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A SYSTEM EQUATION MODEL FOR TOURISM AND ECONOMIC GROWTH

ABSTRACT

This paper aims at investigating the interrelation between economic growth and tourism in Spain, in the period 1995-2017, by making use of a system equation model. Two-stage least squares method is used in order to examine both the direct and indirect relations between tourism and economic growth taking into account the positive effect of investments on tourism. The empirical results indicates that tourism growth has a positive and direct effect on economic growth for Spain for the examined period 1995-2017. The empirical results of Monte Carlo simulation method indicated that the system equation model is very well simulated, since the simulated values are close to actual values of examined variables.

Keywords: Economic Growth; Tourism Growth; Spain
JEL Classifications: C22; O11

RIASSUNTO

La stima di un sistema di equazioni per il turismo e la crescita

Questo articolo ha lo scopo di esaminare l'interrelazione tra crescita economica e turismo in Spagna nel periodo 1995-2017. Si impiega il metodo dei minimi quadrati a due stadi al fine di esaminare la relazione sia diretta che indiretta tra turismo e crescita economica, tenendo presente l'effetto positivo degli investimenti nel settore del turismo. I risultati empirici indicano che la crescita del turismo ha un effetto positivo e diretto sulla crescita economica della Spagna nel periodo 1995-2017. I risultati empirici della simulazione di Monte Carlo indicano che il modello è molto ben simulato, da cui consegue che i valori simulati sono vicini ai valori effettivi delle variabili esaminate.

1. Introduction

The investigation of empirical interrelation between tourism and economic growth consists an important issue in the modern empirical literature. A rapid increase in tourism industry in Spain in the last two decades caused a relative increase in tourist arrivals and tourist expenditures in seasonal products, taking into account the increase in foreign direct investments, the lower tariffs of exports and imports of goods and services. The increase of tourist expenditures is one of the most representative measures of tourism growth in a widely developed country such as Spain. Following the studies of (Balaguer and Cantavella-Jordá, 2002; Adamopoulos and Thalassinos, 2020), a healthy economic system facilitates the tourism growth through innovation and entrepreneurship. Foreign direct investments growth indicated that new entrepreneurs have more incentives to make investments and expand their enterprises in such a reliable economic environment as Spain seems to be in Mediterranean the last decade.

Really, Spain consists an attractive tourist destination country for million tourists all over the world and also one of the most competitive tourist markets in Mediterranean tourist zone. The last decade Spain managed to become the third country in the list of the host countries worldwide, since the number of tourist arrivals in Spain has been more than doubled in about 15 years, from 2001 to 2017. Also, Spain was the unique European State to guarantee explicitly tourism in its Constitution from 2001 to 2017, given that the guarantee on ''tourism and hotel industry'' was erased from Italian Constitution, through the 2001 amendment. The Tourist Revolution of Spain, which began in the 60s, has impressively arrived at the peak in the last years (Maniatis and Cortés-Ramírez, 2020).

In the last two decades, tourism was developed rapidly due to the achievement of higher rates of economic development and improvement of infrastructures and transportation means. The higher rate of tourist arrivals achieved in 2017, while the lower one was remarked in 1995. Specifically, 82 million tourists visited Spain in 2017, but 33 million in 1995.

Comparatively, we can infer that tourist arrivals were higher than tourist departures in Spain in the last two decades. The higher rate of tourist departures was achieved in 2017, where 17 billion tourists travelled to foreign destinations. The lower rate of tourist departures was remarked in 1995, where 4 billion tourists travelled abroad (Figure 1)

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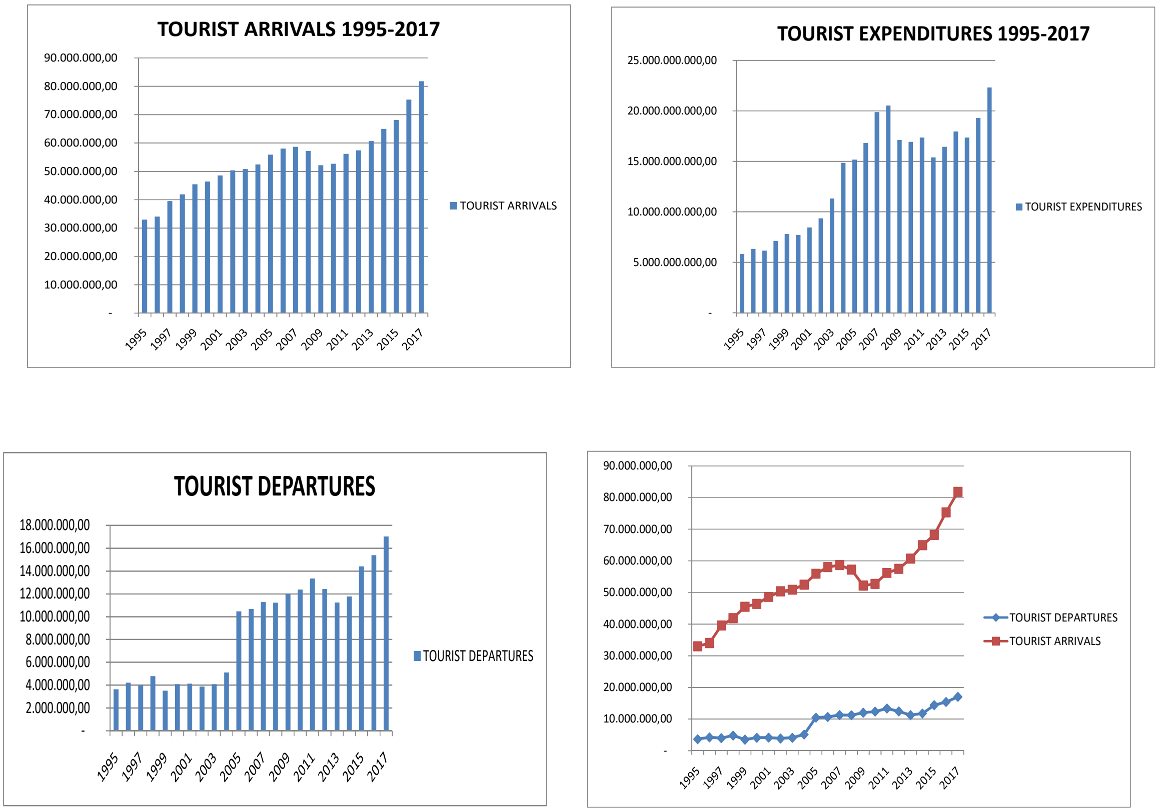
FIGURE 1 - *Tourist Arrivals, Departures and Expenditures*



Tourist expenditures increased rapidly during the period 1995-2017 and displayed fluctuations in the last decade. The higher rate of tourist expenditures was achieved in 2017, while the lower rate was located in 1995. Tourist expenditures were 22 billion dollars in 2017 and 6 billions in 1995 respectively, as we can see in Figure 1, based on World Bank statistical database.

