Energy Research Centre

WORKING PAPER SERIES

Working Paper 2015-004

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Economic Growth, Tourism Arrivals and Climate Change

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***Abstract*:** This link between economic growth, tourism arrivals and climate change. In this research, we formulate three equations. The first equation evaluates the correlation between economic growth and tourism arrivals. The second model considers carbon dioxide emissions and tourism arrivals. Finally, we consider the determinants of tourism arrivals. We selected the period 1990-2009 for European economy using the panel data. The equation that evaluates economic growth demonstrates that tourist arrivals, energy consumption, carbon dioxide emissions and openness trade are positively correlated with economic growth. A large number of studies consider that there is a positive correlation between tourism and climate change. However, some studies show that there is an alternative hypothesis i.e. a negative association between tourist arrivals and climate change. Our results are in this direction. When we apply the fixed effects and GMM-system, the results show that income *per capita* and energy consumption present a positive impact on CO_2 emissions. The econometric results also demonstrate that tourism arrivals and squared income *per capita* are negatively correlated with CO_2 emissions. The equation that analyses the determinants of tourism arrivals demonstrates that income per capita, openness trade and energy consumption present a positive effect on tourism arrivals.

Keywords: Economic Growth; tourism arrivals; climate change; energy consumption.
JEL Classifications: C33, Q40, O44.

1. INTRODUCTION

In recent years, the tourism sector has received much attention from the academic community. The econometric studies have observed a positive correlation between economic growth and the tourism arrivals (Katircioglu 2009, Leitão, 2011, Serra et al. 2014). The determinants of tourism demand (Surugiu et al. 2011), or the relationship between migration and tourism demand (Leitão and Shahbaz 2012; Dwyer et al. 2014) were analyzed by the literature. Usually, the empirical studies of tourism and migration and tourism demand utilize the gravity model arguments. The explanatory variables utilized with more frequently are income *per capita*, the relative prices, exchange rates, geographical distance, and investments. The theoretical models argue that tourism promotes economic growth and reinforce

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the international trade. The connection between tourism and climate change are associated with energy consumption, greenhouse gas emissions, and pollution.

This research considers the relationship between the tourism sector and climate change. As noted, the literature on this link presupposes an interaction between these two vectors. For that, we need to consider the association between tourism arrivals, the climate change on economic growth, and the link between the tourism sector and carbon dioxide emissions. This research presents two contributions to the literature existent. First we revisit the recent empirical studies on the link tourism and the climate changes. The second contribution relates to the analysis of panel data.

2. EMPIRICAL STUDIES

This section allows analyzing the issue of economic growth, tourism arrivals, and climate change. The connection between carbon dioxide emissions and tourism arrivals are also considered in this research. The empirical studies of Léon et al. (2014), Katircioglu et al. (2014), Solarin (2014) and Tiwari et al. (2013) followed this last line of research. It is worth noting that climate change, migrations, economic growth are associated with tourism within the spectrum of ecological economics.

Sequeira and Nunes (2008) studied the effect of the tourism sector on economic growth using the fixed effects estimator and GMM-system. The authors demonstrate that the tourism sector contributes to encouraging economic growth. In this context, Portuguese tourism demand was analyzed by Leitão (2009). Using a fixed effects estimator and GMM-system, the author demonstrates that income *per capita* presents a positive impact on Portuguese tourism demand (Leitão 2009:69). The empirical study of Surugiu et al. (2011) considers the determinants of tourism demand in Romania for the period 1997-2008. The authors utilized a panel data (fixed effects) and Tobit model. They concluded that income *per capita* was correlated with tourism demand (Surugiu et al. 2011:140). Portuguese arrivals and economic growth were analyzed by Leitão (2011). The author considered a panel data and demonstrated that tourism arrivals, income *per capita* and investments are positively correlated with economic growth. In this context, a relevant study produced by Brida and Risso (2011) evaluate German tourism demand in South Tyrol. Based on the gravity model arguments, the authors utilize a GMM estimator proposed by Arellano and Bond, and the results demonstrated that lagged tourism arrivals have a positive impact on the long run. The variables of the price of crude oil and the relative price presented a negative impact on tourism arrivals (Brida and Risso 2011:76). The empirical work of Leitão (2010) analyzes the interconnection between trade and tourism arrivals. With dynamic panel data, the study concluded that tourism arrivals have a positive impact on the Portuguese economy; the bilateral trade encourages tourism demand, and changes of the population are one form of tourism. (Leitão 2010:71-72). The relationship between tourism and economic growth in Turkey was analyzed

