Avrupa Bilim ve Teknoloji Dergisi
Sayı 38, S. 440-449, Ağustos 2022
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Derleme Makalesi

www.ejosat.com ISSN:2148-2683

European Journal of Science and Technology
No. 38, pp. 440-449, August 2022
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Review Article

The Role of Tourism, Energy Consumption, Urbanization, and Economic Growth on Ecological Footprint: The Turkish Case

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(İlk Geliş Tarihi 1 Aralık 2021 ve Kabul Tarihi 11 Ağustos 2022)

(**DOI:** 10.31590/ejosat.1030941)

ATIF/REFERENCE: Boluk, G. & Guven, M. (2022). The Role of Tourism, Energy Consumption, Urbanization, and Economic Growth on Ecological Footprint: The Turkish Case. *Avrupa Bilim ve Teknoloji Dergisi*, (38), 440-449.

Abstract

This study aims to analyze the impacts of tourism, energy consumption, urbanization, and economic growth on the environmental quality in Turkey for the period from 1963 to 2015. Apart from the previous empirical EKC studies, we test the validity of the tourism-induced environmental Kuznets curve (EKC) hypothesis by using a more comprehensive ecological quality indicator named Ecological Footprint. For this purpose, we employ FMOLS and DOLS estimators to estimate our model and CCR estimator to check the robustness of the FMOLS and DOLS estimation results. Moreover, we use the VECM approach to detect the causality between variables. Our results reveal that neither tourism-induced EKC nor tourism-led growth is confirmed for Turkey. Empirical results also show that energy usage, urbanization, and international tourism arrival lead to environmental degradation in Turkey. Hence, the Turkish government should design a more efficient policy that accelerates the transition to renewable energy in the economy, including in the tourism sector. Moreover, Turkey needs to benefit from the advantages of a circular economy and smart tourism.

Keywords: Tourism induced EKC, ecological footprint, sustainable tourism, urbanization, time series analysis.

Turizm, Enerji Tüketimi, Kentleşme ve Ekonomik Büyümenin Ekolojik Ayak İzi Üzerindeki Rolü: Türkiye Örneği

Öz

Bu çalışma, 1963-2015 dönemi için Türkiye'de turizm, enerji tüketimi, kentleşme ve ekonomik büyümenin çevre kalitesi üzerindeki etkilerini analiz etmeyi amaçlamaktadır. Önceki ampirik EKC çalışmalardan farklı olarak, Ekolojik Ayak İzi olarak adlandırılan daha kapsamlı bir ekolojik kalite göstergesi kullanarak turizm-kaynaklı çevresel Kuznets eğrisi (EKC) hipotezinin geçerliliğini test etmekteyiz. Bu amaçla, modelimizi tahmin etmek için FMOLS ve DOLS tahmincilerini ve FMOLS ve DOLS tahmin sonuçlarının sağlamlığını kontrol etmek için CCR tahmincisini kullanmaktayız. Ayrıca, değişkenler arasındaki nedenselliği tespit etmek için VECM yaklaşımını kullanmaktayız. Sonuçlarımız, Türkiye için hem turizm-kaynaklı EKC hem de turizme dayalı büyümenin doğrulanmadığını ortaya koymaktadır. Ampirik sonuçlar ayrıca enerji kullanımı, kentleşme ve uluslararası turist gelişlerinin Türkiye'de çevresel bozulmaya yol açtığını göstermektedir. Bu nedenle, Türk hükümeti turizm sektörü de dahil olmak üzere ekonomide yenilenebilir enerjiye geçişi hızlandıran daha verimli bir politika tasarlamalıdır. Ayrıca Türkiye'nin döngüsel ekonominin ve akıllı turizmin avantajlarından faydalanması gerekmektedir.

Anahtar Kelimeler: Turizm kaynaklı EKC, ekolojik ayak izi, sürdürülebilir turizm, kentleşme, zaman serisi analizi.