The objective of this paper is to examine the direct effect of tourism growth on economic growth, by taking into account the positive influence of investments in a developed country, such as Spain. Surely, the paper examines a very powerful economy which is characterized by higher rates of economic growth facilitating the investment and tourism growth. Spain is regarded as one of the richest and widely developed countries, worldwide. The model hypothesis predicts that tourism expenditures and investments promote economic growth for Spain.

This empirical study has the following objectives:

- To examine the interrelation among tourism, economic growth and investments

- To estimate a system equation model with two-stage least squares method in order to find out the interrelation between examined variables.

First of all, it is to take an approach to the methodology of this empirical study. Besides, it is to analyse the empirical results and then to formulate the final conclusions on the matter.

2. Literature review

The recent revival of interest in the relationship between tourism development and economic growth examines the insights and techniques of endogenous growth models based on cross-sectional, time series and panel data analysis. According to Pablo-Romero and Molina (2013) and Lee and Chang (2008) many empirical studies found that tourism development causes economic growth such as Balaquer and Cantavella-Jordá (2002) for Spain (1975-1997), Ghali (1976) for Hawai (1953-1970), Lanza *et al.* (2003) for 13 OECD countries (1977-1992), Eugenio Martín *et al.* (2004) for low and medium income countries (1980-1997), Sequeira and Nunes (2008) for 98 countries (1980-2002). Katircioglou (2009b) for Turkey (1960-2006), Zortuk (2009) for Turkey (1990-2008), Cortés-Jiménez and Pulina (2010) for Italy (1964), Arslanturk and Atan (2012) for Turkey (1987-2009), Eeckels *et al.* (2012) for Greece (1976-2004).

Some studies resulted that economic growth causes tourism development just like Oh (2005) for Korea (1975-2001), Katircioglu (2009a) for Cyprus (1960-2005), Payne and Mervar (2010) for Croatia (2000-2008), He and Zheng (2011) for Sichuan of China (1990-2009), Cortés-Jiménez *et al.* (2011) for Tunisia (1975-2007), while other concluded that there is a bidirectional causality between tourism development and economic growth, such as Durbarry (2004) for Mauritius (1952-1999), Kim *et al.* (2006) for Taiwan (1971-2003), Katircioglu (2009c) for Malta (1960-2006), Nissan *et al.* (2011) for 11 countries (2000-2005), Apergis and Payne (2012) for 9 Caribbean countries (1999-2004).

Lee and Chang (2008) investigated the long run relationship between tourism development and economic growth using panel cointegration method and causality test based on Engle-Granger two-step procedure for OECD and non-OECD countries consisting of 5 Asian countries, 11 Latin American countries and 16 Sub-Sahara African countries. The results of panel causality tests indicated that there is a unidirectional causality between tourism development and economic

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growth in OECD countries, but a bilateral causality between tourism development and economic growth in non OECD countries.

Ohlan (2017) confirmed that tourism development spurs economic growth in India for the period 1960 to 2014 taking into account the positive effect of financial development on economic growth. The empirical results indicated that there is a long run cointegrated relationship between tourism, financial development and economic growth and also tourism development causes economic growth with direction from tourism development to economic growth according to tourism-led growth hypothesis. This study is compromised with the studies of Gunduz and Hatemi-J (2005) for Turkey, Tang and Abosedra (2016) for Lebanon.

Akan *et al.* (2007) investigated the causal relationship between tourism development and economic growth for Turkey for the period 1985-2007 by estimating a vector autoregressive model. They confirmed that tourism development causes economic growth conducting a Granger causality test. Balaquer and Cantavella-Jordá (2002) found a long-run relationship between tourism and economic growth for Spain from 1975 to 1997. Shakouri *et al.* (2017) examined the short-run and long-run relationship between international tourism and growth by applying Bayer and Hanks cointegration test analysis and estimating an Autoregressive distributed lag model (ARDL) and Granger causality test. Shakouri *et al.* (2017) confirmed the tourism-led growth hypothesis taking into account the effect of physical and human capital and consumption expenditures for Iran for the time period 1980-2014.

Zhang and Cheng (2019) applied a panel threshold regression model supporting the validity and reliability of the tourism-led growth hypothesis for 36 Wenchuan countries in 2008-2016. The empirical results of this study indicated that there is a threshold effect of tourism growth on economic growth based on different conditions of tourism specialization in each examined country in accordance with 6 different types of tourism area life cycle theory. Shortly the empirical studies concentrated on tourism-led growth hypothesis or vice versa are presented in the following tables based on the empirical technique that has been used and the direction of causality test.

TABLE 1- *Tourism-Led Growth Hypothesis*

Authors	Countries -Time Period
Balaquer and Cantavella-Jordá (2002)	Spain (1975-1997)
Ghali (1976)	Hawai (1953-1970)
Lanza *et al.* (2003)	13 OECD countries (1977-2003)
Sequeira and Nunes (2008)	98 countries (1980-2002)
Katircioglou (2009b)	Turkey (1960-2006)
Zortuk (2009)	Turkey (1990-2008)
Cortés-Jiménez and Pulina (2010)	Italy (1964)
Arslanturk and Atan (2012)	Turkey (1987-2009)
Eeckels *et al.* (2012)	Greece (1976-2004)

TABLE 2- *Economic Growth-Led Tourism Hypothesis*

Authors	Countries -Time Period
Oh (2005)	Korea (1975-2001)
Katircioglu (2009a)	Cyprus (1960-2005)
Payne and Mervar (2010)	Croatia (2000-2008)
He and Zheng (2011)	Sichuan (1990-2009)
Cortés-Jiménez *et al.* (2011)	Tunisia (1975-2007)

TABLE 3- *Bilateral Causality between Tourism and Growth*

Authors	Countries -Time Period
Durbarry (2004)	Mauritius (1952-1999)
Kim *et al.* (2006)	Taiwan (1971-2003)
Katircioglu (2009c)	Malta (1960-2006)
Nissan *et al.* (2011)	11 countries (2000-2005)
Apergis and Payne (2012)	9 Caribbean countries (1999-2004)

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3. DATA ANALYSIS

A system equation model is adopted to estimate the effect of tourism growth and investments on economic growth. For this reason, the two-stage least squares method is applied in order to find out the interrelation between the examined variables, based on economic theory.

