Investigating The Relationship on CO_2, Tourism, Economic Growth and Trade Openness in Turkey

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ABSTRACT

The purpose of this study is to examine the impact of economic growth, trade openness and tourist arrivals on CO_2 emissions by considering the period 1970 through to 2014. For this purpose, firstly, by analyzing the stability of the variables, it was determined that the variables were stationary at level I (1). After the variables were determined to be stationary at I (1), the ARDL boundary test analysis was performed. The cointegration relation was determined according to the ARDL boundary test analysis. In addition, economic growth, trade openness and tourist arrivals have significant positive effect on economic growth. According to the VECM Granger causality analysis, there was found to be unidirectional causality from economic growth to CO_2 emissions, from trade openness to CO_2 emissions, from tourist arrivals to CO_2 emissions and from trade openness to economic growth in Turkey. According to the long-term causality results, there is a relationship of unidirectional causality from economic growth, trade openness and tourist arrivals to CO_2 emissions.

Keywords: *Tourism, CO_2 Emission, Economic Growth, Trade Openness, Turkey*

JEL Sınıflandırması: *O40, Z32, C22*

Türkiye'de CO_2, Turizm, Ekonomik Büyüme ve Dışa Açıklık İlişkilerin Araştırılması

ÖZ

Bu çalışmanın amacı, 1970 ile 2014 dönemi arasında Türkiye'de ekonomik büyüme, dışa açıklık ve turist sayısının CO_2 emisyonu üzerindeki etkisini incelemektir. Bu amaçla öncelikle değişkenlerin durağanlıkları analiz edilerek değişkenlerin I(1) mertebede durağan oldukları belirlenmiştir. Değişkenlerin I(1) mertebede durağan oldukları belirlendikten sonra ARDL sınır testi analizine geçilmiştir. ARDL sınır testi analizine göre eşbütünleşme ilişkisi tespit edilmiştir. Ayrıca ekonomik büyüme, dışa açıklık ve turist sayısı ekonomik büyüme üzerinde önemli olumlu etkiye sahiptir. VECM Granger nedensellik analizine göre Türkiye'de ekonomik büyümeden CO_2 emisyonuna doğru, dışa açıklıktan CO_2 emisyonuna doğru, turist sayısından CO_2 emisyonuna doğru ve dışa açıklıktan ekonomik büyümeye doğru tek yönlü nedensellik tespit edilmiştir. Uzun dönem nedensellik sonuçlarına göre ekonomik büyüme, dışa açıklık ve turist sayısından CO_2 emisyonuna doğru tek yönlü nedensellik ilişkisi vardır.

Anahtar Kelimeler: *Turizm, CO_2 Emisyonu, Ekonomik Büyüme, Dış Açıklık, Türkiye*

JEL Classification: *O40, Z32, C22*

I. INTRODUCTION

The relationship between the environmental indicator CO_2, economic growth, trade openness and tourist arrivals has begun to be investigated in the literature. The relationship between these variables has not yet been sufficiently discussed in the literature.

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The word "tour" is derived from the Latin "torn are" and the Greek word "tornos" and means "lathe or circle". In modern English, it means "one's turn" (Srivastav and Kumar, 2018). In the past six decades, tourism has continued to expand to become the world's largest and fastest growing sector. In addition to Europe and North America, many new destinations have emerged. Despite occasional shocks, tourism has grown almost without interruption in recent years. The international tourist arrivals has increased from 25 million in 1950 to 278 million in 1980, 527 million in 1995 and 1.133 billion in 2014. On the other hand, world-wide tourism revenues rose from $2 billion in 1950 to $104 billion in 1980, $ 415 million in 1995 and $1.245 trillion in 2014 (UNWTO, 2015).

Most of the CO_2 emissions related to tourism are produced by transport, especially by air travel. It is also estimated that greenhouse gas emissions from the tourism sector will increase by 3.2% between 2005 and 2035, if not well planned and managed (Peeters and Dubois, 2010; Tang et al., 2014).