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1. Introduction

Tourism is one of the largest industries in the world, and it promotes economic growth (hereafter EGR) and tourism activities have a multiplier effect on the economy (Shaheen et al., 2019). World Travel&Tourism Council (WTTC) reports that global tourism contributed to 10.3 percent of global GDP (around USD 9 trillion) and created 330 million jobs in 2019 (WTTC, 2020). While tourism creates employment, foreign exchange inflow, and output increase in the economies, it also adversely affects the environment. The tourism sector mainly relies on a stable climate and pleasant environmental conditions. However, it also leads to (Nathaniel et al, 2021, UNCC, 2017). Development in the tourism sector is linked to climate change through various channels; for example, an increased number of visitors raises the energy demand for transportation, catering, restaurants, heating or cooling, accommodation activities, etc. Tourism activities lead to energy utilization directly from primary energy sources like oil and coal and indirectly from electricity obtained from oil and natural gas (Danish & Wang, 2018). According to the United Nations Climate Change (UNCC), the tourism sector emits 5 % of global carbon dioxide emissions, and accommodation is responsible for 20 % of carbon emissions from the tourism sector (UNCC, 2017). These data indicate that tourism has deteriorating impacts on environmental pollution, which exacerbates concerns about tourism sustainability and sustainable economic growth. United Nations (UN) declared the year 2017 to be the International Year for Sustainable Tourism for Development to ensure more responsible tourism and draw attention to the contribution of sustainable tourism to development (Nair, 2017).

As the 6th most popular tourism destination, the tourism sector is the most dynamic and fastest-growing sector in the Turkish economy (OECD, 2021). As a result of ambitious reforms in many areas, such as the finance and energy sectors, Turkey's economic and social performances have been impressive since 2000. Turkey has exhibited positive EGR (around 1,8 %) during the 2020 Covid 19 pandemic (TurkStat, 2021). The tourism industry supports economic development by accelerating the foreign currency inflow to Turkey and creating around 2 million jobs (7.4 % of total employment). According to the Association of Turkish Travel Agencies (2020), the contribution of the travel and tourism industry to GDP in Turkey was 3.8 % in 2018 (TÜRSAB, 2020). When an indirect and induced contribution is taken into account, this contribution reaches approximately 12 % of the economy. Using input-output modeling, however, Bölük & Karkacier (2019) highlighted that Turkish tourism is highly integrated with food manufacturing, transportation, agriculture, and energy sectors. Hence, since the environment in Turkey is expected to be disturbed, the interaction between the tourism industry, energy utilization, and environmental quality should be analyzed.