The general form of the structural system equation model is the following one:

$$PGDP_t = c_1 + c_2\,TOUR_{EXPt-2} + c_3\,INV_{t-2} + u_{1t} \quad (1)$$

$$TOUR_{EXPt} = c_4 + c_5 PGDP_{t-2} + c_6 TOUR_{ARRt} + c_7 FDI_{t-1} + u_{2t} \quad (2)$$

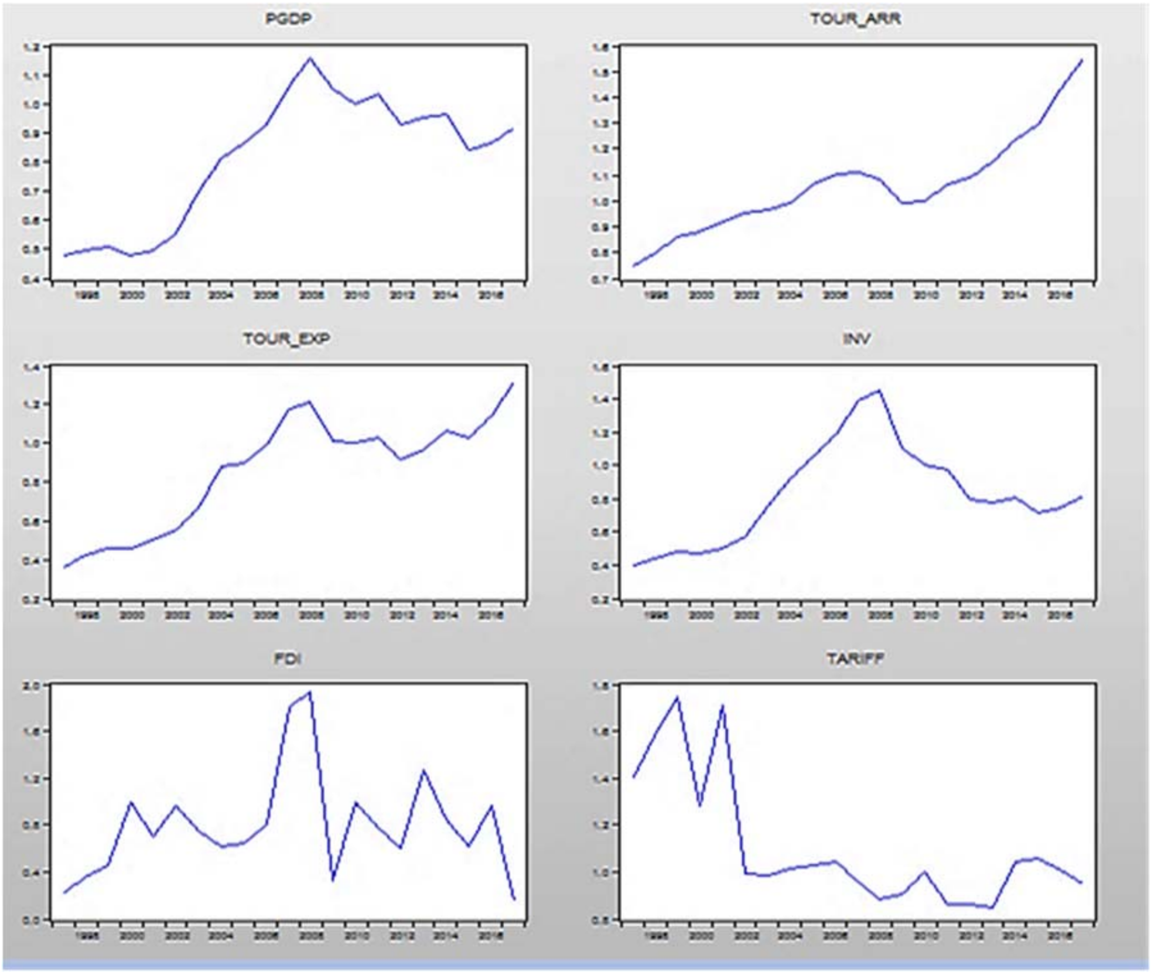
$$INV_t = c_8 + c_9\,PGDP_{t-1} + c_{10}\,TARIFF_t + u_{3t} \quad (3)$$

where:

PGDP = *per capita* gross domestic product
$TOUR_{ARR}$ = tourist arrivals
$TOUR_{EXP}$ = tourist expenditures
INV = investments
FDI = foreign direct investments
TARIFF = tariffs
c = coefficient
t = time trend
t-i = lagged time trend
u_t = residual (error term)

Based on the studies of Agiomirgianakis and Sfakianakis (2014), Adamopoulos and Thalassinos (2020), Vazakidis and Adamopoulos (2020), the variable of economic growth (PGDP) is measured by the real gross domestic product *per capita*, investments (INV) are expressed by the gross fixed capital formation. Tourist arrivals (TOUR_ARR) and tourist expenditures (TOUR_EXP) represent measures of tourist growth. Foreign direct investment (FDI) refers to direct investment equity flows in the reporting economy. Tariffs (TARIFF) express the charges either for exports or imports of goods and services. In this empirical study annual data are used in the matter of Spain while the time period ranges from 1995 to 2017. Data have been obtained from the statistical database of World Bank (World Development Indicators online database). All data variables has been transformed in constant prices regarding 2010 as a base year. The graphs of examined variables are presented in Figure 2.