Turkey's tourism industry has grown even more with adaptation mechanisms initiated in recent years. The tourism industry boasts a large share in the country's economy, which has great tourism potential. According to the World Bank database, the share of tourism revenues in GDP was 2.92% in 1995 and this ratio increased to 4.15% in 2014. There must be more focus on the contribution of the tourism industry, one of the integral components of the Turkish economy, to economic growth.

Tourism has an important market in economic growth and affects many different sectors. Tourism directly affects the development of traditional industries such as civil aviation, rail travel, road transport, commerce, food and accommodation. It also encourages the development of modern services such as international finance, logistics, information consultancy, cultural authenticity, film production, entertainment, conferences and exhibitions. Tourism, which creates business opportunities, promotes improvements in the infrastructure of a country, transferring both new technological and managerial skills to the economy and also generating foreign earnings not only for the consumption of goods but also for importing capital and intermediate goods. In addition, tourism generates foreign earnings not only needed for the consumption of goods but also to import capital and intermediate goods. (Wang et al., 2012; Oh, 2005; Phiri, 2015)

The aim of this study is to examine the relationship between the environmental indicator CO_2 emissions, economic growth, trade openness and tourist arrivals and explore the role of tourism in mitigating climate change. How this study differs from other studies, and its contribution to the literature, lies in the fact that it empirically analyses the impact of economic growth, trade openness and tourism on the environmental factor CO_2 emissions and makes political suggestions. For this purpose, the study consists of four parts. The first part is an introduction with theoretical frame, while the second part is the literature review where findings from previous studies are shown. The third part is the econometric methodology section and the theoretical knowledge of the econometric methods used in the study are included in this section. The fourth section contains data and

application. Information about the data used in the study has been provided and empirical analysis results have been evaluated. The fifth section contains the conclusion and political propositions.

A. Tourism and CO_2 Emissions in Turkey

Turkish economy's tourism trends are presented in Table 1. According to Table 1, the tourist arrivals at Turkey in the 1970s was 1.318 million. The tourist arrivals increased from 2.432 million in the 1980s to 7.442 million in the 1990s and 18.454 million in the 2000s. In the last four years, tourist arrivals have been on an upward trend, reaching 31.456 million, 31.782 million, 34.910 million and 36.837 million in 2011, 2012, 2013 and 2014 respectively. The main reasons for the increase in the tourist arrivals can be cited as the country's natural beauty, tourism investments and political stability.

Table 1. Trend of CO_2 Emissions, Tourism and GDP in Turkey

Time Period	CO_2 emissions (kt)	Tourism (number of arrivals) in thousands	GDP (Constant $) in millions
1970S	63867	1318	42423
1980S	104809	2432	75417
1990S	171967	7442	184247
2000S	240582	18454	456691
2011	320840	31456	832523
2012	329560	31782	873982
2013	324771	34910	950579
2014	345981	36837	934185

Source: World Bank and TURKSTAT (2018).

Turkey's CO_2 emissions trends is presented in Table 1. Based on this table shows that CO_2 emissions in the 1970s were 63867 (kt). CO_2 emissions in the 1980s were 104809 (kt) and increased about one and a half times compared to the previous year. In the 1990s, the CO_2 emissions trend continued to increase reaching 171967 (kt). During the 2000s, the CO_2 emissions continued to increase and reached 240582 (kt). CO_2 emissions in the last four years were 320840 (kt), 329560 (kt), 324771 (kt) and 345981 (kt) respectively. The energy and tourism, etc, sectors can be cited among the factors affecting CO_2 emissions in Turkey.

The tourist arrivals in Turkey is shown in Table 1. 1.318 million tourists visited Turkey in the 1970s. In the 1980s, the tourist arrivals almost doubled 2.432 million. The increase in the tourist arrivals continued and in the 1990s it reached 7.442 million. In the 2000s, the tourist arrivals at Turkey stood at 18.454 million as shown in Table 1. The tourist arrivals in 2011, 2012, 2013 and 2014 was 31.456 million, 31.782 million, 34.910 million and 36.837 million, respectively. As Turkey's tourism potential is very high, the tourist arrivals continue to increase. As well as the tourism potential, positive developments in the tourism industry, quality, customer satisfaction and similar factors affect the growth of the tourism industry in Turkey.