Only a few previous studies examining the role of tourism on the environment in Turkey, like most studies in literature, have focused on CO_2 emissions as a representative of environmental degradation, and air pollution-based implications may be misleading (Lee and Chen, 2021). Moreover, these studies either tested the causal relationship between tourism, GDP, and CO_2 emissions or the link between TOTEN and the tourism sector (i.e., Katircioglu, 2014; De vita et al., 2015, Eyupoglu&Uzar, 2020). The current study differs from previous literature at some points and provides essential contributions. First, in this study, environmental degradation has been evaluated more powerful and comprehensive indicator entitled EFP, which comprises five substantial areas in addition to air pollution: "*cropland, grazing land, fishing ground, forest area, built-up land*" (Ulucak & Bilgili, 2018) for Turkey. Using more than 600 data points, EFP gives more accurate information about the active pressure of human activities (consumption and production) on natural resources. Second, most tourism-induced EKC evaluates the impact of inbound and/or international tourism on pollution and generally ignores the role of energy consumption (hereafter TOTEN). As emphasized by some researchers (See Dinda, 2004; Marrero, 2010; Danish et.al., 2017 among the others) although energy is the vital factor in shaping the inverted-U shaped relation, which indicates the validity of the EKC hypothesis, few empirical studies analyzed the role of energy in tourism-induced EKC modeling. However, we incorporate the TOTEN into the model to better understand the interaction between tourism, energy, and environmental issues and avoid the omitted variable bias. Third, in most tourism-induced EKC models, causalities between variables were investigated by assuming a linear relationship. However, the EKC hypothesis constitutes the theoretical background of linkages between tourism and EGR, and argues quadratic or cubic functional relationship. Therefore, we examine the inverted U-shaped relationship between EGR and EFP (EKC hypothesis). Fourth, although many studies skip applying a robustness test in the literature, we employ Canonical Cointegrating Regression to control the robustness of the fully modified ordinary least squares and dynamic ordinary least squares estimates. Fifth, few studies on the interaction between tourism and the environment in Turkey generally evaluate the worsening in CO_2 emissions. According to the author's best knowledge, there is only one research paper (See Godil et al.,2020) that investigates the role of tourism on EFP. However, key pollutant factors, namely TOTEN and urbanization, have been neglected for Turkey in this study. Hence there is an obvious limitation of tourism impacts on EFP and results are mixed. Sixth, our results would be useful to understand the effects of urbanization better since there are also controversial results on whether urbanization threats environmental sustainability (See Shahbaz et al., 2016; Tupy; 2015; Zhou et al., 2012). Therefore, this is the first attempt to empirically analyze the role of energy and urbanization in the tourism-induced EKC relationship in Turkey. In this respect, the results of the current study would provide important implications for sustainable tourism and sustainable growth for Turkey and tourism-induced economies in the world.

The remaining section of the present study is organized as follows. Section two presents a brief literature review. While the data and empirical methodologies are illustrated in Section three, findings and discussions are presented in section four. The final section offers conclusion and discusses the policy implications.

2. Literature Review

Many studies in the literature focus on the nexus between tourism, economic growth, and environmental quality. These studies can be reviewed in three branches. In the first branch, it has been empirically tested whether the tourism industry accelerates the long-run GDP increase (e.g. human and physical capital, export) under the tourism-led growth (TLG) hypothesis since the 1970s (Kongbuamai et al., 2020; Hye & Khan,2012. Generally, foreign exchange earnings from the tourism industry are used to import capital and intermediate goods, resulting in accelerated EGR. The causality relationships between tourism and EGR discuss four arguments: TLG, economic-driven tourism, bidirectional causality, and no causality (Nepal et al., 2019). In earlier studies, Ghali (1976) analyzed whether tourism activities boost Hawaii's economy or not and concluded that income per capita would be 17% lower without the tourism industry. Similarly, Hye & Khan (2013) provided evidence supporting the TLG hypothesis for Pakistan. The link between tourism and EGR was also examined for country groups. For example, while Skerritt & Huybers (2005) analyzes the role of tourism sector on GDP for 37 developing countries, Fayissa et al. (2007) tested TLG for 47 African countries. As highlighted by Nunkoo et.al. (2019), research papers on tourism industry and EGR have exceeded 364 scientific publications so far. Despite a large number of research papers, there is a lack of consensus on the exact nature of relationships among tourism, EGR, and the environment. Therefore, this area of research is mixed and still needs more scientific proof. After the pioneering study of Grossman & Krueger (1993), many studies have begun to analyze the relationship between EGR and environmental pollution in the framework of EKC. As known EKC constitutes the theoretical basis of environmental degradation-EGR nexus. This hypothesis proposes that pollution level first increases with economic growth and then lessens with the enhancing economic progress in an inverted U-shape link. EKC has gained importance after the study of Grossman and Krueger (1993) because it is supposed to solve the environmental pollution and/or deterioration problem as a concept. If EKC is valid, then environmental degradation will disappear soon once the countries reach a certain level of EGR[†].