FIGURE 2 - *Graphs of Examined Variables*



The basic hypotheses of linear equation model are summarized as follows:

HYPOTHESIS H1: $\uparrow INV_t \Rightarrow \uparrow TOUR_{EXPt} \Rightarrow \uparrow PGDP_t$

HYPOTHESIS H2: $\uparrow FDI_t \Rightarrow \uparrow TOUR_{ARRt} \Rightarrow \uparrow PGDP_t \Rightarrow \uparrow TOUR_{EXPt}$

HYPOTHESIS H3: $\downarrow TARIFF \Rightarrow \uparrow PGDP_t \Rightarrow \uparrow INV_t$

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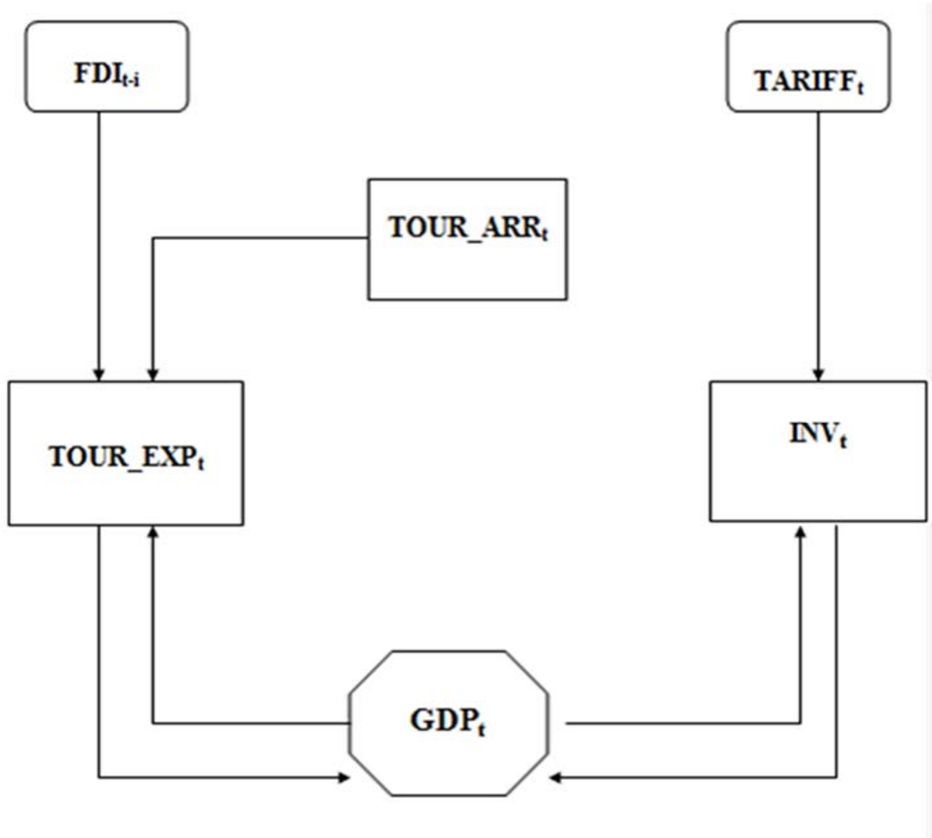
namely an increase in foreign direct investment, tourist arrivals and economic growth causes an increase in tourist expenditures (according to hypothesis one, H_1), an increase in tourist expenditures and investments leads to a relative increase in economic growth (according to hypotheses two, H_2), and finally an increase in tourist expenditures causes a relative increase in investments through the decrease of tariffs (according to hypothesis three, H_3). The system equation model is presented in Figure 3.

FIGURE 3 - *Structure of System Equation Model*



4. METHODOLOGY

The system is consisted by three linear equations with three dependent variables ($PGDP_t$, $TOUR_{EXPt}$ INV_t,) and six independent variables respectively (FDI_{t-1}, $TARIFF_t$, $TOUR_{EXPt-2}$,$TOUR_{ARRt}$, $PGDP_{t-1}$, $PGDP_{t-2}$).

This system is examined for statistical significance, based on the statistical diagnostic tests, such as likely existence of autocorrelation problem. Eviews 9.0 (2015) software package is used to conduct these tests.

4.1. Ordinary Least Squares Method

Initially, ordinary least squares method is applied to estimate a linear regression model for statistical significance. This method defines that the regression line is fitted to the estimated values by minimizing the sum of squares residuals, which indicates the sum of the vertical distances between each point and the relative point on the regression line. The shorter the distances, the better fitted the regression line. A regression model has a general form as follows:

$$Y_t = a + bX_t$$

Estimating a regression model with ordinary least squares method, mainly we have to find the estimations of constant term ($\widehat{a}$) and the slope of equation model ($\widehat{b}$), namely to solve the following patterns (Seddighi *et al.*, 2000; Katos, 2004)

$$\widehat{b} = \frac{n\sum X_t Y_t - \sum X_t \sum Y_t}{n\sum X_t^2 - (\sum X_t)^2} \quad \text{and} \quad \widehat{a} = \overline{Y}_t - \widehat{b}\overline{X}_t,$$

where $\overline{Y}$ is average of values of Y (dependent variable) and $\overline{X}$ average of values of X (independent variable).

The final estimated model has the general form as follows (Katos, 2004):

$$\widehat{Y}_t = \widehat{a} + \widehat{b}X_t$$

4.2. Two-Stage Least Squares Method

Two-stage least squares method is used for estimation of structural system equation model. Simulation defines the simultaneous solution of the system equations model, while a Monte Carlo simulation method is used for making predictions in the estimations of system equation model (Katos *et al.*, 2004).

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4.3. Generalized Method of Moments

According to Arellano and Bond (1991) and Arrelano and Bover (1995) in order to use generalized method of moments (GMM) estimators we have to estimate the following regression model:

$$Y_{it}-Y_{it-1} = (a-1)Y_{it-1} + b_0 X_{it} + n_i + \varepsilon_{i,t}$$

where Y_{it}-Y_{it-1} refers to *per capita* GDP growth, X_{it} expresses a vector of independent variables, η_i denotes a country specific effect, $\varepsilon_{i,t}$ is the error term, t is the time period and i represents the examined country (Alimi, 2015).

4.4. Sensitivity Analysis

In order to *make simulation policies* we have to estimate the dynamic multipliers of dependent variables of the system equation model. For this reason we estimate the percentage change of experimental values of dependent variables to simulated values as follows:

$$mpl = \frac{x_t^{\exp} - x_t^{sim}}{x_t^{sim}} * 100 \text{ or } mpl = \frac{x_t^{\exp}}{x_t^{sim}}$$

where $x^{\exp}$=experimental values of x and x^{sim}=simulated values of x (Katos, 2004).