The GDP trend, which is an indicator of economic growth, is presented in Table 1. While GDP was $42423 million in the 1970s, in the 1980s it grew to 75417 million GDP. In the 1990s and 2000s, GDP increased exponentially to $184247 million and $ 456691 million, respectively. The GDP in 2011, 2012, 2013 and 2014

was 832523 million, 873982 million, 950579 million and 934185 million, respectively.

II. LITERATURE REVIEW

We can divide into three groups the studies that examine the relationship between tourism and economic growth; i) Tourism-led economic growth hypothesis; ii) Economic growth-led tourism hypothesis; and, iii) Growth hypothesis that combines the two hypotheses. Among the studies supporting the tourism-led economic growth hypothesis, Balaguer and Cantavella-Jorda (2002) analyzed the relationship between tourism and economic growth in Spain in their studies covering the period between 1975 and 1997. The findings support the tourism-led economic growth hypothesis. Dubarry (2004) analyzed Mauritius in terms of the relationship between tourism and economic growth between 1952 and 1999. The empirical study shows tourism to be the Granger causality of economic growth. Kreishan (2011) empirically analyzed the period from 1970 to 2009 in Jordan. According to (his/her) findings, the tourism-led economic growth hypothesis is valid in Jordan for the given period of time. From the studies supporting the tourism-led economic growth hypothesis, Çetintaş and Bektaş (2008) examined the period between 1964 and 2006. Findings show tourism to be the causality of economic growth. Zortuk (2009) empirically analyzed the impact of tourism revenues on economic growth from 1990 to 2008. According to his findings tourism revenues have a positive effect on economic growth. Husein and Kara (2011) investigated the period from 1964 until 2006 using the variables of exchange rate, tourism revenues and economic growth. According to the empirical results, the tourism-led economic growth hypothesis is valid in Turkey for the given period of time . Govdeli (2018), investigated the period from 1995 until 2016 using the variables of economic freedom, tourism incomes and economic growth for BRICST. According to the empirical results, the tourism-led economic growth hypothesis is valid in China, South Africa and Turkey.

Among the studies supporting the economic growth-led tourism hypothesis, Oh (2005) examined the period between 1975 and 2001 in South Korea. As a result of the research, economic growth has been determined to be the causality of tourism. Tang and Jang (2009) investigated the relationship between US economic growth and tourism in their study covering the period from 1981 until 2005. According to their findings, economic growth is the causality of tourism. Among studies supporting the economic growth-led tourism hypothesis in Turkey, Balikçioğlu and Oktay (2015) examined the relationship between tourism revenues and economic growth covering the quarterly data for the period 2003 to 2014. They found that the economic growth-led tourism hypothesis was valid. Kızılgöl and Erbaykal (2008) examined the relation between tourism and economic growth for the period from 1992 to 2006. According to the empirical analysis, economic growth is the causality of tourism incomes.

Wang (2012) examined the relationship between tourism and economic growth in China from 1984 to 2009, combining the tourism-led economic growth hypothesis and economic growth-led tourism hypothesis. He found a bilateral

causal relationship between tourism and economic growth. Ongan and Demiröz (2005) intended to test the validity of the tourism-led hypothesis growth in Turkey using quarterly data for the period from 1980 to 2004. They found a bilateral causality relationship between tourism and economic growth in both short and long term.