Later the EKC hypothesis has been linked with the TLG hypothesis and started to be called as "tourism-induced EKC hypothesis" (Kongbuamai et.al., 2020). For example, Danish & Wang (2018) investigated the dynamic relationship between the tourism industry, EGR, and CO_2 emissions for BRICS countries from 1995 to 2014. Authors found that tourism encourages EGR; however tourism sector deteriorates the environment. Bella (2018) tested the tourism-induced EKC for France and validated the EKC hypothesis between GHGs and international tourist arrivals. Apart from these studies tourism industry has also been found to mitigate CO_2 emissions or EFP in some countries and/or regions (See Ozturk et al., 2016; Katircioglu et al., 2018).

Since energy usage is at the heart of the growth and climate change debates, many studies have started to discuss the link between TOTEN and EGR. In this second branch of EKC studies, the interaction between environmental pollution, EGR, and aggregate TOTEN has been examined by adding some additional explanatory variables like financial development, trade, total factor productivity, urbanization, foreign direct investment, information and communication technologies, natural gas or coal consumption, etc. for some countries or country groups (see Akbostancı et al., 2009; Apergis & Payne, 2009; Pao & Tsai, 2011, Luzzati & Orsini, 2009, Sarkodie & Strezov, 2018; Dong et al., 2018; Amri, 2018, among the others). Since renewable energy technologies are considered as environment-friendly sources, the role of renewable energy on growth and quality of environment has been started to be discussed in recent EKC studies (See Apergis & Payne, 2010; Sadorsky, 2009; Marrero, 2010; Danish et.al., 2017; Gill et.al., 2018; Yao et.al., 2019; Sugiawan & Managi, 2016). These studies point out that TOTEN (fossil or renewable energy) has a crucial role in both validations of EKC and mitigating environmental pollution. Similarly, since the tourism industry has a vital role in climate change because of the energy usage for transportation, heating, cooling, cooking, etc., resulting in more CO_2 emissions, some studies in this branch examined the role of international arrivals on environmental pollution. For instance, Danish & Wang (2018) analyzed the dynamic relationship between tourism, energy, and CO_2 emissions for BRICS countries over the period 1995-2014 and found evidence in favour of EKC validation and economy driven tourism industry. By using panel data analysis Shaheen et.al. (2019) examined the dynamic linkage between international tourism, TOTEN and CO_2 emissions for top ten tourism induced countries over the period of 1995-2016. Authors found evidence validating the EKC hypothesis and feedback relationship between tourism income and TOTEN. By adding health expenditures into the model, Zaman et al. (2016) examined the role of tourism development and TOTEN and CO_2 for developed and developing countries and found evidence supporting the EKC hypothesis, that growth led to tourism and tourism-induced emissions. Gamage et al. (2017) showed tourism development exacerbates the environmental pollution in Sri Lanka. Udemba (2019) empirically proved that tourism in energy consuming and environment pollutant industry for China. However, Dogan et al. (2017) found no evidence in validating the EKC hypothesis, but the author's results showed that tourism and TOTEN deteriorated CO_2 emissions in OECD countries. Bozkurt et.al. (2016) analyzed the role of tourism, energy, and trade openness for BRICTS countries over the period from 1995 to 2011 and found that tourism and TOTEN increases the emissions. Instead of focusing on tourism-induced countries, Qureshi et al. (2017) examined the dynamic relationship among the CO_2, energy, health, and wealth at the province level (80 international destinations from 37 countries) by employing a panel GMM estimator. According to the results, inbound tourism increases the energy demand, GDP, FDI inflow, trade, and CO_2 emissions in these provinces. On the contrary, some authors found no evidence that tourism is a pollutant industry. For example, using the ARDL bounds test and data over the 1980-2016 period, Liu et al. (2019) have no significant impact on air pollution in Pakistan. De Vita et.al. (2015) found that EKC is confirmed for Turkey and international tourist arrivals increase the emissions. Using Fourier ADL and ARDL testing, Eyupoglu & Uzar (2020) demonstrated that environmental quality is essential for tourists in the decision process of destination, and tourism increases the CO_2 emissions in Turkey. Some authors investigated the role of TOTEN, international tourism, and GDP on CO_2 emissions at the sectoral level. For example, Jebli & Hadhri (2018) showed that energy utilization and international tourism mitigates the GHGs level emitted from the transportation level in the top ten international destinations.