Furthermore, the best predictive ability of the system equation model is achieved by estimating the inequalities ratios indices of Theil, specifically bias ratio, variance ratio and covariance ratio as follows:

$$U = \frac{\sqrt{\frac{1}{T}\sum\left(x_t^{sim} - x_t\right)^2}}{\sqrt{\frac{1}{T}\sum(x_t^{sim})^2} + \sqrt{\frac{1}{T}\sum(x_t)^2}} \quad \text{Theil index}$$

$$U^M = \frac{(\overline{x}^{sim} - \overline{x})}{\frac{1}{T}\sum(x_t^{sim} - x_t)^2} \quad \text{bias ratio}$$

$$U^S = \frac{(s_{x^{sim}} - s_x)^2}{\frac{1}{T}\sum (x_t^{sim} - x_t)^2} \quad \text{variance ratio}$$

$$U^C = 1 - (U^M + U^S) \quad \text{covariance ratio}$$

The smaller dynamic multipliers and inequalities ratios indices the better predictive ability of the system equation model. Bias ratio(U^M) measures the distance between the average of simulated values of time series and the average of actual values of time series. Variance ratio (U^S) measures the distance between the variance of simulated values of time series and the variance of actual values of time series. Covariance ratio (U^C) is a non-systematic prediction failure. The smaller values of inequalities ratios indices the better fitting of simulated values of time series to actual values of time series. Perfect adjustment exists when Theil index equals to zero (Katos, 2004).

5. EMPIRICAL RESULTS

The significance of the empirical results is dependent on the variables under estimation. The number of fitted time lags was selected for the best estimation results and to ensure statistical significance in each equation model. The basic hypothesis denotes that there is positive interrelation between tourism growth and economic growth.

Estimating the equation model with ordinary least squares method we can infer that there is statistical significance in coefficients of independent variables, based on probabilities and t-student distribution test statistics. Their estimated values have the expected statistical sign, on the basis of economic theory. The coefficient of determination in each equation is very high and is close to unity, so the model is very well adjusted (Table 1). The same conclusion is easily confirmed by studying probabilities and F-distribution test statistics. All probabilities values are lower than 5% and t-student and F-student test statistics are greater than critical values, obtained by statistical tables of t-student and F-distributions for 5% level of significance.

Durbin-Watson test statistic indicates that maybe there is a possible problem of autocorrelation due to lower values, while there is a possible existence of multicollinearity problem due to the

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highest values of coefficients of determination (Table 4). The empirical results of ordinary least squares method are summarized in Table 4.

TABLE 4 - *Method: Ordinary Least Squares (OLS)*

Equation 1: Dependent Variable: PGDP

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.1685	0.0333	5.0591	0.0000
TOUR_EXP(-2)	0.4228	0.0473	8.9257	0.0000
INV	0.3835	0.0468	8.1809	0.0000
R-squared	0.9587	Akaike info criterion		-3.1078
Adjusted R-squared	0.9542	Schwarz criterion		-2.9586
F-statistic	209.41	Durbin-Watson stat		1.4681
Prob(F-statistic)	0.0000			

Equation 2: Dependent Variable: TOUR_EXP

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.4828	0.1352	-3.5699	0.0008
PGDP(-2)	0.5132	0.1306	3.9282	0.0002
TOUR_ARR	0.7883	0.1533	5.1415	0.0000
FDI(-1)	0.1314	0.0599	2.1917	0.0328
R-squared	0.8800	Akaike info criterion		-1.4128
Adjusted R-squared	0.8589	Schwarz criterion		-1.2138
F-statistic	41.5910	Durbin-Watson stat		0.8549
Prob(F-statistic)	0.0000			

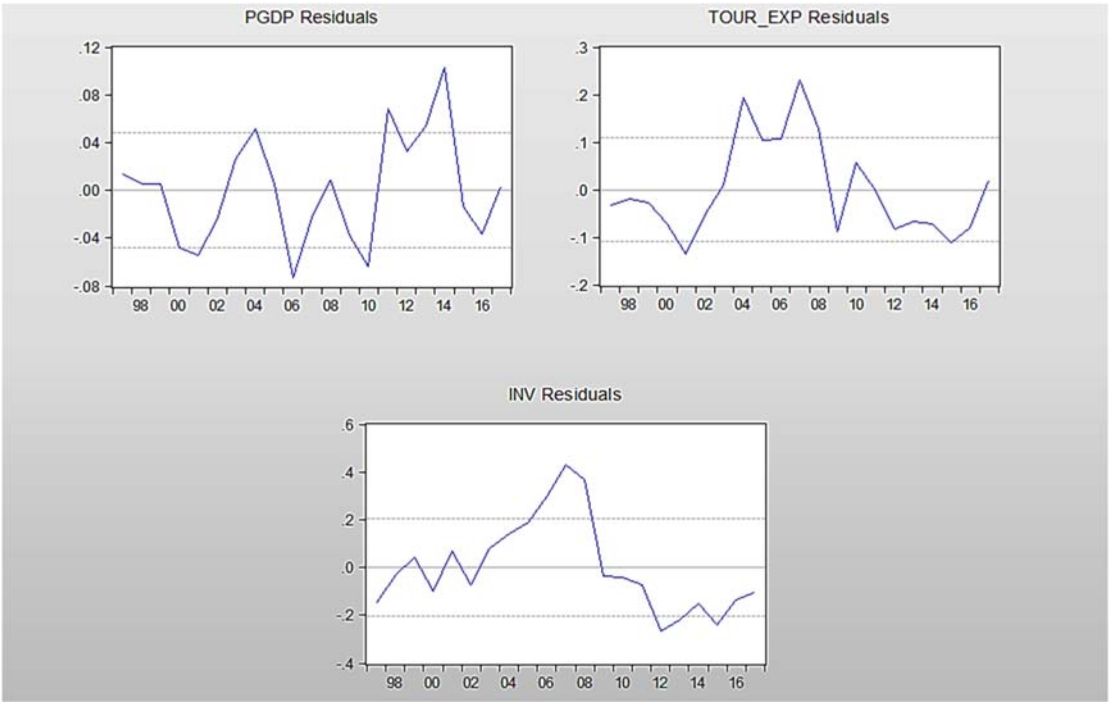
Equation 3: Dependent Variable: INV

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.5583	0.4544	1.2286	0.2342
PGDP(-1)	0.7261	0.2883	2.5182	0.0209
TARIFF	-0.2810	0.2265	-1.2404	0.2299*
R-squared	0.6170	Akaike info criterion		-0.2648
Adjusted R-squared	0.5766	Schwarz criterion		-0.1160
F-statistic	15.3046	Durbin-Watson stat		0.5269
Prob(F-statistic)	0.0000			

Examining the economic interrelation between dependent variables and independent ones, we can infer that tourism growth and investments have a positive effect on economic growth, while tariffs on goods and services have a negative effect on it.