Studies examining the relationship between CO_2 and tourism are increasing, although they are very limited. Katircioglu et al. (2014) investigated the relationship between tourism, CO_2 and energy consumption in Cyprus for the period from 1970 to 2009. According to the empirical findings that there was a causality between increases in CO_2 emissions and the tourist arrivals. Dogan et al. (2017) analyzed the effects of energy consumption, real GDP, tourism and trade openness on CO_2 for OECD countries, covering the period 1995-2010. According to the findings, tourism is the causality of CO_2 emissions. Katircioglu (2014) examined the relationship between tourism and the Environmental Kuznets Curve in his study of Singapore covering the period from 1971 to 2010. According to the empirical results, tourism is the causality of CO_2 emissions in the Singapure's economy over the long term. Lee and Brahmasrene (2013) used the variables such as tourism incomes, economic growth, foreign direct investment and CO_2 emissions in the EU countries during the period from 1988 to 2009. They used two different models in which CO_2 emissions and GDP were dependent variables. The long-term relationship between the variables was determined in both models. In addition, tourism incomes affects economic growth directly and positively, and while economic growth affects CO_2 emissions positively, tourism reduces pollution. Solarin (2014) investigated the impact of Malaysia's tourism arrivals, energy consumption, financial development and urbanization on CO_2 emissions. A one-way causality relationship was discovered between tourism and urbanization, one of the other variables, and CO_2 emissions. Other findings of the study show that tourist arrivals cause pollution and that they do not make a sufficient contribution to economic growth. De Vita et al. (2015) examined the period from 1960 to 2009 in Turkey in a study where they analyzed the relationship between tourism and the Environmental Kuznet Curve. A long-running relationship was found between tourism and CO_2 emissions.

III. ECONOMETRIC METHODOLOGY

In this study, to test the cointegration relationship, the Autoregressive Distributed Lag model developed by Pesaran et al. (2001) has been used. Compared to the Johansen cointegration test, developed by Johansen and Juselius (1990), the model yields more desirable effects and therefore is used commonly for empirical modeling. This model has four advantages: i) it yields better results for small samplings (Ghatak and Siddiki, 2001). ii) The ARDL approach can be used for the series that are stationary at level zero I(0) as well as at level one I(1). The Johansen cointegration test does not allow such an operation. iii) The ARDL approach deals with the endogeneity of certain variable regressions by providing long-term estimates and significant t-statistics (Odhiambo, 2009). iv) The ARDL approach

also enables the simultaneous identification of the long and short-term effects of a variable (Bentzen and Engster, 2001).

Using the ARDL bounds testing approach after the stability tests, long term relationships between the variables are calculated by the following equation:

$$\Delta CO_2 = \alpha_0 + \sum_{i=1}^{m} \alpha_{1i} \Delta CO_{2_{t-1}} + \sum_{i=1}^{m} \alpha_{2i} \Delta GDP_{t-1} + \sum_{i=1}^{m} \alpha_{3i} \Delta OP_{t-1} + \sum_{i=1}^{m} \alpha_{4i} \Delta TA_{t-1} + \delta_1 CO_{2_{t-1}} + \delta_2 GDP_{t-1} + \delta_3 OP_{t-1} + \delta_4 TA_{t-1} + \varepsilon_t \quad (1)$$

Here, Δ represents first-level difference, α represents the parameters to be estimated, and ε_t represents white noise error term. The ARDL approach estimates the optimum lag length for each variable. Optimum lag length is selected according to the Akaike information criterion (AIC) or the Schwartz information criterion (SIC). The empty hypotheses which do not display bounds test cointegration are decided based either on F statistics or Wald statistics.

The null hypothesis which do not have cointegration between the variable are shown in equation 1 $H_0: \delta_1 = \delta_2 = \delta_3 = \delta_4 = 0$ and as in an alternative hypothesis $H_1: \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq 0$.

