

The role of globalization, real income, tourism in environmental sustainability target. Evidence from Turkey

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Abstract:

In this study, we examine the role of real income, globalization and tourism on environmental sustainability targets by applying Autoregressive Distributed Lag (ARDL) bounds testing approach that control for structural breaks and Vector Error Correction Model (VECM) Granger causality approach that produces robust, efficient and reliable short-run and long-run estimates in the case of Turkey over the periods 1970-2014. To achieve our research objective, we examine stationarity properties of the series via unit root test, after which we applied Bayer-Hanck combined cointegration technique to evaluate presence of a long-run cointegration relationship among the series. The empirical results show that a 1% increase in real income level and international tourists' arrivals led to 0.555% and 0.153% increase in metric ton per capita CO₂ emissions in the short-run and 0.802% and 0.077% increase in metric tons per capita CO₂ emissions in the long-run, while globalization has non-significant negative impacts on CO₂ emissions. The causality analysis suggest that tourism Granger causes CO₂ emissions both in the short- and long-run, while real income and globalization only Granger cause CO₂ emissions in the long-run. Findings also show that a one standard deviation shock to CO₂ emissions has a noticeable positive and persistent impact on tourism, globalization and economic growth in the long-run.

Keywords: CO₂ emissions; real income; globalization; tourism; short-run; long-run; time series; Turkey.

1. Introduction

The multi-dimension of carbon emissions development and especially its potential responses from the real gross domestic product (GDP), globalization and tourism development among other macroeconomic variables remained an avid gap for deliberation. Like in many fast economies of the world, the biggest contributor to the rise of carbon dioxide (CO₂) emissions in most of the economies of the world, and specifically in Turkey remains the significant expansion or change in composition of its economy (Lise, 2006; Akadiri et al, 2018). The situation of Turkey is far from being an outlier, this is because, the global CO₂ emissions energy-related sources is observed to have grown by 1.7% in 2018 (International Energy Agency, IEA, 2019). Indicators from the earlier year (2017) revealed that China and India contributed about half of the global carbon emissions growth while 44% increase in Spain's carbon emissions increase also put the European Union carbon emissions parameter on the spotlight (British Petroleum, BP, 2019). In the case of Turkey, the drive for a more stable economy might have constrained the carbon-cut policies, thus leading to increasing emissions of CO₂. In fact, the Climate Action Tracker noted the lack of consistency of Turkey with the Paris Agreement, thus qualifying the country's pledge as "critically insufficient" (Climate Action Tracker, CAT, 2018). The peculiarity of the Turkish experience is not unconnected with the country's drive toward attaining sustaining economy, notwithstanding its Paris Agreement's² responsibility for carbon emissions reduction.

Importantly, the global economic returns from tourism development which include revenues, employment, skill and human capita development are overwhelming (World Travel and Tourism

² The Paris Agreement is the 2015 agreement on climate change of the United Nations Framework Convention on Climate Change (UNFCCC). More details is available on <https://unfccc.int/>.

Council, WTTC, 2018). Precisely for Turkey, the WTTC 2019 annual research highlight implies that with about 48.6 million international tourists expected to arrive in 2019, the industry is expected to add about three (3) million jobs. Unfortunately, these abundant contributions of the tourism industry is not without causing undesirable returns. In real term, the increasing demand for energy resulting from tourism investments and related activities within the tourism industry is not unconnected with the increasing tendency of environmental hazard of the large economies (Alola & Alola, 2018a; Alola & Alola, 2018b; Bekun, Alola & Sarkodie 2019; Pata 2018a). Turkey being a fast-developing country and a tourism hub, there are bound to be challenges associated with potential increase in the energy demand and maintenances of wastes and the nation's ecosystem.

Giving that tourism development is a major source of revenue generation, and as much as the impact of tourism on the environment could potentially be hazardous, the impacts of economic growth (measuring the real income) and globalization could not be ignored. Before now, inexhaustible studies have carefully examined the significant of the link between environmental quality vis-à-vis carbon emissions and economic growth vis-à-vis real per capita income (Nasr et al, 2018; Akadiri, Saint Akadiri & Gungor, 2019; Alola, 2019). As much as the investigation of economic growth and environmental quality nexus is a continuum, the economic instability in Turkey (Financial Times, 2018) in the last years makes the study more desirable.

Similar to the role of real per capita income on environmental quality, globalization has been added to the continuum of determinants that affects the environment quality (Akadiri et al, 2018, 2019a & b). As the world continue to tend toward emerging into a perfect global village, the evidences of the phenomenon has revealed beyond the societal, economic, culture, religion

classifications. As countries advance the proponent, and focusing on mitigating the adverse impacts of climate change, several measures have been developed especially by developed or rich countries toward attaining sustainable economy and environment. In essence, the reality of globalization has continued to be the essential policy tool of most developed countries especially in the attempt to balance their seemingly economic advantage with the dire environmental risks. For instance, countries have continued to explore the advantage of globalization, thus causing a dichotomy of import and export vis-à-vis outsourcing or offshoring carbon emissions especially among trade partners.

Considering the attempt by Akadiri et al (2018) to examine the causal nexus of carbon emissions, globalization, economic growth and tourism, and recently in Akadiri et al (2019), this current study is a resemblance but with specifics on Turkey. The essence of considering Turkey is not only because of the country's robust tourism activities, but because of the peculiarity of the country's economic instability. Hence, the current study examines the short-run and long-run nexus of the observed variables (carbon emissions as measure of pollutant emissions, real income, globalization and tourism) in Turkey. As such, this study potentially presents unique deviation from the previous studies, thus adding novelty to the literature under certain premises. Importantly, considering the peculiarity of Turkey's economy, this study is the first to underpin the 'myth' of the short-run and long-run. This because in such economy like Turkey, it remained a puzzle if there exist significant difference between the two periods. Also, to the best of authors' knowledge, this study is the first to examine the environmental impact of globalization in Turkey.

The succeeding part of the study is structured as follows. Section 2 highlights the theoretical perspectives from extant literature while Section 3 covers data description and empirical methodologies employed. The empirical findings are reported in Section 4. Concluding remarks and implications for policy are provided in Section 5.