An increase in tourist expenditures and investments per 1% cause an increase in GDP *per capita* per 0.43, 0.39 relatively, while an increase in (Equation 1). The graph of estimated residuals shows that the estimated residuals are normally distributed (Figure 4).

FIGURE 4- *Estimated Residuals of the Model*



Also the correlogram of residuals indicates that there is a problem in autocorrelation test (Figure 5).

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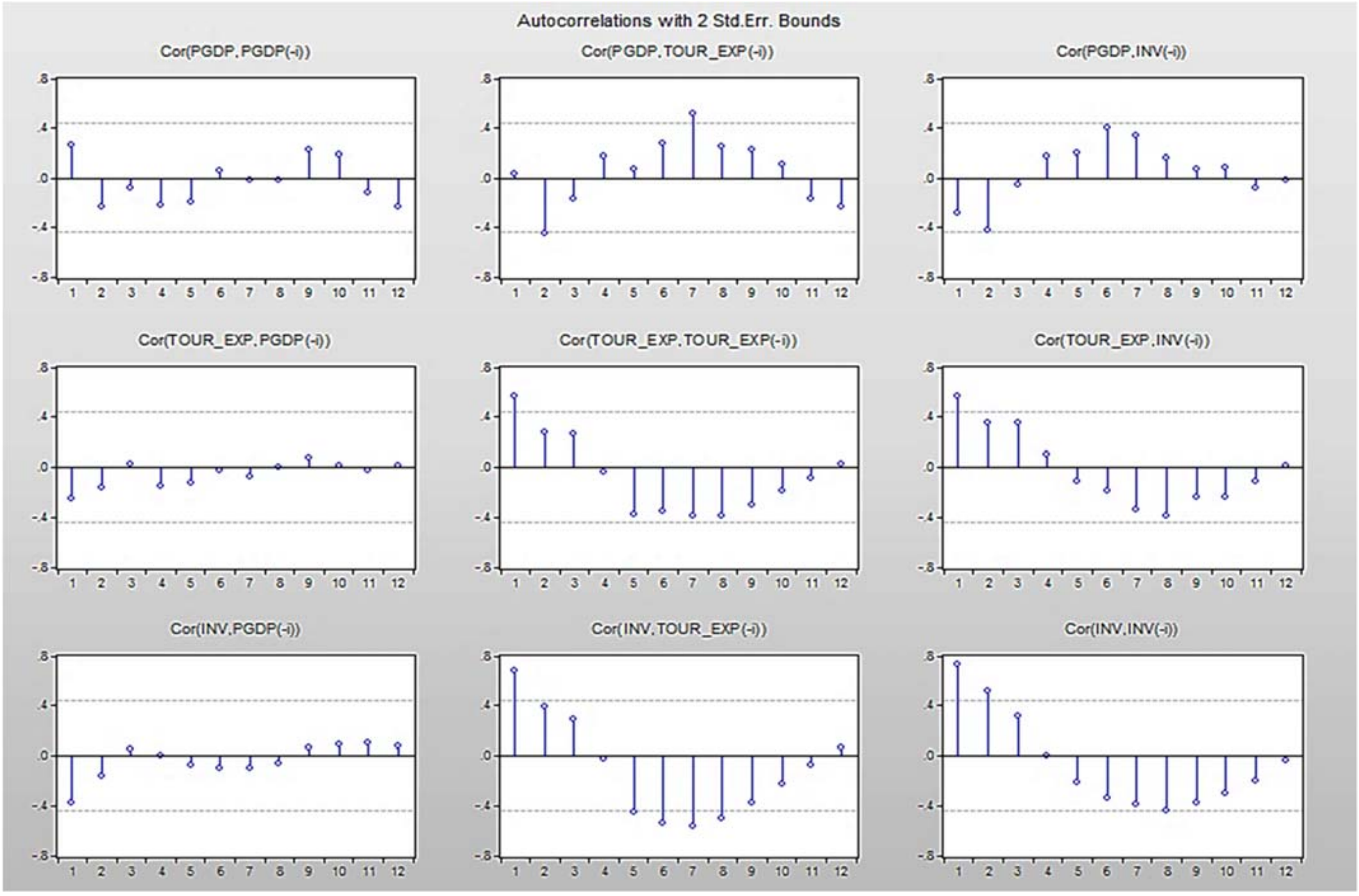
FIGURE 5 - *Correlogram of Residuals*



Estimating the system equation model with two-stage least squares method we can see that there is statistical significance in coefficients of independent variables based on probabilities and t-student distribution test statistics. Their estimated values have the expected statistical sign based on economic theory. All probabilities values are lower than 5% level of significance, except in equation 3 in which there is a problem in statistical significance of independent variable of tariffs of goods and services.

Durbin Watson test statistics indicates that there is a possible problem of autocorrelation (Table 5). Table 5 presents the empirical results from two-stage least squares method.