If there is evidence of cointegration between variables, a vector error correction model is used (VECM) and short- and long-term causality relationships are determined by the Granger causality test (Granger, 1969). The VECM can be written as:

$$(1-L)\begin{bmatrix} CO_2 \\ GDP \\ OP \\ TA \end{bmatrix} = \begin{bmatrix} a_1 \\ a_2 \\ a_3 \\ a_4 \end{bmatrix} + \sum_{i=1}^{p} (1-L) \begin{bmatrix} b_{11i} & b_{12i} & b_{13i} & b_{14i} \\ b_{21i} & b_{22i} & b_{23i} & b_{24i} \\ b_{31i} & b_{32i} & b_{33i} & b_{34i} \\ b_{41i} & b_{42i} & b_{43i} & b_{44i} \end{bmatrix} X \begin{bmatrix} CO_{2t-1} \\ GDP_{t-1} \\ OP_{t-1} \\ TA_{t-1} \end{bmatrix} + \begin{bmatrix} \beta_1 \\ \beta_2 \\ \beta_3 \\ \beta_4 \end{bmatrix} + ECT_{t-1} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \end{bmatrix} \quad (2)$$

The delay 1-L operator, ECT_{t-1} the delayed error correction term, β_j (j=1,2,3,4) correction factors and ε_{jt} (j = 1,2,3,4) error correction terms above. The long term causality between the variables is defined by looking at the statistical significance of the delayed error correction term coefficient. For short-term causality, the statistical significance in the first difference of variables is taken into account using the Wald test (Shahbaz et al., 2015).

In order to interpret long-term causality, the ECT_{t-1} coefficient must be significant and between -1 and 0. The fact that the ECT_{t-1} coefficient is negative and statistically significant indicates that the effect of a shock that may occur in the variables will continue to have a decreasing impact and so it will balance itself out again in the long run.

IV. DATA AND EMPIRICAL ANALYSIS

This study used annual data from Turkey for the period from 1970 until 2014. In the empirical study, variables such as CO_2 emissions, economic growth (GDP), tourist arrivals (TA) and trade openness (OP) were used. CO_2 emissions were measured in (kt) and GDP was calculated in US $ currency. It was calculated using the formula OP = [(Export + Import) / (GDP)]. Here, the exports, imports and GDP were calculated in US $ currency. Tourist figures were taken from TurkStat (Turkish Statistical Institute). Other data was taken from the Worldbank database. The natural logarithm of all variables was taken into account and added to the model.

Table 2. The Results of the ADF and PP Unit Root Tests

	ADF				**PP**			
Variables	Intercept		Trend and Intercept		Intercept		Trend and Intercept	
	t-statistic	p value	t- statistic	p value	t- statistic	p value	t- statistic	p value
CO_2	-1.985	0.292	-3.070	0.126	-2.142	0.230	-3.092	0.121
ΔCO_2	-6.090*	0.000	-6.221*	0.000	-6.103*	0.000	-6.353*	0.000
GDP	-1.033	0.733	-2.646	0.263	-1.037	0.732	-2.758	0.220
ΔGDP	-6.827*	0.000	-6.832*	0.000	-6.821*	0.000	-6.823*	0.000
OP	-1.875	0.341	-2.263	0.444	-1.877	0.340	-2.263	0.444
ΔOP	-5.715*	0.000	-5.678*	0.000	-5.796*	0.000	-5.764*	0.000
TA	-0.581	0.865	-2.555	0.302	-0.566	0.868	-2.597	0.284
ΔTA	-7.702*	0.000	-7.605*	0.000	-7.710*	0.000	-7.613*	0.000

Note: Critical values are indicated by 1%, *.

The results of the ADF and PP unit root tests are given in Table 2. According to the test results, it was found that CO_2, GDP, OP and TA variables were not stable. By taking the difference in the variables, all the variables became stable at the first level I(1).

Table 3. Boundary Test Results

Optimum lag length	**(1, 2, 2, 0)**	
k	3	
F Statistic	7.53	
Critical Values	I(0) Bound	I(1) Bound
%1	3.65	4.66
%5	2.79	3.67
%10	2.37	3.20

The results of the ARDL boundary test are given in Table 3. The model's F-statistic is 7.53 and as a statistical value it is larger than the above critical values, so the ARDL model is cointegrated. After the ARDL model was found to be cointegrated, the model's diagnostic test results need to be tested for the model's significance.