by Gokavali (2010). The author considers the period 1985-2005. Using OLS estimator, the econometric results show that tourism arrivals and investments are positively correlated with economic growth.

Faway et al. (2014) consider the association between tourism and economic growth by 144 countries cover the period 1975-2010.The authors found a positive correlation between tourism, human capital, investment, openness trade and economic growth (Faway et al. 2014:358). The tourism sector and economic growth using time series were analyzed by Panahi et al. (2014). The authors allow analyzing the growth in Turkey for the period 1970-2011. They consider such as independent variables the spending of tourists, human capital, government consumption expenditures and exchange rates (Panahi et al.2014:8).Tourism, human capital, and government consumption expenditures have a positive effect on economic growth. However, the exchange rate is negatively correlated with growth. The tourism arrivals and economic growth for the period1980-2005 were investigated by Akinboade and Braimoh (2010). The authors apply Granger causality methodology. The economic results establish that there is causality between tourism, exports and real exchange rate and economic growth (Akinboade and Braimoh 2010:159).

Tiwari et al. (2013), Léon et al. (2014), Katircioglu et al. (2014) demonstrate that tourism sector induces climate changes. However, if we think in terms of the assumptions Environmental Kuznets Curve (EKC) the tourist arrivals may contribute to a decrease in carbon dioxide emissions in the long term perspective. Tourists prefer places, where pollution tends to decrease. Ecotourism and the rural tourism associated with the concept of sustainability can justify the opposite effect suggested by several studies. Considering this assumption, the concept of sustainable tourism involves a reduction of carbon dioxide emissions, i.e. there is a negative correlation between tourist arrivals and carbon dioxide emissions. Jebli et al. (2014) consider the relationship between carbon dioxide emissions, economic growth, renewable energy and tourism arrivals. Using panel data for the period 1995-2010, the econometric results show that renewables and tourist arrivals have a negative impact on CO2. The authors report that in the perspective of the long run the tourism arrivals contribute to reducing carbon dioxide (Jebli et al. 2014:7). In this context, the empirical study Xiao et al. (2011) considers the relationship between mitigation and the possible strategies and the ways to reduce carbon dioxide applied to the city of Lijiang. The study demonstrates that carbon dioxide emissions cause changes in the water, agriculture, and tourism. The authors consider a crucial behavioral change to reduce CO_2 emissions allowing invest in sustainable development. The research of Jiang (2009) draws attention to the importance of the concept of sustainability. The harmonization between tourist and locals, Lijiang seems to be a determining factor.

The empirical studies of Leitão (2015), Shahbaz et al. (2013), Leitão and Shahbaz (2013), Ozturk and Uddin (2012) show that energy consumption has a positive effect on carbon dioxide emissions. In this context, the literature review argues that carbon dioxide emissions and energy consumption are positively correlated with economic growth. The relationship between trade and growth is ambiguous. Thorpe and Leitão (2014) demonstrate that there is a negative or insignificant association between economic growth and openness trade. However, Grossman and Helpman (1991), Barro and Sali-i-Martin (1995), Helpman and Krugman (1985), Krugman (1997) argue that the international trade stimulates the economic growth. Léon et al. (2014) evaluated carbon dioxide emissions and tourism arrivals in developed and less developed economies. Léon et al. (2014:3) use a generalized moment's method (GMM) for the period 1998-206. The authors conclude that tourism presents a positive impact on CO_2 emission in both economies. The correlation between international trade and climate change has different point views. The dominant literature attributes a negative sign; i.e. the international trade promotes innovations. For the developed economies, Ozturk and Uddin (2012) consider that there is a positive correlation between international trade and CO_2.