2. Theoretical Perspectives: Literature Synopsis

The consistent evidence of global warming across the regions of the world has further encouraged more studies on environmental dynamics arising from the social, economic, geographical, and human activities. Specifically, for the case of Turkey, the relative impact of real per capita income (a common proxy for economic growth) on carbon emissions is not new in the literature. Following the respective growth and environmental models illustrated in Acemoglu (2012) and York, Rosa and Dietz (2003), the subsequent investigations of the Environmental Kuznets Curve hypothesis (EKC) and other environmental-income related studies on Turkey have been illustrated in the literature (Acaravcı, Erdogan & Akalın, 2015; Cetin, Ecevit & Yucel, 2018; Katircioğlu & Taşpınar, 2017; Ozcan, Apergis, & Shahbaz, 2018). For instance, Cetin, Ecevit and Yucel (2018) expectedly found that there exist a long-run relationship between real per capita income and carbon emissions in the presence of structural breaks. As much as the study affirms a unidirectional Granger causality running from real income per capita to carbon emissions, it also showed that the EKC hypothesis is valid for the country. Additionally, Ozcan, Apergis, and Shahbaz (2018) recently advanced the study by using the ecological footprint (EFP) in lieu of carbon emissions, thus the study revealed that the EKC hypothesis is not significant for the Turkish economy.

Similarly, the examination of tourism-induced EKC hypothesis has continued to be of great interests to environmentalists and as well to tourist destinations like Turkey. Recently, Bojanic

and Warnick (2019) examined the impact of country-level of tourism on greenhouse gas (GHG) emissions. The study measured the level of tourism in the countries as a percentage of tourism contribution to the country's gross domestic product (GDP). In doing so, Bojanic and Warnick (2019) found that countries with higher percentage of tourism in GDP suffers lesser GHG emissions as compared to the countries with none (or lesser) tourism component of the GDP. In addition, in investigating the relationship between tourism and carbon dioxide (CO₂) emissions, Balli et al (2019) explored the case of the Mediterranean countries (Turkey inclusive) and found that tourism increases CO₂ emissions among the panel countries in the long-run. Also, earlier study by Katircioglu (2014) found that CO₂ emissions converges at a speed rate of about 91% in the long-run and also have a significant positive impact on tourism in the case of Turkey. The study further affirmed from the impulse response and variance decomposition results that CO₂ emissions positively responds to change in tourism development especially with impressive strength in longer periods. Because of the increasing global awareness of the impact of climate change that have continued to drive the tourist destinations toward a sustainable tourism, environmental and academic studies have further advanced the tourism-environmental nexus investigation (Azam, Alam & Hafeez, 2018; Gupta & Dutta, 2018; Wang & Wang, 2018; Ouattara, Pérez- Barahona & Strobl, 2019)

Moreover, earlier studies have revealed the relationship between globalization and the environment (Brahmasrene & Lee, 2017; Rahman & Miah, 2017; Wang et al, 2018; You & Lv, 2018). But the recent studies of Akadiri et al (2018) and Akadiri et al (2019a) respectively explored the impact of globalization in the context of carbon emissions and the EKC hypothesis especially for tourism territorial regions. Although, globalization has not been examined in the context of environmental quality or EKC for the case of Turkey, but the study of Akadiri et al

(2019) which focused on the tourist destinations states is a perfect reflection of the Turkish experience. Using 15 selected states that prioritize tourism as a means of boosting their economies like Turkey, Akadiri et al (2019) affirms the globalization-tourism EKC hypothesis for the panel countries. A closely related study by Pata (2018b) informs that the per capita GDP, urbanization and industrialization are among the positive determinants of per capita CO₂ emissions especially in the long-run in Turkey. Lastly, the study also affirms the EKC hypothesis for Turkey by exploring the aforementioned variables over the period 1974-2013.

3. Data and Methodology

3.1 Data

In this section, we discuss the data and the adopted methodology for the empirical research. As discussed earlier, this study examines at what particular period (whether in the short-run or long-run) does globalization, international tourists' inflow and real income become problematic or contribute to environmental degradation in the case of Turkey. The choice of Turkey as sampled country is based on the fact that the nation has experienced sporadic increase in international tourist inflows in this era of economic, social and political globalization, which has impacted the outlook of the tourism industry and the economic growth of the region.

In addition, this study seeks to test empirically, whether the noticeable increase in international tourist inflows through the channel of globalization as it increases real income contribute to environmental degradation and how soon (short-run or in the long-run) should the policymakers expect the adverse impact in terms of environmental degradation on the economy of Turkey. To achieve study objective of unraveling the myth between the short-run and the long-run impact of the variables under observation on environmental degradation, Autoregressive Distributed Lag (ARDL) bound testing approach is employed for coefficient estimates and Vector Error

Correction Model (VECM) approach to Granger causality testing. The adopted econometric approaches for this study, generate short-run and long-run estimates that are robust and consistent for policy decision making, even at the presence of small sample size for annual frequency data over the periods 1970-2014.

Data for international tourism arrivals are measured in millions of tourists inbound, carbon dioxide emissions measured in metric tons per capita and real GDP per capita measured in constant 2010 USD. These data are all sourced from the World Development Indicators database (online) while globalization index that incorporate economic, social and political globalization as introduced by Dreher (2006) and improved upon by been recently improved by Dreher, Gaston and Martens (2008) and Gygli, Haelg and Sturn (2018) are sourced from KOF Swiss Economic Institute database.

3.2 Methodology

For sound and robust empirical analysis, we employ ARDL bounds testing approach that control for regime shifts in time series analysis. This is due to the short-comings of the conventional approaches to examine cointegration vectors. The ARDL bounds testing approach is rich in its flexibility in terms of the integration order of the series, i.e., whether the series become stationary at level $I(0)$, first difference $I(1)$ or partially integrated $I(0)/I(1)$. In addition, ARDL bounds testing approach is appropriate for small sample size. Moreover, a simple linear transformation of the series, helps to obtain dynamic unrestricted error correction model (UECM) from the ARDL bounds testing technique, which incorporates the short-run dynamics with the long-run cointegration equilibrium and still maintain all information for the long-run dynamics. The empirical framework of the ARDL bounds testing technique to cointegration specified for this study is given below in Eq. (1):