Apart from the first two branches, studies in the third branch employed the EFP proposed by Rees (1992) and Wackernagel (1994) since EFP is supposed to be a more comprehensive indicator of environmental sustainability than CO_2 emissions. For

[†] In order not to take up too much space, we do not provide detailed information and discussions about EKC hypothesis. Dinda (2004), Shahbaz and Sinha (2018) and Mitic et.al. (2019) provide detailed literature overview of theoretical and empirical EKC studies.

example, Katircioglu et al. (2018) investigated the role of international tourist arrivals and energy utilization on EFP for the top ten tourism destinations. Taking urbanization as a control variable in the model, the author found evidence supporting the tourism induced-EKC for these countries and TOTEN, and urbanization negatively affects the EFP level. Using the quantile ARDL model over the period of 1986-2018, Godil et al. (2020) investigated the asymmetric effect of tourism, financial development, and globalization on EFP in Turkey. The authors found no evidence supporting the EKC hypothesis, but all explanatory variables, including tourism, deteriorate the EFP. Using nonlinear ARDL, Khoi et al. (2021) found a detrimental effect of tourism on EFP for Singapore over the 1978-2016 period. Adding a new variable, namely country-specific risk, and employing a quantile regression approach for 123 countries from 1992 to 2016, Lee & Chen (2021) tested the economic, tourism, and country risk-induced EKC and confirmed validation of EKC for grazing land and forest land. Qureshi et al. (2019) analyzed the impacts of both inbound and outbound tourism in both EFP and different kinds of GHG emissions (namely CO_2, SOx, and NOx). The results show that while inbound tourism leads to biodiversity loss and increases CO_2 emissions, there is no relation between outbound tourism and EFP, and food management practices improve ecological diversity. While these studies support the detrimental impact of tourism on the environment, some empirical studies (See Kongbuamai et al.,2020, Ozturk et al., 2016, Mikayilov et al., 2019, among the others) did not find any significant impact of tourism activities on environmental degradation.

3. Data and Econometric Methodology

3.1. Data

This study uses annual time series data covering a very long period from 1963-2015 for Turkey. The time period of this study was determined by the data availability. Our dependent variable, which represents environmental deterioration, is EFP. The independent variables are tourism-the number of international arrivals (T), and urbanization-urban population growth (annual %) (URBAN). In addition to these explanatory variables, we use two control variables: GDP-a proxy for EGR (EGR)-is collected as the GDP, constant 2010 US$ and aggregate energy consumption (TOTEN) (kg oil equivalent). EFP was elaborated from Global Footprint Network (2021). GDP, TOTEN, and urbanization were derived from World Bank (2021), “development indicators”. Tourism data have been compiled from TÜRSAB (2021) and World Bank (2021).

3.2. Model Constructions

Following literature summarized in detail in the literature review, this study examines how tourism, TOTEN, and urbanization affect environmental degradation in Turkey. To achieve this goal, the EKC hypothesis is tested, which argues that there is an inverse-U relationship between environmental degradation and income level. For this purpose, we model the relationship between EFP, tourism, TOTEN, urbanization, GDP, and GDP^2 for Turkey within the time series (Enders, 2014) framework as follows:

$$EFP = f(GDP, GDP^2, T, TOTEN, URBAN) \tag{1}$$

Where EFP, GDP, GDP^2, T, TOTEN, and URBAN represent the ecological footprint, Gross Domestic Product, Gross Domestic Product square, tourism sector, total energy, and urbanization in Turkey. We carry out the equation (1) in the logarithmic form as follows:

$$LEFP_t = \beta_0 + \beta_1 LGDP_t + \beta_2 LGDP_t^2 + \beta_3 LT_t + \beta_4 LTOTEN_t + \beta_5 LURBAN_t + \varepsilon_t \tag{2}$$