The studies of Environment Kuznets curve (EKC) such as Leitão (2015), Leitão and Shahbaz (2013), Ozturk and Uddin (2012) find a positive correlation between income *per capita* (Y) and CO_2, and negative association between squared income *per capita* (Y2) and CO_2 . Shahbaz et al. (2015) investigate the environmental Kuznets assumptions for the Portuguese case. The authors applied ARDL methodology cover the period 1971-2008. This empirical study demonstrates that there is a relationship between energy consumption, international trade, economic growth and CO_2. (Shahbaz et al. 2015:480).In this context, the research of Babu and Datta (2013:312) applied to 22 developing countries for the period 1980-2008, using a pooled panel data display that income per capita and population present a positive effect on carbon dioxide emissions. The empirical work of Babu and Datta (2013:313) also show that squared income per capita presents a negative impact on CO_2. The link between international tourism, energy consumption, and carbon dioxide emissions for Cyprus for the period 1979-2009 was analyzed by Katircioglu et al. (2014). As an econometric strategy, the authors applied Granger causality, unit root, and ARDL. The study concludes that there is causality between tourism, energy use and carbon dioxide emissions (Katircioglu et al. 2014:639). Tourism and carbon dioxide emissions in Malaysia for the period 1972-2010 were investigated by Solarin (2014). The article uses a multivariate model (unit root test, ARDL, and Granger causality). Solarin (2014) considers such as explanatory variables: income *per capita*, tourism arrivals, energy consumption, and urban population. When the author applied DOLS model, the results demonstrate that there is a positive correlation between tourism arrivals and carbon dioxide emissions. The empirical work of Solarin (2014) also shows that income *per capita* and financial developments present a positive impact on carbon dioxide emissions.

Tiwari et al. (2013) consider the relationship between tourism and climate change in OECD countries. The authors applied panel VAR model for the period 1995-2005. They formulated three equations (tourism arrivals, energy consumption, and carbon dioxide emissions). The econometric results (Tiwari et al. 2013: 253) show that the lagged variable of energy consumption variable presents a positive effect on tourism and carbon dioxide emissions. The study also demonstrates that carbon dioxide emissions are positively correlated with energy consumption. Mulali et al. (2014) studied the association between tourism arrivals, and CO_2 applied to the transport sector. The authors utilized a panel data with cointegration analysis. The empirical study of Mulali et al. (2014:11) selected five regions (Africa; Middle East; The Americas; Asia and Pacific and Europe). Considering as explanatory variables tourism arrivals, energy consumption, and urban population, the econometric results show that these variables have a positive impact on CO_2, with exception tourism demand is not statistically significant in Europe (Mulali et al. 2014: 12).

3. METHODOLOGY AND DATA

In this study, we apply a panel data. The sample was collected for the 27 countries of the European Union for the period 1990-2009. Following the empirical works of Faustino and Leitão (2007), Leitão and Faustino (2013) we apply a static panel (OLS, fixed effects, and random effects) and dynamic panel data (GMM-system). As in Faustino and Leitão (2007), Leitão and Faustino (2013), or recently Thorpe and Leitão (2014) is suggested that this method allows to solve the problems of serial correlation and the endogeneity of independent variables. Next, we present and formulate the assumptions underlying the empirical study. For the equation of economic growth, we consider the following assumptions:

Hypothesis 1: Tourism arrivals and economic growth are positively correlated.
Fawaz et al. (2014), Panahi et al. (2014), Sequeira and Nunes (2008) support this hypothesis.

Hypothesis 2: Economic growth causes climate change.
Leitão (2014), Ozturk Uddin (2012) demonstrated that the economic growth induce carbon dioxide emissions.

Hypothesis 3: Economic growth is influenced by the consumption of energy.
The empirical studies of Joo et al. (2015), Leitão (2014), Elliot et al. (2013) validate this hypothesis.