$$\begin{aligned} \Delta \ln CO_{2t} = & \beta_1 + \beta_{DV} DV + \beta_{RGDP} \ln RGDP_{t-1} + \beta_{GLO} \ln GLO_{t-1} + \beta_{TR} \ln TR_{t-1} \\ & + \sum_{i=1}^p \beta_i \Delta \ln RGDP_{t-i} + \sum_{j=0}^q \beta_j \Delta \ln GLO_{t-j} + \sum_{k=0}^t \beta_k \Delta \ln TR_{t-k} + \varepsilon_t \end{aligned} \quad (1)$$

where, $\ln CO_{2t}$, $\ln RGDP_t$, $\ln GLO$ and $\ln TR_t$ are natural logarithm of CO₂ emissions metric tons per capita, real gross domestic product per capita (as a measure of real income/economic growth), globalization index (that incorporate economic, social and political globalization) and international tourists' arrivals while ε_t represent stochastic terms. According to Pesaran et al (2001) to observe the presence of cointegration, it is required to compute F-statistics and compare it with the estimated lower and upper critical bounds values.

The null hypothesis is specified under the assumption of no cointegration among the series against its alternative of cointegration relationship among the series in is specified in Eq. (2) as follows;

$$\begin{aligned} H_0 = & \beta_{CO_2} = \beta_{RGDP} = \beta_{GLO} = \beta_{TR} = 0 \\ H_1 = & \beta_{CO_2} \neq \beta_{RGDP} \neq \beta_{GLO} \neq \beta_{TR} \neq 0 \end{aligned}$$

If the estimated F-statistics is greater than the upper critical bounds value, then, cointegration relationship is present among the series and vice versa.

The vector error correction model (VECM) is suitable Granger causality testing approach to apply when the variables are integrated at first order i.e., $I(1)$ and long-run cointegration relationship is present among the series. In this study, we apply VECM to examine Granger causality relationship. The VECM Granger causality method for this study is specified as follows in Eq. (2):

$$(1-L) \begin{bmatrix} \ln CO_{2t} \\ \ln RGDP_t \\ \ln GLO_t \\ \ln TR_t \end{bmatrix} = \begin{bmatrix} \beta_1 \\ \beta_2 \\ \beta_3 \\ \beta_4 \end{bmatrix} + \sum_{i=1}^p (1-L) \begin{bmatrix} c_{11i} & c_{12i} & c_{13i} & c_{14i} \\ c_{21i} & c_{22i} & c_{23i} & c_{24i} \\ c_{31i} & c_{32i} & c_{33i} & c_{34i} \\ c_{41i} & c_{42i} & c_{43i} & c_{44i} \end{bmatrix} \times \begin{bmatrix} \ln CO_{2t-1} \\ \ln RGDP_{t-1} \\ \ln GLO_{t-1} \\ \ln TR_{t-1} \end{bmatrix} + \begin{bmatrix} \beta \\ \gamma \\ \theta \\ \rho \end{bmatrix} ECT_{t-1} + \begin{bmatrix} \mu_{1t} \\ \mu_{2t} \\ \mu_{3t} \\ \mu_{4t} \end{bmatrix} \quad (2)$$

Where, ECT_{t-1} is the lagged residual obtained from the long-run relationship, $(1-L)$ denotes difference operator and μ_{1t} , μ_{2t} , μ_{3t} and μ_{4t} are the random terms, which are intended to reveal the homoscedasticity property (constant variance). In addition, the significance of the estimated coefficient of the ECT_{t-1} shows the long-run causal nexus among the series, while the short-run causal nexus is depicted by the significance of F-statistics via Wald test by integrating lagged differences and differences of the explanatory variables in the VECM model. Besides, the joint statistical significance of the lagged differences of the explanatory variables with lagged error term generates short-run and long-run causality estimates. For an instance, $c_{12i} \neq 0 \forall_i$ signifies that real income predict CO_2 emissions, while $c_{21i} \neq 0 \forall_i$ indicates that CO_2 emissions predicts real income.

4. Results and Discussion

In this section we discuss the results. The non-rejection of the Jarque-Bera null hypothesis of the descriptive statistics presented in Table 1 show that the natural logarithms of CO_2 emissions, real GDP, globalization index and tourism are normally distributed.

Table 1: Descriptive statistics

	$LNCO_2$	$LNRGDP$	$LNGLO$	$LNTR$
Mean	11.856	26.665	3.997	14.703
Median	11.938	26.680	4.014	15.107
Max.	12.754	27.656	4.267	17.350
Min.	10.660	25.715	3.726	10.851
Std. Dev.	0.590	0.545	0.187	1.971
Skewness	-0.266	0.044	-0.084	-0.337
Kurtosis	1.933	1.917	1.405	1.804

Jarque-Bera	2.666	2.213	4.821	3.534
Probability	0.263	0.330	0.089	0.170
Sum	533.563	1199.952	179.909	661.636
Sum Sq. Dev.	15.355	13.074	1.554	171.001
Observations	45	45	45	45

