such, tourism development has become a common awareness in political authorities worldwide.

Table 1 displays the results of the analyses on tourism development and economic growth relationship conducted for different country/countries in different years employing different methods. In their analyses conducted on Turkish economy, Zortuk (2009) and Gunduz and Hatemi-J (2005) concluded that the increase in tourism income effects economic growth. 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, the analyses by Dritsakis (2004) on Greece, Durbarry (2004) on Mauritius and Balaguer and Cantavella-Jorda (2002) on 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 countries including both OECD countries and non-OECD countries, found that there is a unidirectional relationship running from tourism towards growth for OECD countries whereas a bidirectional causality relationship exists for non-OECD countries.

Table 1: Comparison of the Empirical Results for Tourism Development and Economic Growth

Samples	Authors	Empirical Method	Period	Countries	Causal Relationship		
One Country							
	Zortuk (2009)	VECM	1992-2008	Turkey	Tourism	=>	Growth
	Oh (2005)	Granger Causality	1975-2001	Korea	Growth	=>	Tourism
	Gunduz & Hatemi-J (2005)	Vector Autoregressive Model (VAR)	1963-2002	Turkey	Tourism	=>	Growth
	Dritsakis (2004)	VECM	1960-2000	Greece	Tourism	<=>	Growth
	Durbarry (2004)	VECM	1952-1999	Mauritius	Tourism	<=>	Growth
	Balaguer & Cantavella-Jorda (2002)	VECM	1975-1997	Spain	Tourism	<=>	Growth
Cross-Section							
	Eugenio-Martin & Morales (2004)	Panel Generalised Least Squares (GLS)	1980-1997	Latin American Countries	Tourism	=>	Growth*
	Lee & Chang (2008)	Panel cointegration	1990-2002	OECD &	Tourism	=>	Growth
				non-OECD countries	Tourism	<=>	Growth

Notes: «Tourism=>Growth» denotes causality running from tourism development to economic growth. «Growth=>Tourism» denotes causality running from economic growth to tourism development. «Tourism<=>Growth» denotes bidirectional causality between tourism development and economic growth.
* Exists for low and middle income countries but not for high income countries.

Adding to previous literature, the aim of this paper is to investigate whether tourism has really contributed to the economic growth in Greece. The rest of the paper is organized as follows. Section 2 describes the data and a presentation of the methodology. Section 3 contains empirical results and their interpretation. Finally, section 4 offers a summary and conclusions.

2. Data and Methodology

There are several alternatives to measure the volume of tourism. One of them is tourism receipt, which is the volume of earnings generated by foreign visitors. A second one is the number of nights spent by visitors from abroad. A third one is the number of tourist arrivals. However, this study makes use of tourist arrivals to represent tourism, since the problem of multicolinearity emerges when tourism receipts are used. Given that the tourism-led growth hypothesis is about contribution of tourism to the economic growth, real GDP is also included to represent the economic growth. Therefore, we estimate the following equation:

$$\ln GDPR_t = \alpha + \alpha_1 \ln TAR_t + \alpha_2 \ln REXR_t + \varepsilon_t$$

where,

GDPR = natural logarithm of Gross Domestic Product at constant prices,

TAR= natural logarithm of tourist arrivals,

REXR= natural logarithm of real effective exchange rate,

ε = the error term with the conventional statistical properties.

Many authors, such as Oh (2005), Gunduz and Hatemi-J. (2005), Dritsakis (2004) and Balaguer and Cantavella-Jorda (2002) suggest the inclusion of real exchange effective rate in the discussion of international tourism in order to deal with potential overlooked variable problems and to account for external competitiveness.

The data are annual over the period 1960 to 2010, obtaining from the annual national accounts data of the European Commission AMECO (Annual Macro-Economic Data) database and the Hellenic Statistical Authority.

The modeling strategy adopted in this study is based on the now widely used Engle-Granger methodology (Engle and Granger, 1987). Testing for cointegration involves two steps: the first step, in our methodology, is to determine whether the variables we use are stationary or non-stationary. If a series is non-stationary, then all the usual regression results suffer from spurious regression problem. To this end, the augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests of stationarity are performed both on the levels and the first differences of the variables (Dickey and Fuller, 1981; Phillips and Perron, 1988). Both the ADF and PP unit root tests use the various specifications of the following regression:

$$\Delta x_t = \alpha + \beta x_{t-1} + \lambda_t + \sum_{i=1}^{k} \delta_i \Delta x_{t-i} + u_t$$

Where,

x_t = the level of the variable under consideration,

t= time term,

u_t = normally distributed random error term with zero mean and constant variance.