Hypothesis 4: The international trade induces economic growth.

The literature review shows that there is an ambiguity sign. However, the dominant paradigm provides a positive association between the openness trade and economic growth (Grossman and Helpman 1991; Leitão 2011).

In relationship, the equation of climate change and tourist arrivals, we have formulated the following hypotheses:

Hypothesis 5: There is a positive association between per capita income and carbon dioxide emissions.

Hypothesis 6: The variable of squared income per capita is negatively correlated with CO_2.

Empirical studies of Mulali et al. (2014), and Shahbaz et al. (2013) support the hypotheses 5 and 6.

Hypothesis 7: The climate change affects tourism arrivals.

The concept of sustainable tourism illustrates that visitors prefer tourist destinations, where there are preoccupations with the sustainable development. However, if a climate change occurs in a particular tourist destination, this negative externality will lead to a decrease in tourism demand.

Hypothesis 8: The energy consumption is positively correlated with carbon dioxide emissions.

The hypothesis 8 was constructed based on the studies of Katircioglu et al. (2014), Shahbaz et al. (2013), Shahbaz et al. (2015).

The determinants of tourism arrivals are formulated based the following the hypotheses:

Hypothesis 9: The incomes of tourists influence the tourism demand of an economy.

The empirical studies of Serra et al. (2014), Surgiu et al. (2011), Leitão (2010) found a positive impact of income *per capita* on the tourist demand.

Hypothesis 10: International trade stimulates tourism demand.

Phakdisoth and Kim (2007), Leitão (2010), Surugiu et al. (2011) show there is a positive correlation between international trade and tourism demand.

Hypothesis 11: The carbon dioxide emissions and energy consumption has a positive association with the tourism demand.

Tiwari et al. (2013), Katircioglu et al. (2013) give support the hypothesis formulated.

The proxies used in this study were collected from the World Development Indicators (CD-ROM, 2013). All variables are expressed in logarithm forms. The constant term is β_0. The coefficients for each variable take β_x. The error term is expressed by ε_{it}.

Considering the literature (Katircioglu et al. 2014; Solarin 2014; Tiwari et al. 2013) we formulate three equations:

Model [1]: $Y_t = \beta_0 + \beta_1 \times Tour + \beta_2 \times CO_2 + \beta_3 \times EC + \beta_4 \times Trade + \varepsilon_{it}$ (1)

Where: Y_t is *per capita* income; *Tour* is number of tourism arrivals; CO_2 is carbon dioxide emissions; *EC* is energy consumption; *Trade* is openness trade.

According to the literature the expected signs are:

$$\beta_1 > 0; \beta_2 > 0; B_3 > 0; \beta_4 > 0$$

Model [2]: $CO_2 = \beta_0 + \beta_1 \times Y + \beta_2 \times Y^2 + \beta_3 \times Tour + \beta_4 \times EC + \varepsilon_{it}$ (2)

Where: CO_2 is carbon dioxide emissions; Y is *per capita* income; Y^2 is squared *per capita* income; *Tour* is number of tourism arrivals; *EC* is energy consumption.

$$\beta_1 > 0; \beta_2 < 0; \beta_3 > 0; \beta_4 > 0$$

Model [3]: $Tour_t = \beta_0 + \beta_1 \times Y + \beta_2 \times CO_2 + \beta_3 \times EC + \beta_4 \times Trade + \varepsilon_{it}$ (3)

Where: *Tour* is number of tourism arrivals; Y_t is *per capita* income; CO_2 is carbon dioxide emissions; *EC* is energy consumption; *Trade* is openness trade.

The expected signs for the third equation are:

$$\beta_1 > 0; \beta_2 < 0; \beta_3 > 0; \beta_4 > 0$$ Table 1 presents the definition of each variable used in this research and the source where the data were collected.