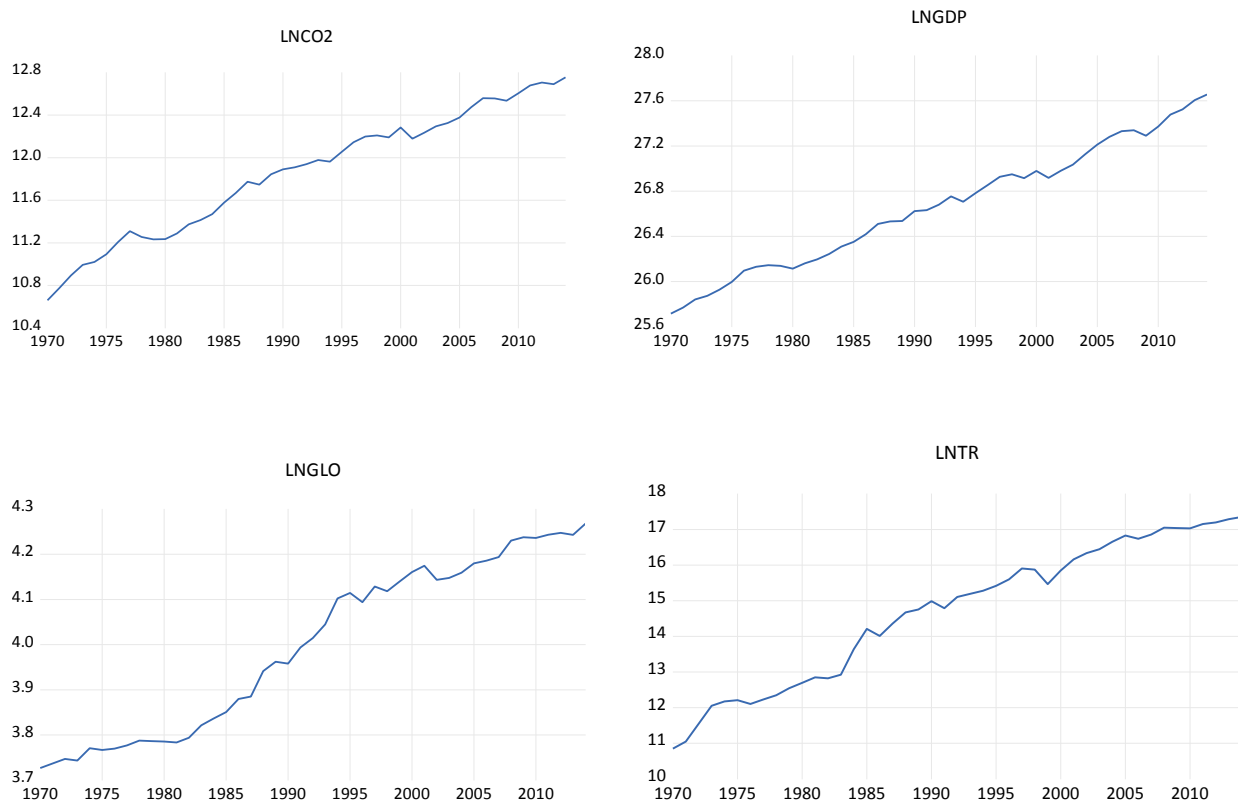


Figure 1: Graphical plot of $\ln CO_{2t}$, $\ln GDP_t$, $\ln GL_t$ and $\ln TR_t$

The graphical plot reported in Figure 1 illustrate the relationship among the series overtime in Turkey. By mere observing these plots, one would notice that the series have been trending upward (positive) over the years. Environmental degradation appears to be increasing with the increase in tourism, globalization and hence economic growth (real income). From a policy perspective, the interconnectedness among the variables as displayed in Figure 1, would do more harms than good for any economy be it developed, emerging and developing economies. It

appears production processes of Turkey lack necessary and adequate energy-saving and technologies that could accommodate tourism sector development (or excesses) in the era of globalization for a safer and clean environment.

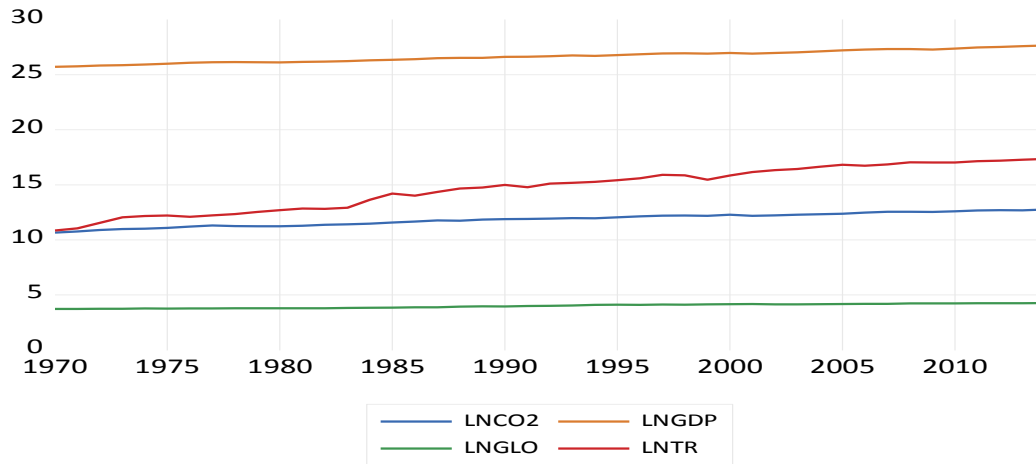


Figure 2: Combined Graphical plot of $\ln CO_{2t}$, $\ln GDP_t$, $\ln GLO_t$ and $\ln TR_t$

The environmental impact of tourism in the era of globalization in Turkey can never be overemphasized. This is confirmed in the combined graphical plots as reported in Figure 2. One interesting fact from this plot is that, tourism through the channel of globalization has been contributing consistently to environmental pollution in Turkey.

Table 2: Zivot and Andrews (1992) structural break unit root test

Variables	At level		At Δ	
	<i>T-stat</i>	<i>Break</i>	<i>T-stat</i>	<i>Break</i>
$\ln CO_{2t}$	-2.589 (0)	2002	-6.724*** (0)	1977
$\ln RGDP_t$	-1.601 (0)	2002	-7.151*** (0)	2009
$\ln GLO_t$	-2.620 (0)	1987	-7.615*** (0)	1994
$\ln TR_t$	-3.746 (0)	1983	-6.665*** (0)	1985

Note, *** depicts variables significance at 0.01 percent level. Δ represent first difference.

Our subsequent step is to observe the unit root properties of the series in order to advance to the ARDL bounds testing method to cointegration. This bound testing approach to cointegration

does not necessarily require before-unit root testing, however we see to it that not one of the series is integrated at first two, i.e., $I(2)$. The ARDL bound testing approach suggests that series should be non-stationary-free at level $I(0)$, at first difference $I(1)$ or partially integrated $I(0)/I(1)$ respectively. In order to overcome this issue, we did not bother to estimate Augmented Dickey and Fuller (1979) and Phillips and Perron (1988) unit root approaches for testing the stationarity properties of the series under observation, since none of these unit root approach control for regime (structural break) shifts that is common in time series data. It is believed that, the basic information regarding the regime shifts would serve as a policy tool for policymakers to consider these regimes shifts while formulating all-inclusive tourism, globalization, economic and environmental policies in the region. On this premise, we make use of Zivot and Andrews (1992) unit root testing approach that control for a single unknown regime shift. Results as reported in Table 2 reveal that, we could not reject the null hypothesis that the series are non-stationary when the unit root test, was conducted at level with the existence of a single regime shift, however integrated at first order, i.e., $I(1)$, with the estimated break-dates in the 1980's and 2000's.