Where *t=1963, 1964… 2015.*

In equation (2), subscript t indicates time. β_0 and ε_t are intercept and the error term. $\beta_1, \beta_2, \beta_3$ β_4 and β_5 denote the coefficients of LGDP, $LGDP^2$, LT, LTOTEN and LURBAN, respectively. Based on the EKC hypothesis, the expected coefficients for LGDP and $LGDP^2$ are $\beta_1 > 0$ and $\beta_2 < 0$ respectively. If the coefficients of LGDP and $LGDP^2$ are as expected, there is an inverse-U relationship between EFP, and income level, and it is argued that the EKC hypothesis is exists. Moreover, the expected coefficients for LT, LTOTEN, LURBAN are $\beta_3 > 0$, $\beta_4 > 0$ and, $\beta_5 > 0$, respectively. Tourism development could increase LEFP by stimulating energy usage in tourism-related activities such as traveling, food consumption, entertainment, etc. Urbanization could be harmful to environment since a higher level of urbanization can lead to greater use of energy and other natural resources such as forest, land, water, etc. As known, greater use of energy sources leads to increased GHG emissions and environmental deterioration.

3.3. Methodology

We first test the stationarity of the variables to determine the order of integration. Considering the order of integration, we avoid the spurious regression problem. Hence, we use Augmented Dickey-Fuller (hereafter ADF) by Dickey & Fuller (1979, 1981), Dickey-Fuller Generalized Least Squares (hereafter DF-GLS), and Elliot, Rothenberg & Stock (hereafter ERS) by Elliott et al. (1996), Philips Perron (hereafter PP) by Phillips & Perron (1988), Kwiatkowski, Philips, Schmidt & Shin (hereafter KPSS) by Kwiatkowski et al. (1992) under the null hypothesis of unit root (null hypothesis of stationarity for KPSS) in our study. After unit root tests, we employ the Maki (2012) cointegration test under the null hypothesis of no cointegration since traditional cointegration tests do not consider structural breaks and are likely to give misleading results. In addition, The cointegration test of Maki (2012) performs better than other cointegration tests of Gregory & Hansen (1996) & Hatemi-J (2008) since Maki accounts for up to five breaks while Gregory & Hansen and Hatemi-J account for one and two breaks, respectively.

In Maki (2012) cointegration test, there are four different models to test the cointegration that allows the structural breaks as following :

$$y_t = \mu + \sum_{i=1}^{k} \mu_i D_{i,t} + \beta' x_t + \varepsilon_t \tag{3}$$

$$y_t = \mu + \sum_{i=1}^{k} \mu_i D_{i,t} + \beta' x_t + \sum_{i=1}^{k} \beta_i' x_t D_{i,t} + \varepsilon_t \tag{4}$$

$$y_t = \mu + \sum_{i=1}^{k} \mu_i D_{i,t} + \gamma t + \beta' x_t + \sum_{i=1}^{k} \beta_i' x_t D_{i,t} + \varepsilon_t \tag{5}$$

$$y_t = \mu + \sum_{i=1}^{k} \mu_i D_{i,t} + \gamma t + \sum_{i=1}^{k} \gamma_i t D_{i,t} + \beta' x_t + \sum_{i=1}^{k} \beta_i' x_t D_{i,t} + \varepsilon_t \quad (6)$$