Table-1. Definition of each variable

Variables	Definition	Source
Y	Gross domestic product divided by population	Word Bank
Tour	Number of tourism arrivals	World Bank, and World Tourism Organization, Yearbook of Tourism Statistics
CO_2	Carbon dioxide emissions per capita	World Bank, and Environmental Sciences Division, USA
EC	Energy consumption per capita	World Bank, and International Energy Agency
Trade	Exports plus Imports of goods and services % GDP	World Bank , national accounts, and OECD

4. RESULTS AND INTERPRETATION

This section analyses the impact of climate change and tourism arrivals on economic growth. In Table 2, we can observe the unit root test using the criterion Fischer- type for all variables used in the econometric models. The tourism arrivals (Tour), carbon dioxide emissions (CO_2), energy consumption (EC), and openness trade (Trade) are stationary.

Table-2. Fischer –type unit-root test (Based on Phillips-Perron)

Variables	Unit root test
Y	36.88 (0.963)
Tour	78.91** (0.01)
CO_2	86.09*** (0.00)
EC	123.35*** (0.00)
Trade	73.25** (0.04)

Note: () is the p-value ***/** significant at 1%, 5%levels. The variable *per capita* income is included the time trend. All variables are expressed in logarithm form.

Table 3 reports the empirical results for the relationship between economic growth, tourism demand and climate change, using OLS estimator, fixed effects, and random effects model. The variables of tourism arrivals (Tour), carbon dioxide emissions (CO_2), energy consumption (EC), and openness trade (Trade) are introduced in the regression such as explanatory variables. All variables are expressed in logarithm form. Hausman test demonstrates that the econometric results should be analyzed by the fixed effects estimator.

The coefficient of tourism arrivals (Tour) presents a positive effect on economic growth, and the variable is statistically significant at 1% level. We observe that tourism arrivals encourage economic growth. The empirical studies of Durbarry (2004) and Sequeira and Nunes (2008) also found a positive correlation between tourism arrivals and economic growth. The variable of carbon dioxide emissions (CO_2) presents a positive effect on economic growth. The variable is statistically significant at 1% level. This result is in the line of empirical studies of Leitão (2014), and Sbia et al. (2014).

Table-3. Economic growth, tourism arrivals and climate changes: Model [1]

Dependent Variable: Economic growth			
Variables	**OLS**	**Fixed Effects**	**Random Effects**
Tour	0.11*** (0.00)	0.78*** (0.00)	0.75*** (0.00)
CO_2	1.03*** (0.00)	1.65*** (0.00)	0.60*** (0.00)
EC	-0.12*** (0.00)	2.39*** (0.00)	0.27*** (0.00)
Trade	0.23*** (0.00)	0.03* (1.99)	0.05** (0.00)
C	2.89*** (0.00)	-10.21** (0.00)	-0.25 (0.59)
Observations	356	356	356
Ad. R^2	0.54	0.47	0.34
Hausman Test= chi2 (5) 100.23***			

Note: ( ) is the p-value ***/**/* significant at 1%, 5% and 10% levels.
All coefficients are expressed in logarithm form.

The consumption of energy (EC) is statistically significant at 1% level, showing that an excessive use of energy stimulates the economic growth. The coefficient of openness trade (Trade) presents a positive correlation with economic growth and is statistically significant at 10% level. This result is according to the literature (Grossman and Helpman 1991). The relationship between growth, tourism arrivals and climate change using a dynamic panel data model (GMM-system) is presented in Table 4. The model [1] doesn't have the problem of serial correlation (Ar_2). This test was suggested by Arellano and Bond (1991). According to Sargan test, our specification doesn't have the problems.

Table-4.Economic growth, tourism arrivals and climate change: Model [1]

Dependent Variable: Economic growth		
Variables	**GMM–System 1step**	**GMM-System 2 step**
Y_{t-1}	0.89*** (0.00)	0.91*** (0.00)
Tour	0.19*** (0.00)	0.19** (0.01)
CO_2	0.99*** (0.00)	1.08*** (0.00)
EC	-0.39*** (0.00)	-0.40** (0.03)
TRADE	0.06 (1.24)	0.06 (0.17)
C	0.36 (0.41)	-0.02 (0.98)
Observations	329	329
$Ar_{2=}$ 0.63		
Sargan Test = chi2(169) = 1.00		

Note: ( ) is the p-value ***/** significant at 1%, 5%levels.
All coefficients are expressed in logarithm form.