The estimated break-dates rally around with 2000s peak carbon intensity of the energy sector in Turkey, which had a significant impact on the economic growth. This is coupled with the revitalizing Turkey tourism's industry, which was one of the main achievements of the late Prime Minister Turgut Ozal, a man who dominated Turkish economic policies with his vibrant ideas in the 1980s. His economic alongside tourism policies opened up Turkish tourism sector to the globalized world. This is at a time, when Turkish economy was struggling to put its fragile economy together, because they were unaware that their rich history, wispy radiant sea, dazzling sunshine and natural beauty could also be commercialized.

Table 3: Bayer and Hanck cointegration test results

Estimated Models	EG-JOH-BO-BDM	Critical Values	Cointegration
$\ln CO_{2t} = f(\ln TR_t)$	99.184 ^{**}	11.229	Yes
$\ln CO_{2t} = f(\ln TR_t, \ln GLO_t)$	49.562 ^{**}	21.106	Yes
$\ln CO_{2t} = f(\ln TR_t, \ln GLO_t, \ln RGDP_t)$	40.011 ^{**}	20.486	Yes

Note, ** depicts variables significance at 0.05 percent level.

The typical integration order of the series motivates us to employ the unique econometric tool of ARDL bounds testing approach to test whether cointegration relationship exist among the series or not. It is crucial to state here that, for model specification, the ARDL bounds testing approach necessitates the use of appropriate lag length. We make use of Akaike Information Criteria (AIC) to choose suitable lag length, since it preferable (superior power properties) for small sample size data compared to Schwarz Information Criteria (SBC), Hannan-Quinn Information Criteria and Final Prediction Error (FPE) as suggested by Lutkepohl (2006). The results are presented in the upper part of Table 4 using various lag length criteria. Using the AIC, we find that, the appropriate lag length is 1 in the annual frequency data between the periods 1970-2014 in the case of Turkey.

Table 4: Lag order criteria and F-Bound test results

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-530.332	NA	4709861.	26.716	26.885	26.777
1	-342.549	328.621 [*]	881.131 [*]	18.127 [*]	18.971 [*]	18.432 [*]
2	-336.638	9.161	1497.810	18.631	20.151	19.181
3	-321.885	19.917	1703.732	18.694	20.889	19.488
4	-300.878	24.157	1514.220	18.443	21.315	19.482
5	-285.502	14.607	1977.006	18.475	22.021	19.757
F-Bounds Test		Null Hypothesis: No levels relationship				
Test Stat	Value	Significant.	I(0)	I(1)		
Asymptotic: n=1000						
F-stat	16.428 ^{***}	10%	2.37	3.2		
k	3	5%	2.79	3.67		
		2.5%	3.15	4.08		
		1%	3.65	4.66		

*Note: LR: sequential modified LR test statistic (each test at 5% level). FPE: Final prediction error. AIC: Akaike information criterion. SC: Schwarz information criterion. HQ: Hannan–Quinn information criterion. * indicates lag order selected by the criterion. Note *** depict significance level at 0.01 percent level,*

Having confirmed the stationary properties and the appropriate lag length criteria for the ARDL bounds testing approach, the combined cointegration tests newly introduced by Bayer and Hanck (2013) become appropriate to test, whether the cointegration relationship exist among the series or not. Table 3 provide illustration of the combined cointegration tests of the EG-JOH-BO-BDM. Results as reported in Table 3 show that, the estimated Fisher-statistics for EG-JOH-BO-BDM tests is greater than the critical values at a ($p < 0.05$) significant level, as we used $\ln CO_{2t}$ as dependent variable. Based on the combined cointegration results, we reject the null hypothesis of no cointegration relationship among the series. Thus, we conclude based on enough evidence that there is presence of a long-run equilibrium cointegration relationship among carbon dioxide emissions, globalization, tourism and economic growth over the sample periods 1970-2014.

As discussed earlier that the combined cointegration approach of Bayer and Hanck (2013) generates efficient and robust long-run cointegration results, however, the cointegration methodology fails to control for regime shift while testing the long-run nexus among the series. This problem is accounted for by utilizing the ARDL bounds testing technique to cointegration even with the existence of regime shift as suggested by Shahbaz, Ozturk and Ali (2013) and Shahbaz, Uddin, Rehman and Imran (2014). The second part of Table 4 reveals the results of the ARDL bounds testing method, and provide the evidence that is statistically significant enough to justify that presence of a long-run cointegration relationship among the series. Results as reported above (Table 4) shows that, the estimated F-statistic is greater than the upper and lower critical values (bounds) at ($p < 0.01$), ($p < 0.05$) and ($p < 0.10$) significance levels respectively.

This confirms the empirical results that there is an existence of a long-run relationship among the series in Turkey.

We proceed to examine the impacts of the explanatory variables on carbon emissions (dependent variable) in the short-run in the case of Turkey. Results as reported in Table 5 reveal that real income (economic growth) has a positive impact on metric tons per capita CO₂ emissions at a ($p < 0.01$) significance level. The result signifies that a 1% increase in real income level will increase metric ton per capita CO₂ emissions by 0.555%. Thus, metric tons per capita CO₂ emissions increase as economic and production activities rise. Similarly, the impact of international tourists' arrivals is also positive and less elastic at a ($p < 0.01$) significance level. The result indicates that a 1% increase in international tourists' arrivals level is associated with 0.153% increase in metric tons per capita CO₂ emissions. This result is expected because, Turkey has a well-developed tourism sector, which has contributed positively (about 4.1% to GDP) to economic growth, and at the same time increased metric tons per capita CO₂ emissions from the consumption of energy such as coal production and fossil fuel consumption generated by the use of automobiles, electricity generation and industrial production, which in one way or another has increased environmental pollution/degradation as a result of increased demand for tourism products in Turkey.