Where t = 1,2, …, T. y_t along with $x_t = (x_{1t},...,x_{mt})'$ are observable $I(1)$ variables. ε_t represents the equilibrium error. In these equations, y_t and $x_t = (x_{1t},...,x_{mt})'$ are scalar and $(mx1)$ vector, respectively. It is assumed that $z_t = (y_t, x_t')' = z_{t-1} + e_t$, e_t is i.i.d , generates an $(nx1)$ vector z_t. Positive definite variance covariance matrix, $\sum$, with mean zero, and $E|e_t|^s \prec \infty$ for some $s \succ 4$. $\mu, \mu_i, \gamma, \gamma_i, \beta' = (\beta_1,...,\beta_m)$ and $\beta_i' = (\beta_{i1},...,\beta_{im})$ denote the true parameters. When $t \succ T_{Bi}$ $(i = 1,...,k)$, $D_{i,t}$ takes the value of 1 and 0 otherwise, where k and T_{Bi} represent the maximum number of breaks and time period of breaks, respectively. Equation (2) is the model with level shifts. Equation (4) is the regime shifts model allowing for structural breaks of β with μ. Equation (5) is the regime shifts model with a trend. Lastly, Equation (6) includes structural breaks of levels, trends, and regressors.

To obtain long-run results from equation (2), we use Fully Modified Ordinary Least Squares (hereafter FMOLS) by Phillips & Hansen (1990) and Dynamic Ordinary Least Squares (hereafter DOLS) by Saikkonen (1992) and Stock & Watson (1993). To overcome the problems due to the long-run correlation between the cointegrating equation and stochastic regressor innovations, the FMOLS estimator uses a semi-parametric correction and follows an efficient mixture normal asymptotic that permits standard WALD tests (Phillips & Hansen, 1990). Moreover, the cointegration regression in DOLS is augmented by leads and lags of the error term in the cointegration equation. Thus, the error term of the result of the cointegrating equation becomes orthogonal to the stochastic regressor innovations (Saikkonen, 1992; Stock & Watson, 1993). Moreover, we employ the VECM approach (Johansen, 1988) based on VAR (Sims, 1980) to test the direction of the causality. This approach limits the long-run behavior of the endogenous variable so that it converges to their cointegrating relationships. At the same time, it allows for short-run adjustment dynamics. Error Correction Term is used as a cointegration term due to the correction of deviation from long-run equilibrium by means of partial short-run adjustments (Brüggemann et al., 2006). Our VECM models is defined as in Etokakpan et al.(2020) by:

$$(1-L)\begin{bmatrix} LEFP_t \\ LGDP_t \\ LGDP_t^2 \\ LT_t \\ LTOTEN_t \\ LURBAN_t \end{bmatrix} = \begin{bmatrix} \beta_1 \\ \beta_2 \\ \beta_3 \\ \beta_4 \\ \beta_5 \\ \beta_6 \end{bmatrix} + \sum_{i=1}^{n}(1-L)\begin{bmatrix} \beta_{11,i}\beta_{12,i}\beta_{13,i}\beta_{14,i}\beta_{15,i}\beta_{16,i} \\ \beta_{21,i}\beta_{22,i}\beta_{23,i}\beta_{24,i}\beta_{25,i}\beta_{26,i} \\ \beta_{31,i}\beta_{32,i}\beta_{33,i}\beta_{34,i}\beta_{35,i}\beta_{36,i} \\ \beta_{41,i}\beta_{42,i}\beta_{43,i}\beta_{44,i}\beta_{45,i}\beta_{46,i} \\ \beta_{51,i}\beta_{52,i}\beta_{53,i}\beta_{54,i}\beta_{55,i}\beta_{56,i} \\ \beta_{61,i}\beta_{62,i}\beta_{63,i}\beta_{64,i}\beta_{65,i}\beta_{66,i} \end{bmatrix} x \begin{bmatrix} LEFP_{t-1} \\ LGDP_{t-1} \\ LGDP_{t-1}^2 \\ LT_{t-1} \\ LTOTEN_{t-1} \\ LURBAN_{t-1} \end{bmatrix} + \begin{bmatrix} \delta_1 \\ \delta_2 \\ \delta_3 \\ \delta_4 \\ \delta_5 \\ \delta_6 \end{bmatrix} ECT_{t-1} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \\ \varepsilon_{5t} \\ \varepsilon_{6t} \end{bmatrix}$$

Where $(1-L)$ and ECT_{t-1} denoted the difference operator and Error Correction Term, respectively. In addition, ε_{1t} , ε_{2t} , ε_{3t} , ε_{4t} , ε_{5t} and ε_{6t} represent the error terms. In this model, if ECT_{t-1} is negative and statistically significant, then this indicates long-run causality between variables. We also perform Canonical Cointegrating Regression (hereafter CCR) by Park (1992) as a robustness test to control the consistency of FMOLS and DOLS results.