Table 4. Diagnostic Test Results

R^2	0.996
Adjusted R^2	0.997
F Statistic	1352,65
LM Test	0.065
ARCH Test	0.224
RESET Test	0.941
Normality Test	0.529

Diagnostic test results are presented in Table 4. Based on the evaluations of the diagnostic tests, the LM test (Breusch-Godfrey Lagrange Multiplier) tests whether there is an autocorrelation in the model. It is seen that there is no autocorrelation problem in the model according to the 5% significance level. The ARCH test, the second of the diagnostic tests, indicates the problem of changing variance. It is seen that there is not a problem of changing variance in the model. The Ramsey RESET test indicates that the model is configured correctly. According to the Ramsey RESET test result, the model is configured correctly. The Jarque-Bera Normality test represents the normal distribution of error terms. According to the results of the Jarque-Bera normality test, the error term is normally distributed. According to the diagnostic test results, no problems were found in the model.

Table 5. Short-term Coefficients

Variables	Coefficient	p value
Δ(GDP)	0.171*	0.000
Δ(OP)	0.167*	0.000
Δ(TA)	0.039	0.308
CointEq(-1)	-0.573*	0.000

Note: Critical values are indicated by 1%, *.

Short term coefficients for the ARDL model are shown in Table 5. The coefficients of GDP and OP are positive and significant in the short term. GDP and OP variables positively affect the CO_2 variable in the short term. The probability value of the TA variable is statistically insignificant. Because of this, no short-term relationship was found between the TA variant and the CO_2. The error correction coefficient is negative and statistically significant. 57.3% of the short-term deviation is corrected in the following period.

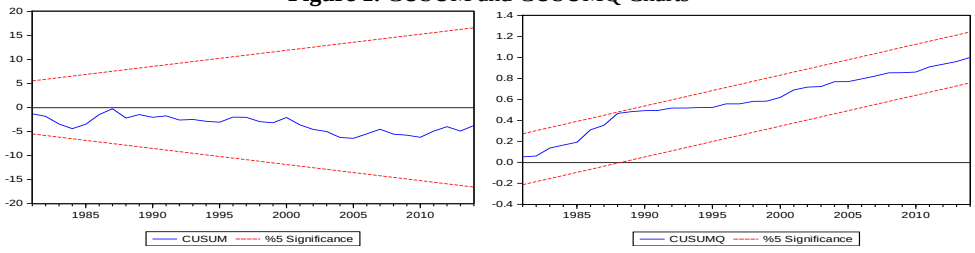
Table 6. Long-term Coefficients

	ARDL Estimators		FMOLS Estimators		DOLS Estimators	
Variables	**Coefficient**	**p value**	**Coefficient**	**p value**	**Coefficient**	**p value**
GDP	0.222*	0.000	0.259*	0.000	0.161*	0.002
OP	0.405*	0.000	0.347*	0.000	0.372*	0.000
TA	0.111**	0.023	0.109**	0.028	0.181*	0.001
C	4.959*	0.000	3.916*	0.000	5.404*	0.000

Note: Critical values 1% and 5% are represented by * and **, respectively.

Long-term coefficient estimations are given in Table 6. The rationale behind giving the results of the FMOLS and DOLS estimators, as well as the ARDL boundary test, is to increase the reliability of the cointegration coefficients. When the coefficients of the variables are interpreted, it is seen that the flexibility coefficients are statistically significant in all variables. GDP, OP and TA variables affect the CO_2 positively.

Figure 1. CUSUM and CUSUMQ Charts



Parameters are determined with the aid of CUSUM and CUSUMQ Charts. Cumulative sum (CUSUM) and cumulative sum of squares (CUSUMQ) charts are given in Figure 1. As can be seen in the CUSUM and CUSUMQ charts, it has been established that the estimated parameters remain at 5% within line limits and are therefore determined.