Table 5: Short-run and Long-run ARDL (1, 0, 0, 0) results

Dependent Variable = $\ln CO2_t$			
Short-run results			
Variable	<i>Coefficient</i>	<i>Std.Error</i>	<i>T-stat.</i>
$\Delta \ln RGDP_t$	0.555***	0.105	5.254
$\Delta \ln GLO_t$	-0.092	0.174	-0.527
$\Delta \ln TR_t$	0.153***	0.028	5.464
D1983	0.037	0.030	1.254
D1987	0.021	0.029	0.816
D2002	-0.040	0.029	-1.408
Constant	-7.043***	1.791	-3.931
ECM_{t-1}	-0.692***	0.109	-6.307
R^2	0.994		
$F-stat.$	15.63***		
Long-run results			
Variable	<i>Coefficient</i>	<i>Std.Error</i>	<i>T-stat.</i>
$\ln RGDP_t$	0.802***	0.102	7.841
$\ln GLO_t$	-0.132	0.253	0.523
$\ln TR_t$	0.077**	0.036	2.129
D1983	0.054	0.045	1.201
D1987	0.034	0.043	0.810
D2002	-0.058	0.037	-1.557
Constant	-10.165***	2.100	-4.832
Diagnostic results			
Tests	<i>F-stat</i>	<i>p-Value</i>	
Serial Correlation	1.331	0.272	
Heteroscedasticity	0.126	0.723	
Normality	0.044	0.977	

*Note *** and ** depicts significance at 0.01 and 0.05 percent level.*

Globalization has no significant negative impacts on CO₂ emissions at all significance levels. This result indicates that, globalization has no role to play on the increase in metric tons per capita of CO₂ emissions generated in the short-run. This result is consistent with the findings of Akadiri et al (2018; 2019) for tourist destination states, where they found that globalization has no statistical impact on environmental pollution and thus, argued that, factors that contributes to environmental pollution in a nation are mostly internal factors rather external factor that comes with globalization.

The long-run results are also reported followed the short-run estimates in Table 5. Results as reported for long-run estimated coefficient estimates show that, real income per capita have a positive and significant impact on metric tons per capita CO₂ emissions. Result indicates that a 1% increase in real income per capita in the long-run is associated with 0.802% increase in metric tons per capita CO₂ emissions at a ($p < 0.01$) significance level, holding other factors constant (*ceteris paribus*). International tourists' arrivals positively impact, although less elastic, on metric tons per capita CO₂ emissions. We found that, a 1% increase in tourism is linked with 0.077% rise in metric tons per capita CO₂ emissions in the future time (long-run) in Turkey. Similarly, globalization has no significant negative impacts on CO₂ emissions at all significance levels. This result indicates that, globalization has no role to play on the increase in metric tons per capita of CO₂ emissions generated in the long-run in the case of Turkey.

In addition, we applied the structural breaks-dates into the ARDL bounds testing model to test, whether the break-dates have significant impact on the environmental degradation over the period 1980s-2000s, the results as reported in Table 5 show that, all the noticeable break-dates are not statistically significant at all significance levels. This indicates that, the structural break-

dates has no significant impact in the nation over the sample period. This results also confirm that the ARDL estimated coefficients are efficient, robust and reliable for policy making.

The estimated error correction model adjustment term ECT_{t-1} is negative (-0.692) and statistically significant at a ($p < 0.01$) significance level. This result provides strong evidence to support long-run equilibrium relationship among the variables in the case of Turkey. The ECT_{t-1} estimated coefficient is significant at a ($p < 0.01$) level. This indicates that, short-run deviations from the steady state path are corrected 0.692% towards the long-run equilibrium steady state path annually.

The autonomous term provides a noticeable result both in the short-run and long-run. The autonomous term is negative and significant associated with metric tons per capita. Results show that, holding other factors constant, a 1% increase in the autonomous term will decrease metric tons per capita CO₂ emissions by 7.043% and 10.185% in the short-run and long-run respectively. This result indicates that the established Turkish government environmental plan and programs to curtail the impact of tourism, globalization, economic activities and any other factors that contributes to CO₂ emissions that are not observed in this study has been successful. One of environmental policies is the Tenth Development Plan introduced between the period of 2014-2018, with the major objectives of environment sustainability and increasing development of Turkey's renewable energy sector, specifically for geothermal and power. Turkey, in an attempt to proceed its accession procedures to join the European Union (EU), the nation has made an attempt towards putting in place emission controls, improve in their use of renewable energy resources and also encourage the all-inclusive energy-saving technologies and energy-efficiency of the nation. Turkey has made considerable progress; in terms of regulating industrial

pollution and air quality, however, further attempt into fully executing this environmental legislation policies must be put in place.

The study empirical model also undergoes major and crucial sensitivity (diagnostic) tests; such serial correlation, heteroscedasticity and normality tests. The results are reported at the lower part of Table 5. From the results, we found that, the error correction terms of the short-run models are normally distributed and free from heteroscedasticity and serial correlation problems. The high value of the coefficient of determination ($R^2 = 0.994 \rightarrow 1$) of the ARDL bounds testing model indicates that the adjustment coefficient is significant and robust in the short-run. The model joint statistic (F-stat = 15.63) that show the overall significance and robustness of the model is significant at a ($p < 0.01$) level.

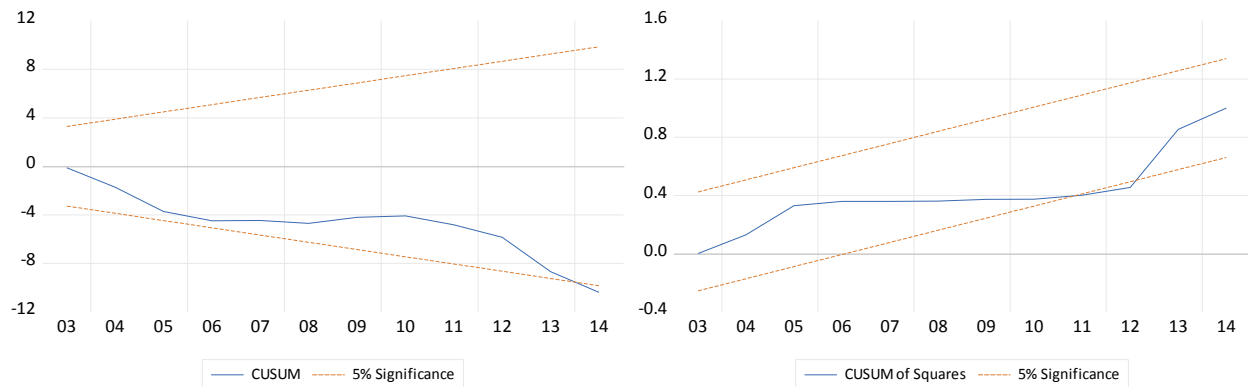


Figure 3: Graphical plot of Cumulative Sum of Squares of Recursive Residuals. The straight lines depict critical bounds at 5% significance level.