In the second stage, cointegration test is performed to identify the existence of a long-run relationship. Johansen (1988) and Johansen and Juselius (1990) procedures set out a model in error-correction form as follows:

$$\Delta Z_t = \Gamma_1 \Delta Z_{t-1} + ... + \Gamma_{k-1} \Delta Z_{t-k+1} + \Pi Z_{t-1} + \mu + \Psi D_t + \varepsilon_t$$

Where,

Z_t = a $p \ x \ 1$ vector of stochastic variables, comprised of real GDP, tourist arrivals and real effective exchange rate,

μ = a constant term,

D_t = a vector of non stochastic variables,

k= the lag length

t = 1,…,T

$\varepsilon_t \sim Niid_P(0, \Sigma)$

If the data are integrated of order one I(1), then the matrix Π has to be reduced rank r:

$$\prod = \alpha\beta'$$

where α and β are $p \ x \ r$ matrices and r<p and where $\beta' Z_t$ are the r long-run cointegration relations and α represents the error-correction parameters which can be interpreted as speed of adjustment parameters.

Johansen (1988) and Johansen and Juselius (1990) propose two test statistics for testing the number of cointegrating vectors (or the rank of Π) in the VAR model, the trace (Tr) and the maximum eigenvalue (*L-max*) test. The likelihood ratio statistic for the trace test is

$$Tr = -T \sum_{i=r+1}^{p-2} \ln(1 - \hat{\lambda}_i)$$

where $\hat{\lambda}_{r+1},...,\hat{\lambda}_p$ are the estimated p-r smallest eigenvalues.

The null hypothesis to be tested is that there are at most r cointegrating vectors. That is, the number of cointegrating vectors is less than or equal to r, where r is 0,1, or 2…, and so forth. In each case, the null hypothesis is tested against the general alternative. Alternatively, the L-max statistic is

$$L - \max = -T \ln(1 - \hat{\lambda}_{r+1})$$

In this test, the null hypothesis of *r* cointegrating vectors is tested against the alternative of *r+1* cointegrating vectors. Thus, the null hypothesis *r=0* is tested against the alternative that *r=1*, then *r=1* against the alternative *r=2*, and so forth.

3. Empirical Analysis and Findings

Many macroeconomic time series contain unit roots dominated by stochastic trends as developed by Nelson and Plosser (1982). Knowing that unit root tests are sensitive to the presence of deterministic regressors, three models are estimated. The most general model with an intercept and time trend is estimated first and restrictive models, i.e. with an intercept and without either intercept or trend, respectively, are estimated thereafter. Unit root tests for each variable then is performed on both levels and first differences of variables. Table 2 reports the results for both the ADF and PP test results for only the model with an intercept and trend. It can be seen that the null hypothesis of non-stationarity cannot be rejected at the 5% level for the levels of all the variables. However, when first differences are taken, the null hypothesis of non-stationarity is rejected for all the variables. Hence it is concluded that the three variables are integrated of order one I(1). This result is consistent to the finding of Nelson and Plosser (1982) that most of the macroeconomic variables are non-stationary at level, but they are stationary after first differencing.

Table 2: Results of unit root tests

Variable	Augmented Dickey-Fuller (ADF)		Phillips-Perron (PP)	
	Levels	**First differences**	**Levels**	**First differences**
lnGDPR	2.309 (0.994)	-3.540 (0.000)	3.223 (0.999)	-3.445 (0.000)
lnTAR	3.486 (0.999)	-5.347 (0.000)	3.486 (0.999)	-5.358 (0.000)
lnREXR	-0.728 (0.396)	-6.612 (0.000)	-0.703 (0.407)	-6.612 (0.000)
Critical Values				
1%	-2.613		-2.613	
5%	-1.948		-1.948	
10%	-1.613		-1.613	

Note: Probabilities are in parentheses. The optimal lags for the ADF tests are selected based on optimizing Schwarz Criterion using a range of lags. Tests for unit roots have been carried out on EViews 5.0.

Given that all the variables are integrated of the same order, the next step is to test for cointegration using Johansen's trivariate maximum likelihood procedure. Johansen (1988) proposes two likelihood ratio tests for the cointegration rank, a maximum eigenvalue test and a trace test. Results of both tests are reported in Table 3, where *r* represents the number of cointegrating vectors. When applying the cointegration test, we choose the case 3 assumption where the level data has a linear trend but the cointegrating equations have only intercepts. We notice that the null hypothesis of no cointegration relationships is rejected against the alternative of one cointegrating relationship at the 5% level. These results show that the single-equation estimation for an increase in tourism can capture the long-run relationship. The interpretation of the elasticity of GDP growth with respect to tourism should be considered as follows: a 1% of sustained growth rate in arrivals would imply an estimated increase of almost 0.62% real GDP in the long run.