The econometric results using 1 step and 2 step are very similar. However, according to the literature the empirical results should be to analyze by 2 step. The lagged variable of economic growth (Y_{t-1}) presents a positive effect in the long run and is statistically significant at 1% level. The previous studies of Thorpe and Leitão (2014:82) also found a positive sign for the Australian case. The variables of tourism arrivals (Tour) and carbon dioxide emissions (CO_2) are according to the expected signs. Sequeira and Nunes (2008) shows that tourism arrivals promote the economic growth. Carbon dioxide is positively correlated with growth. The equation [2] allows evaluating the climate change and tourism arrivals. The equation is analyzed based on the arguments of the environment Kuznets curve (EKC).

The results will be evaluated by fixed effects. The variable of income *per capita* (Y) is statistically significant at 1% level and presents a positive effect on CO_2. This result is according to previous studies (Babu and Datta 2013; Leitão, Shahbaz et al. 2013; Shahbaz et al. 2015).

Table-5.Climate change and tourism arrivals: Model [2]

Dependent Variable: Carbon dioxide emissions			
Variables	**OLS**	**Fixed Effects**	**Random Effects**
Y	-0.79*** (0.00)	0.65*** (0.00)	3.81*** (0.00)
Y^2	0.13*** (0.00)	-0.08*** (0.00)	-0.45*** (0.00)
Tour	-0.05*** (0.00)	-0.04*** (0.00)	-0.05*** (0.00)
EC	0.21 (0.20)	1.02*** (0.00)	0.57*** (0.00)
C	2.22*** (0.00)	-4.54*** (0.00)	-1.88*** (0.00)
Observations	360	360	360
Ad. R^2	0.33	0.68	0.65
Hausman Test= chi2 (4) : 1468***			

Note: ( ) is the p-value *** significant at 1% level.
All coefficients are expressed in logarithm form.

Table 6 reports the equation where we can assess climate change and the tourist arrivals using the GMM-system estimator. The variable of the carbon dioxide (CO_2) presents a positive sign. This result is in line as the study of Twiari et al. (2013). The variables of income *per capita* (Y), squared income *per capita* (Y^2) and energy consumption (EC) are according to previous studies of EKC (Babu and Datta 2013 and Ozturk and Uddin 2012, Shahbaz et al. 2013). The result of tourism arrivals demonstrates that there is a negative association with CO_2 demonstrating that tourist arrivals, showing that we are in the presence of a negative externality.

Table- 6. Climate change and tourism arrivals: Model [2]

Dependent Variable: Carbon dioxide emissions		
Variables	**GMM –System 1step**	**GMM-System 2 step**
CO_{2t-1}	0.85*** (0.00)	0.65*** (0.00)
Y	0.28*** (0.00)	0.45*** (0.00)
Y^2	-0.03*** (0.02)	-0.05*** (0.00)
Tour	-0.05*** (0.00)	-0.13*** (0.00)
EC	0.04*** (0.00)	0.36** (0.01)
C	-0.27 (0.26)	-1.37** (0.02)
Observations	333	333
$Ar_{2=}$ 0.47		
Sargan Test = chi2(169) = 1.00		

Note: ( ) is the p-value ***/** significant at 1%, 5% levels.
All coefficients are expressed in logarithm form.

Table 7 presents the determinants of tourism arrivals. The explanatory variables introduced in this equation are income *per capita* (Y), carbon dioxide emissions (CO_2), energy consumption (EC), and

openness trade (TRADE). The econometric results are very similar between three estimators. The income *per capita* (Y) presents a positive effect on tourism arrivals. The variable is statistically significant at 1% level. This result is in line with the empirical studies of Leitão (2009), Surugiu et al. (2011), and Brida and Risso (2011). The coefficient of carbon dioxide emissions demonstrates that there is a negative association with tourism arrivals. This result is according to the sustainable tourism concept. The energy consumption presents a positive effect on tourism arrivals. The recent empirical study of Chasapopoulos et al. (2014) demonstrates that tourist's income *per capita*; relative price and geographical distance are the main determinants of tourism arrivals in Greece. The authors used a panel data for the period 2001-2010.