Lastly, we also report the stability test result of the ARDL bounds testing estimates via the cumulative sum (CUSUM) and cumulative sum square of recursive residuals (CUSUMsq.) tests in Figure 3. Stability tests results show that, the graphical plots of the CUMSUM and CUSUMsq falls within the 5% significance critical bounds. This indicates the specified model is consistent

and series follow a long-run stable pattern, thus, the ARDL bounds testing model is robust, reliable and efficient for policy decision making.

The presence of a long-run equilibrium cointegration relationship observed among the series, such as CO₂ emissions, economic growth, globalization index and tourism motivate us to make use of VECM approach to Granger causality testing. This approach generates information regarding the predictive (causality) relationship among series for both the short- and long-run. Thus, the suitable information regarding the direction of causality among the series will be of use to policymakers to have a better understanding of the interrelationships and interconnectedness that exist among the series, thus, empower them to design economic, tourism and globalization (be it social, economic and political) with a view to formulate and enhance environmental quality of such nation and by so doing realize laid down economic sustainability objective for both the immediate and future generation.

Table 6: VECM Granger causality test results

Dep. Variables	Direction of Causality				
	<i>Short-run</i>				<i>Long-run</i>
	$\Delta \ln CO_{2t-1}$	$\Delta \ln RGDP_{t-1}$	$\Delta \ln GLO_{t-1}$	$\Delta \ln TR_{t-1}$	ECT_{t-1}
$\Delta \ln CO_{2t}$	-----	2.771 (0.104)	0.258 (0.614)	0.503*** (0.001)	0.305*** (0.001)
$\Delta \ln RGDP_t$	1.508 (0.226)	-----	0.064 (0.800)	1.671 (0.203)	1.036*** (0.000)
$\Delta \ln GLO_t$	0.925 (0.342)	0.051 (0.821)	-----	0.202 (0.640)	0.816*** (0.000)
$\Delta \ln TR_t$	2.037 (0.161)	0.822 (0.370)	1.333 (0.255)	-----	0.742*** (0.000)

Note *** depicts significance at 0.01 percent level.

The VECM Granger causality results is presented in Table 6. The short-run prediction can be observed by the joint statistical significance of the LR test of the lagged independent variables in the specified model, while the long-run prediction is designated by the statistical significance of

the estimated coefficient of the one-period lagged ECT_{t-1} term specified in Eq. (2) via the student t-test. Results reported in Table 6 show that, the estimated ECM_{t-1} term is positive and significant across the VECM equations.

As reported, the empirical results from the short-run prediction (causality) show a unidirectional relationship running from tourism to CO₂ emissions, while between globalization and CO₂ emissions and economic growth between CO₂ emissions there is no feedback relationship. From a policy standpoint, increase or decrease in international tourists' arrivals have a major influence on the environmental quality, particularly in Turkey. In the long-run, we found bidirectional causality relationship between CO₂ emissions and economic growth. The direction of causality between globalization index and CO₂ emissions is bidirectional. Tourism is also bidirectionally link with CO₂ emissions.

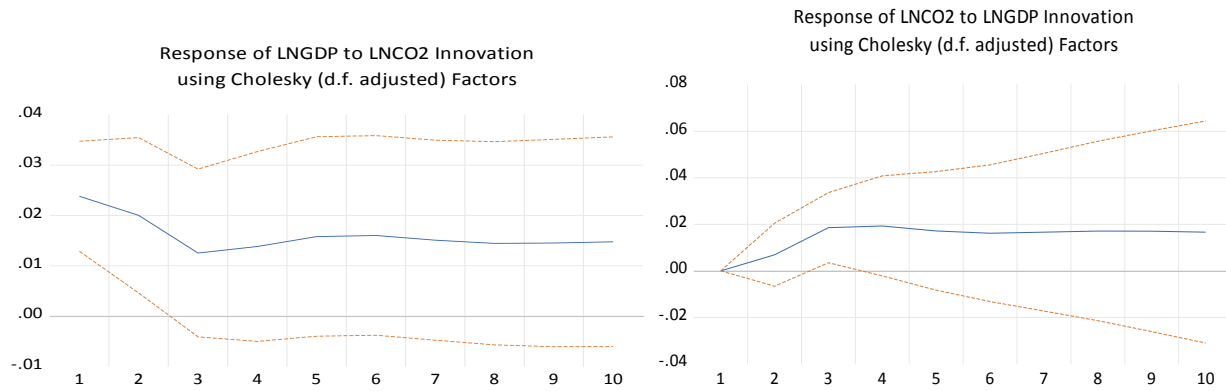


Figure 4: Impulse response plot of $\ln GDP_t$ to $\ln CO_{2t}$ and vice versa.

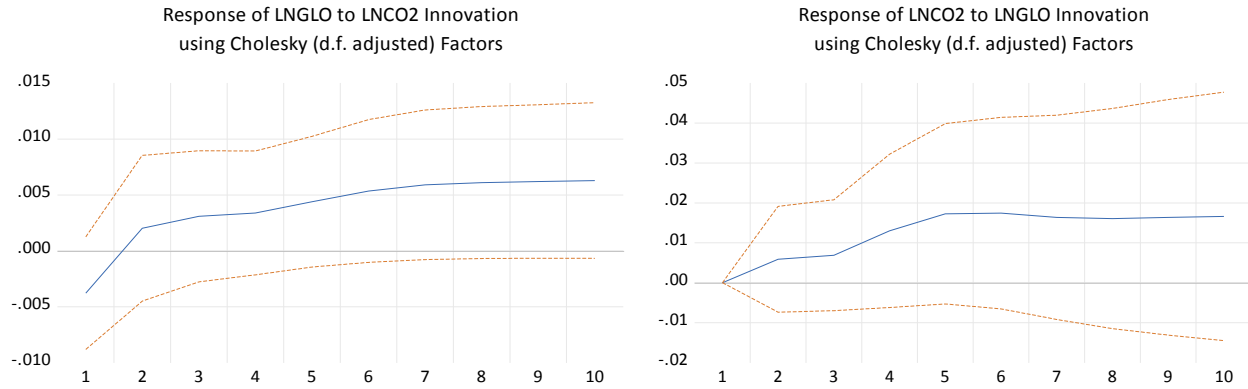


Figure 5: Impulse response plot of $\ln GLO_t$ to $\ln CO_{2t}$ and vice versa.