Table 3: Results of Johansen's maximum likelihood tests for multiple cointegrating relationships

Null Hypothesis	Eigenvalue	Trace statistic	5% critical value (trace)	Max-Eigen statistic	5% critical value (Max-Eigen)
None (r=0)	0.554	46.55	29.80	35.49	21.13
At most 1 ($r \leq 1$)	0.172	11.06	15.49	8.33	14.26
At most 2 ($r \leq 2$)	0.060	2.73	3.84	2.72	3.84
Normalised cointegrating coefficients					
Variables			**Cointegrating vector**		
lnGDPR				-1.000	
lnTAR				0.619 (0.036)	
lnREXR				0.929 (0.259)	

Note: Coefficient estimates express different elasticities. Standard errors are in parentheses.
lnGDPR, natural logarithm of real gross domestic product; lnTAR, natural logarithm of tourist arrivals; lnREXR, natural logarithm of real effective exchange rate.

We also perform Wald coefficient tests to investigate the significance estimated parameters. Table 4 reports the outcomes of the parameter restriction tests for economic growth, tourism and exchange rate variables. The restriction is that each coefficient of the corresponding variables is zero. This hypothesis is rejected for lnGDPR, lnTAR for all levels of significance but is not rejected for lnREXR.

Table 4: Wald Coefficient Test for the significance of estimated parameter

Parameter Restriction	Chi-Squared Test Statistic	Probability
$\alpha = 0$	28.411*	0.000
$\alpha_1 = 0$	882.64*	0.000
$\alpha_2 = 0$	2.077	0.150

Note: * Indicates significance at 1%, 5% and 10% level.

Since this research note attempts to investigate the validity of tourism-led growth hypothesis for Greece, the fact that lnREXR could be zero it does not affect the specification of our model. In addition, Gunduz and Hatemi-J (2005), Oh (2005) and Tang (2011) apply a double-log bivariate model to examine the relationship between tourism and economic growth, omitting real effective exchange rate. Employing also a trivariate model to check for robustness, they found no additional evidence against the bivariate model.

However, there is an important inquiry that should be addressed as a last step. Is tourism causing economic growth or is it economic growth leading tourism? Given the results of the cointegration tests, the procedure is as follows: when the variables are not cointegrated, the causality tests are conducted by running the standard Granger regressions. However, if the cointegration hypothesis is not rejected the standard Granger regressions are misspecified. Thus, error correction models can be applied to these time series for determining causality[1].

Table 5 reports the statistical analysis based on Vector Error Correction Models (VECM) on the causal relationships between income, real exchange rate and tourist arrivals for Greece. Based on the estimates, there is no Granger causality between the three variables. Therefore, the tourism-led growth hypothesis is not confirmed through causality testing. Our results are not consistent with the findings of Dritsakis (2004), who found evidence of a strong feedback relationship between tourism and economic growth in Greece by using quarterly data.

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[1] Engle and Granger (1987) have proposed the error-correction model as a more comprehensive method to use in the test of causality when variables are cointegrated.

Table 5: Granger Causality results based on VECM

Null Hypothesis	χ^2 - statistic	Probability
lnGDPR $\Rightarrow$ lnTAR	1.130	0.568
lnGDPR $\Rightarrow$ lnREXR	4.485	0.106
lnTAR $\Rightarrow$ lnGDPR	3.644	0.162
lnTAR $\Rightarrow$ lnREXR	1.398	0.497
lnREXR $\Rightarrow$ lnGDPR	2.153	0.341
lnREXR $\Rightarrow$ lnTAR	1.755	0.416

Note: lnGDPR, natural logarithm of real gross domestic product; lnTAR, natural logarithm of tourist arrivals; lnREXR, natural logarithm of real effective exchange rate.

4. Summary and Conclusions

This study investigates a series of unit root, cointegration and causality tests to ascertain whether there is a causality between income, tourist arrivals and exchange rate in Greece. Using annual data over the 1960-2009 period and since the variables in this paper are nonstationary and present a unit root, Johansen's cointegration technique is applied. This methodology allowed us to obtain a cointegrating relationship among the three variables. Moreover, the parameters are tested using Wald test. The restriction is that each coefficient of the corresponding variables is zero. This hypothesis is rejected at all levels of significance for lnGDPR, lnTAR, but not for lnREXR. Finally using the concepts and methods of the cointegration and Granger causality test, this study explores that there is not a long-run equilibrium relationship between income and tourist arrivals. Therefore, our results do not support the hypothesis of tourism-driven economic growth which is specific to developing countries. In addition, they are not consistent with the findings of the existing literature for Greece, supporting a bidirectional relationship between the two variables.

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