Table-7. Determinants of Tourism arrivals: Model [3]

Dependent Variable: Tourism arrivals			
Variables	**OLS**	**Fixed Effects**	**Random Effects**
Y	0.20*** (0.00)	0.33*** (0.00)	0.33*** (0.00)
CO2	-0.44*** (0.00)	-0.51** (0.01)	-0.53*** (0.00)
EC	0.56*** (0.00)	0.54** (0.02)	0.55*** (0.00)
TRADE	0.004 (0.23)	0.08 (0.40)	0.09 (0.39)
C	3.81*** (0.00)	3.42*** (0.00)	3.38*** (0.00)
Observations	356	356	356
Ad. R^2	0.54	0.54	0.54
Hausman Test= chi2 (4):0.9973			

Note: ( ) is the p-value ***/** significant at 1%, 5% levels.
All coefficients are expressed in logarithm form.

The determinants of tourism arrivals with dynamic panel (GMM-System) are expressed in Table 8. Reading the econometric results using the 2 step results are possible concluded that lagged variable of tourism arrivals presents a positive effect on a long run. The variable is statistically significant at 1% level. The income *per capita* (Y), energy consumption (EC), and openness trade (TRADE) present a positive effect on tourism arrivals.

Table 8-. Determinants of Tourism arrivals: Model [3]

Dependent Variable: Tourism arrivals		
Variables	**GMM–System 1step**	**GMM-System 2step**
$Tour_{t-1}$	0.80*** (0.00)	0.92*** (0.00)
Y	0.20 (0.24)	0.02** (0.02)
CO_2	-0.20 (0.42)	-0.01 (0.56)
EC	0.41 (0.27)	0.03*** (0.00)
TRADE	0.03*** (0.00)	0.02*** (0.00)
C	-0.31 (0.76)	0.40**** (0.00)
Observations	329	329
$Ar_{2=}$ 0.30		
Sargan Test = chi2(314) = 1.00		

Note: ( ) is the p-value ***/** significant at 1%, 5%levels.
All coefficients are expressed in logarithm form.

The equation [3] doesn't have the problem of serial correlation (Ar_2). Sargan test shows that the specification is robust. Kusni et al. (2013) examine the tourism arrivals in Malaysia. Using a panel data (OLS, fixed effects and random effects) for the period 1995-2009, they found a positive effect of relative price on tourism demand (Kusni et al. 2013:31).

5. CONCLUDING REMARKS

This study evaluates the link between the economic growth, tourism arrivals and climate change. We formulated three equations. In the first model, we consider economic growth and tourism arrivals. The second model analyses the relationship between climate change and tourism arrivals. In the last equation, we consider the determinants of tourism arrivals.

This research revisited the empirical literature on economic growth, tourism arrivals and climate change. We apply a panel data (OLS, fixed effects, random effects, and GMM-system). For the equation of economic growth, we can observe that tourism arrivals present a positive impact on economic growth. Energy consumption, carbon dioxide emissions and trade openness are positively correlated with economic growth. The econometric model shows that there are costs associated with growth in carbon dioxide emissions, and energy consumption has a positive correlation between economic growth. When, we consider CO_2 as dependent variable the results show that income *per capita* and energy consumption presented a positive effect on climate change. However, squared income *per capita* presents a negative correlation with CO_2 emissions. These results are in line with EKC hypotheses. The tourism arrivals presented a negative impact on CO_2 emissions, showing that tourism arrivals decreased with carbon dioxide emissions i.e. there is a negative externality. The equation of the determinants of tourism arrivals demonstrates that income *per capita*, openness trade and energy consumption present a positive effect on tourism arrivals.

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