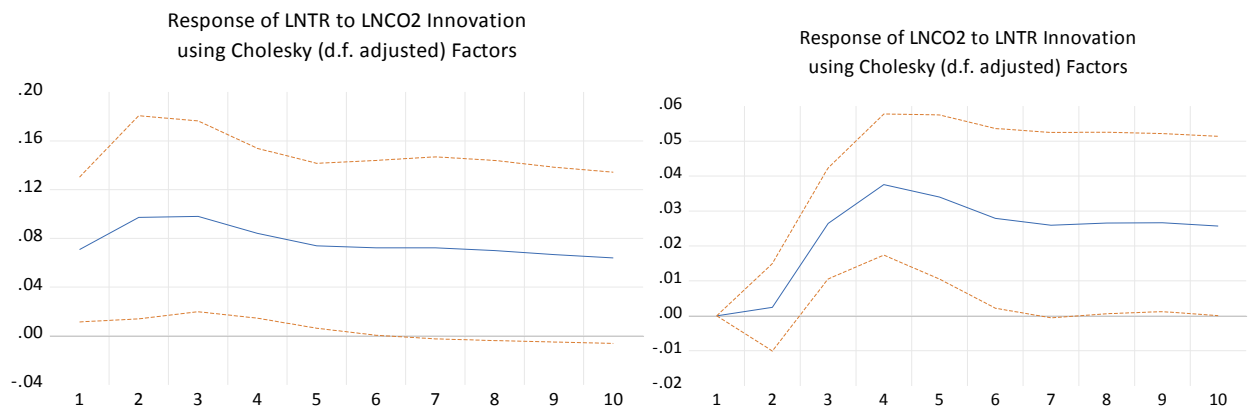


Figure 6: Impulse response plot of $\ln TR_t$ to $\ln CO_{2t}$ and vice versa.

Having confirmed bidirectional causality relationship between tourism to CO₂ emissions, between globalization and CO₂ emissions and between economic growth and CO₂ emissions in the long-run, we proceed to investigate how these variables react to a shock using the impulse response function (IRF). Figure 4-6 reports the impulse response function (IRF) results of the responses of a shock from economic growth to CO₂ emissions, shock from globalization to CO₂ emissions and shock from tourism to CO₂ emissions, and vice versa.

In Figure 4, the IRF shows that economic growth first declines between the period 1-3, react positively between period 3-6 and become stable to a shock in CO₂ emissions, while CO₂ emissions first react positively, then inverse and become stable to a shock in tourism. In Figure 5, globalization index negatively reacts between the period 1-2, and become stable to a shock in

CO₂ emissions, while CO₂ emissions react positively between the period 1-6 and then become stable to a shock in globalization between period 7 to 10. Tourism on the other hand in Figure 6, first react positively to a shock in CO₂ emissions, then become stable between the period 2-3 and react adversely to a shock in CO₂ emissions, while CO₂ emissions first react positively to a shock in tourism, between the period 1-4, react adversely between period 4-6, and become stable afterwards to a shock in tourism. Consequently, results show that, a one standard deviation shock to tourism, globalization and economic growth has a noticeable positive and persistent impact on CO₂ emissions in the long-run.

5. Conclusion and Policy Implications

In study proffers new insight on how real income, globalization index and tourism interact and influence CO₂ emissions by using ARDL bounds testing and VECM Granger causality approaches that produces short-run and long-run estimates over the periods 1970-2014 in the case of Turkey. We incorporate dummy variables to suitably control the regime shifts present in the time series. Empirical results provide enough significant evidence of cointegration relationship among the series even with the existence of regime shifts. The empirical also confirm that economic growth and tourism are the principal determinant of environmental degradation as they contribute to CO₂ emissions both in the short- and long-run. Globalization index though negative but statistically insignificant both in the short- and long-run. Thus, we infer that, factors that contribute to environmental degradation in Turkey are more internal than external factors. The autonomous term also yields an interesting result. The estimated coefficients both in the short- and long-run was found to be more elastic, negative and significant. This is an indication, that efforts put together by the policymakers and government of Turkey are beginning to yield meaningful impacts on the economy.

The clean and healthy environmental strategy is stated in the Tenth Turkey Development Plan. Although, the environmental strategy is a short-term program, which if well implemented, is expected to have a long-term impact environmental quality on the Turkish economy. The environmental policy is put together to curb and reduce demand for non-renewable energy both for the residence, transportation, industrial production and tourism sectors, with the major objectives of environment sustainability and increasing development of Turkey's renewable energy sector, specifically for geothermal and power.

Turkey, in an attempt to proceed its accession procedures to join the European Union (EU), the nation has made an attempt towards putting in place emission controls, improve in their use of renewable energy resources and also encourage the all-inclusive energy-saving technologies and energy-efficiency of the nation. Turkey has made considerable progress; in terms of regulating industrial pollution and air quality, however, further attempt into fully executing this environmental legislation policies must be put in place.

With the nation plan to meet increased energy demand by enhancing the nation new coal-fired power plants, a policy which contradict efforts to reduce greenhouse gas emissions and the use of coal in electricity generation worldwide by two-thirds over 2020–2030 and to zero by 2050. Besides, on a positive note, the Turkish government has recently invested approximately 11 billion US\$ in its National Energy Efficiency Action Plan and energy efficiency measures, this policy if fully put in place, is anticipated to minimize Turkey's CO₂ emissions by 7 to 11% lower than their present policy projections by 2030.

In conclusion, given the sporadic increase in tourism and industrial production and risks associated with the increased in economic activities and energy consumption of non-renewable in Turkey in the era of globalization, it makes more sense - on, economic, environmental, social

grounds and energy security for Turkish government to invest more in renewables, if any meaningful improvement in environmental quality and sustainability is to be achieved both for the immediate and future generation.

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