TABLE 5 - *Estimation Method: Two-Stage Least Squares (TSLS)*

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.1651	0.0356	4.6291	0.0000
C(2)	0.4159	0.0542	7.6659	0.0000
C(3)	0.3940	0.0617	6.3838	0.0000
C(4)	-0.4828	0.1352	-3.5699	0.0008
C(5)	0.5132	0.1306	3.9282	0.0002
C(6)	0.7883	0.1533	5.1415	0.0000
C(7)	0.1314	0.0599	2.1917	0.0328
C(8)	0.5456	0.4820	1.1321	0.2627
C(9)	0.7297	0.2980	2.4481	0.0177
C(10)	-0.2712	0.2504	-1.0830	0.2837*

Equation: PGDP = C(1) + C(2)*TOUR_EXP(-2) + C(3)*INV
Instruments: C TOUR_EXP(-2) TOUR_ARR FDI(-1) PGDP(-2) PGDP(-1)

R-squared	0.9586	Durbin-Watson stat	1.4178
Jarque-Bera test (prob)	0.6216(0.71)		

Equation: TOUR_EXP = C(4) + C(5)*PGDP(-2) + C(6)*TOUR_ARR + C(7) *FDI(-1)

R-squared	0.8800	Durbin-Watson stat	0.8549
Jarque-Bera test (prob)	2.6077(0.27)		

Equation: INV = C(8) + C(9)*PGDP(-1) + C(10)*TARIFF

R-squared	0.5844	Durbin-Watson stat	0.4994
Jarque-Bera test (prob)	0.2054(0.90)		

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The empirical results of two-stage least squares method (based on Table 5) are summarized as follows:

$$PGDP_t = 0.16 + 0.41\, TOUR_{EXPt-2} + 0.39\, INV_{t-2} + u_{1t}$$

$$TOUR_{EXPt} = -0.48 + 0.51 PGDP_{t-2} + 0.78 TOUR_{ARRt} + 0.13 FDI_{t-1} + u_{2t}$$

$$INV_t = 0.54 + 0.72\, PGDP_{t-1} - 0.27\, TARIFF_t + u_{3t}$$

As we can see from the estimated results, an increase in tourist expenditures per 1% causes a relative increase in gross domestic product *per capita* per 0.41 and 0.39 relatively. An increase in investments per 1% causes an increase in GDP *per capita* per 0.39 and (Equation 1). An increase in GDP *per capita*, tourist arrivals and foreign direct investments per 1% causes an increase in tourist expenditures per 0.51, 0.78 and 0.13 relatively (equation 2), while an increase in tariffs of goods and services per 1% causes a relative decrease in investments per 0.27 and an increase in GDP *per capita* per 1% cause a relative increase in investments per 0.72 relatively (equation 3).

Finally estimating the equation model with generalized method of moments we can obtain better estimations in statistical significance of all equations as we can see in Table 6. Estimating the system equation model with generalized method of moments we can see that that there is statistical significance in coefficients of independent variables based on probabilities and t-student distribution test statistics. Their estimated values have the expected statistical sign based on economic theory. All probabilities values are lower than 5% level of significance, correcting the problem of insignificance of independent variable of tariffs of goods and services in estimated results of equation 3. Table 6 presents the empirical results from generalized method of moments.

TABLE 6 - *Generalized Method of Moments (GMM)*

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.1701	0.0140	12.098	0.0000
C(2)	0.4001	0.0329	12.130	0.0000
C(3)	0.3979	0.0241	16.447	0.0000
C(4)	-0.5336	0.0558	-9.5549	0.0000
C(5)	0.5284	0.0729	7.2451	0.0000
C(6)	0.8275	0.0533	15.508	0.0000
C(7)	0.1198	0.0113	10.536	0.0000
C(8)	0.6192	0.1512	4.0939	0.0001
C(9)	0.6855	0.1191	5.7539	0.0000
C(10)	-0.3187	0.0717	-4.4443	0.0000

Equation: PGDP = C(1) + C(2)*TOUR_EXP(-2) + C(3)*INV

Instruments: C TOUR_EXP(-2) TOUR_ARR FDI(-1) PGDP(-2) PGDP(-1)

R-squared	0.9579	Durbin-Watson stat	1.3338

Equation: TOUR_EXP = C(4) + C(5)*PGDP(-2) + C(6)*TOUR_ARR + C(7) *FDI(-1)

R-squared	0.8784	Durbin-Watson stat	0.7930

Equation: INV = C(8) + C(9)*PGDP(-1) + C(10)*TARIFF

R-squared	0.5813	Durbin-Watson stat	0.5263

The empirical results of two-stage least squares method (based on Table 6) are summarized as follows:

$$PGDP_t = 0.17 + 0.40\, TOUR_{EXPt-2} + 0.39\, INV_{t-2} + u_{1t}$$

$$TOUR_{EXPt} = -0.53 + 0.52 PGDP_{t-2} + 0.82 TOUR_{ARRt} + 0.11 FDI_{t-1} + u_{2t}$$

$$INV_t = 0.61 + 0.68\, PGDP_{t-1} - 0.31\, TARIFF_t + u_{3t}$$

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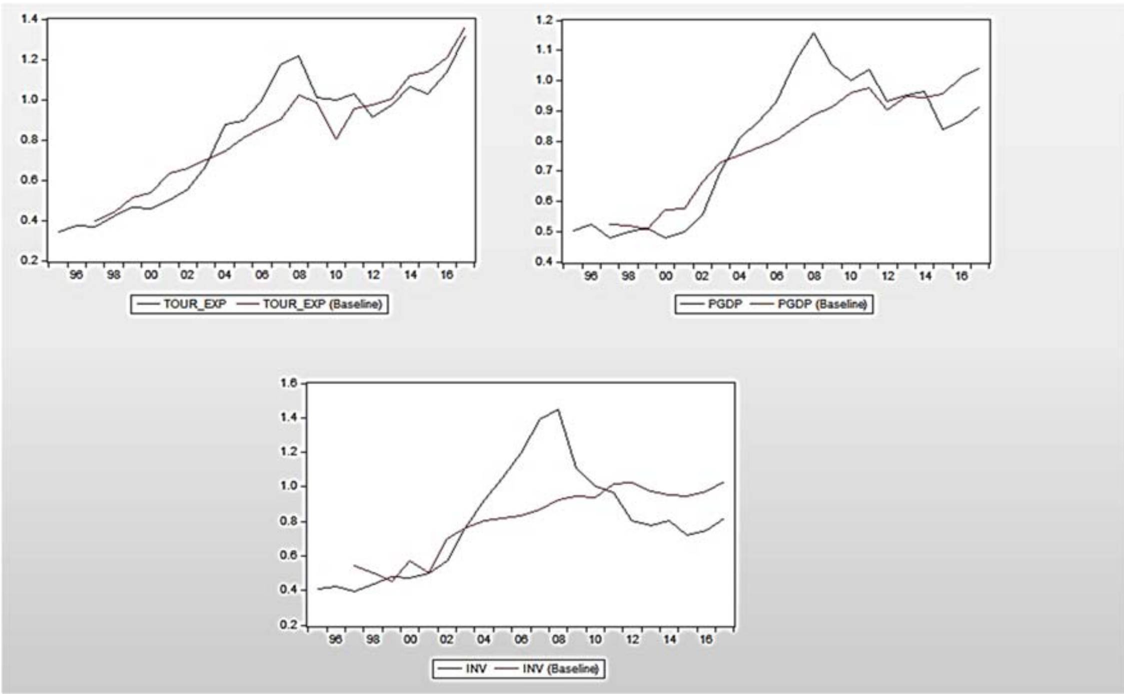
As we can see from the estimated results, an increase in tourist expenditures per 1% causes a relative increase in gross domestic product *per capita* per 0.40 and 0.39 relatively. An increase in investments per 1% causes an increase in GDP *per capita* per 0.39 (equation 1). An increase in GDP *per capita*, tourist arrivals and foreign direct investments per 1% causes an increase in tourist expenditures per 0.52, 0.82 and 0.11 relatively (equation 2), while an increase in tariffs of goods and services per 1% causes a relative decrease in investments per 0.31 and an increase in GDP *per capita* per 1% causes a relative increase in investments per 0.68 relatively (equation 3).