Table 7. VECM Granger Causality Test Results

Dependent Variables	Short-run F-statistics (p-value)				Long-run t-statistics (p-value) ECM_{t-1}	Joint (short- and long-run) F-statistics (p-value)
	ΔCO_2	**ΔGDP**	**ΔOP**	**ΔTA**		
ΔCO_2	-	4.412** (0.036)	5.350** (0.021)	5.615** (0.019)	-0.605* (-5.642)	10.889** (0.012)
ΔGDP	1.111 (0.292)	-	4.286** (0.038)	0.852 (0.359)	-1.327 (-3.198)	5.433 (0.143)
ΔOP	0.294 (0.587)	1.468 (0.226)	-	0.099 (0.753)	0.775 (1.879)	3.263 (0.352)
ΔTA	1.534 (0.215)	0.802 (0.371)	0.321 (0.571)	-	-0.176 (-0.476)	4.187 (0.242)

Note: Critical values 1% and 5% are represented by * and **, respectively.

The first column shows the results of the short-term or weak VECM Granger causality test. According to the short-term VECM Granger causality analysis, there was found to be a unidirectional causality relationship in Turkey from economic growth to CO_2 emissions, from trade openness to CO_2 emissions, from tourist arrivals to CO_2 emissions and from trade openness to economic growth. The second column shows the results of the long-term VECM Granger causality test. According to the results of the long-term causality test, the ECM_{t-1} coefficient results are significant for the CO_2 emission variable and range between -1 and 0. For this reason, there is a unidirectional causality relationship in the long run between the variables of economic growth, trade openness and tourist arrivals and the CO_2 emission variable. The third column shows the results of the strong VECM Granger causality test. According to the results of the strong VECM Granger causality test, there is a strong causality between the variables of economic growth, trade openness and tourist arrivals and the CO_2 emission variable (Table 7).

CONCLUSION

The study examined the impact of economic growth, trade openness and tourist arrivals on CO_2 emissions, by considering the period 1970 through to 2014. In this context, firstly, the stability of the variables has been examined. It has been found that all of the variables are stationary at level I(1). The pre-requirement for the variables to be stable at level I(0) or I(1), a prerequisite also for the ARDL boundary test, has been met. Firstly, the boundary test results have been examined on the basis of the ARDL boundary test analysis. Since the F test was meaningful, a cointegration relation has been found in the model. The diagnostic tests have been examined after the cointegration relationship has been established. Diagnostic Test Results show that the model has been configured properly and accurately. The long term coefficients of the variables have been predicted using the ARDL boundary test, FMOLS and DOLS methods. With all three models, the long term coefficients of the variables are positive and significant.

The short and long term causality associations of the variables have been analyzed using the VECM Granger causality test. According to the short-term causality analysis, there has been found to be a unidirectional causality from economic growth to CO_2 emissions, from trade openness to CO_2 emissions, from tourist arrivals to CO_2 emissions and from trade openness to economic growth. In the long-term, there has been found to be a relationship of unidirectional causality from economic growth, trade openness and tourist arrivals to CO_2 emissions. According to the strong causality test results, there has been found to be a relationship of causality between economic growth, trade openness and tourist arrivals and CO_2 emissions.

Developments in the tourism industry show that the increase in tourist arrivals also increases CO_2 emissions causing air pollution in Turkey. The key question here is, are increasing tourist arrivals sustainable despite the air pollution? The opportunity-cost decisions are important in this context. Policy makers must take measures to enable the tourism sector to grow and help reduce air pollution. Environmental pollution can be prevented by using clean energy in industries heavily reliant on energy, such as logistics and tourism. In addition, necessary measures must be taken in order to minimize damage on the environ-ment from new touristic areas.

With economic growth, the welfare and living standards of countries increase. However, along with economic growth comes the issue of increasing environmental pollution. Policy makers need to make the right decisions to prevent this happening. It is necessary to aim at reducing environmental pollution without compromising economic growth. Adequate incentives should be provided and investments should be made in technologies that reduce environmental pollution. Clean and renewable energy sources should be used instead of energy sources that pollute the environment.

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