Therefore, summarizing the empirical results we can infer that tourist expenditures and inward investments have a positive direct effect on economic growth, while foreign direct investments have a positive indirect effect on economic growth and tariffs of goods and services have a negative indirect effect on economic growth.

Estimating the system equation model with Monte Carlo simulation method we can infer that the estimated simulated values are very close to actual one, so the model is very well simulated (Figure 6).

FIGURE 6 - *Graph of Monte Carlo Simulation Model*

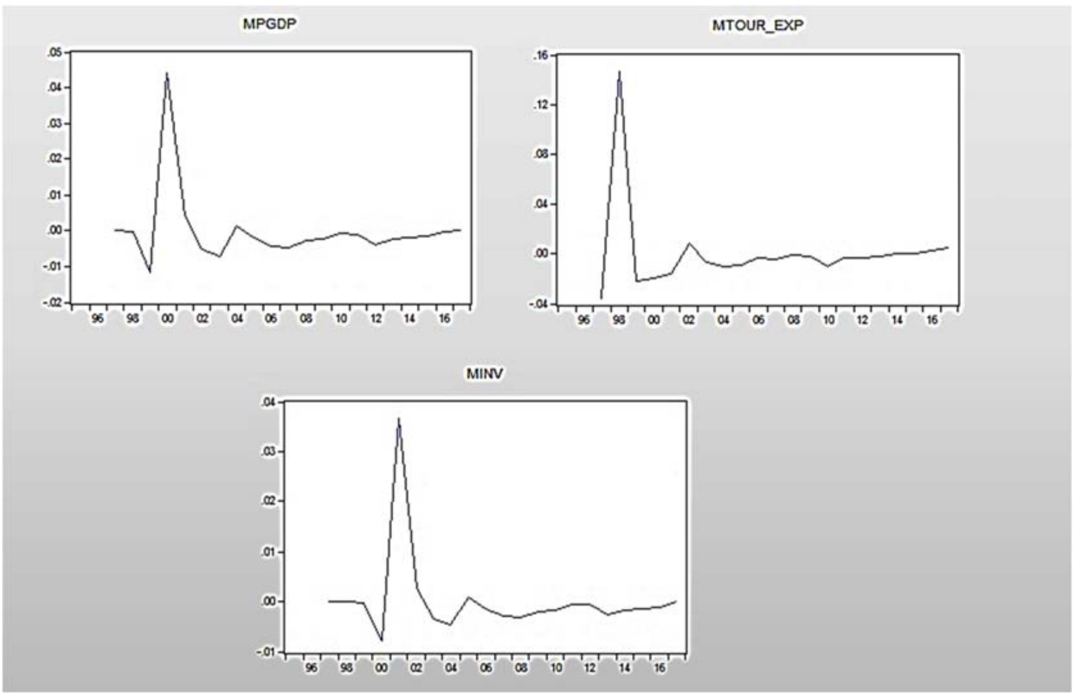


The results of estimated inequalities ratios indices of Theil, suggested that there is a good predictive ability of simulated system equation model (Table 7). A possible change in foreign direct investments in 1997 causes a rapid increase of dynamic multipliers of economic growth in 2009, investments in 2001 and tourism expenditures in 1997 (Figure 7).

TABLE 7 - *Estimations of Inequalities Ratios Indices*

	U THEIL INDEX	U^M BIAS RATIO	U^S VARIANCE RATIO	U^C COVARIANCE RATIO
$PGDP_t$	0.0658	0.0144	0.2511	0.7343
$TOUR\_EXP_t$	0.0630	0.0761	0.2455	0.6782
INV_t	0.1321	0.0097	0.2909	0.6993

FIGURE 7- *Graphs of Dynamic Multipliers of Estimated Simulated Model*



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6. CONCLUSIONS: A REALISTIC REGRESSION MODEL

To sum up, the current study has examined the interrelation between tourism and economic growth in an interesting country, such as Spain. For this purpose, a structural system linear regression model has been estimated by using two-stage least squares method. It is well known that a well functioning economic system facilitates tourism growth, taking into account the lower tariffs and investment growth. Furthermore, technological progress and innovation facilitate investment growth, increase entrepreneurship and consequently lead to productivity growth.

The empirical data of the present paper have indicated that the regression model is very well adapted to reality and has reliable results due to statistical significance of coefficients of examined variables. Tourism growth has a positive and direct effect on economic growth for Spain for the examined period 1995-2017. This conclusion fits in well with relevant studies of Balaguer and Cantavella-Jordá (2002), Agiomirgianakis and Sfakianakis (2014), Adamopoulos and Thalassinos (2020), Maniatis and Cortés-Ramírez (2020), Vazakidis and Adamopoulos (2020). The empirical results of Monte Carlo simulation method indicated that the system equation model is very well simulated, since the simulated values are close to actual values of examined variables. Finally, the results of estimated inequalities ratios indices of Theil suggested that there is a good predictive ability of simulated system equation model. A possible change in foreign direct investments in 1997 causes a rapid increase of dynamic multipliers of economic growth in 2009, investments in 2001 and tourism expenditures in 1997. Many empirical studies examining the main determinants of economic growth differ relatively to the sample period, the examined countries and the estimation methodology. However, it is worth signalizing that further research should focus on the comparative analysis of economic growth, let alone a positive one.

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