4. Results

We firstly provide basic descriptive statistics in Table 1. LEFP the values from 17.69646 to 21.56695, and the mean value of the variable LEFP is 18.70858. The mean value of LGDP is 26.53341, the highest LGDP value is 27.715251and the lowest is 25.34426. The mean values of LT, LTOTEN, and LURBAN are 15.20463, 24.53316, and 1.176656, respectively.

Table 1. Descriptive Statistics

	LEFP	LGDP	LT	LTOTEN	LURBAN
Mean	18.70858	26.53341	15.20463	24.53316	1.176656
SD	18.71230	26.53537	15.31047	24.61717	1.172893
Maximum	21.56695	27.71525	17.49965	25.58834	1.824852
Minimum	17.69646	25.34426	12.20026	23.24493	0.721565

We perform five different unit root tests as mentioned in the section of methodology. The tests for stationarity of the variables using ADF, DF-GLS, PP, ERS, KPSS unit root tests are given in Table 2. Table 2 shows that we do not reject the null hypothesis of unit root in all variables for ADF, DF-GLS, PP, and ERS unit root tests except for LEFP for ADF and PP unit root test, and we reject the null hypothesis of stationarity in all variables for the KPSS unit root test. In addition, Table 2 also presents that we reject the null hypothesis of unit root in first difference of all variables for ADF, DF-GLS, PP, and ERS unit root tests and we do not reject the null hypothesis of stationarity in first difference of all variables for KPSS unit root test. According to these results, all variables used in this paper have integration of order one.

Table 2. Unit Root Tests Results

Variables	ADF	DF-GLS	PP	ERS	KPSS
LEFP	-3.849***	-1.726	-3.718***	3.006	0.874***
LGDP	-0.264	3.277	-0.264	903.298	0.995***
LT	-1.678	1.647	-1.678	393.772	0.989***
LTOTEN	-1.701	2.502	-1.865	959.319	0.984***
LURBAN	-1.478	-1.334	-1.270	6.451	0.708**
ΔLEFP	-8.461***	-8.269***	-46.799***	0.608***	0.500
Δ LGDP	-7.002***	-6.987***	-7.003***	0.949***	0.064
Δ LT	-7.442***	-7.459***	-7.443***	1.057***	0.192
Δ LTOTEN	-6.638***	-6.618***	-6.623***	0.961***	0.242

Notes: *i. **, *** show 5% and %1 level of significance.*
ii. Δ denotes first differences.

Hence, we can check the cointegration relationship for the variables. In this regard, we employ the Maki (2012) Cointegration Test to investigate the cointegration for our model depending on the number of breaks from 1 to 5 in each case of Level shifts, Level shifts with trend, Regime shifts, and Trend and Regime shifts and illustrate the results in Table 3.

Table 3 shows that we reject the null hypothesis of no cointegration in all numbers of breaks for our model. Therefore, we find a long-run relationship across the variables and employ the level of the variables in the rest of the paper. After capturing cointegrating relationships across the variables, we estimate our models employing FMOLS and DOLS and illustrate the results in Table 4.

Table 3. Maki (2012) Cointegration Test results

Number of Breaks	Test statistic	Break dates
m ≤ 1		
Level shifts	-8.282(−5.650)[a]	1981
Level shifts with trend	-9.130(−5.913)[a]	1981
Regime shifts	-10.010(−6.520)[a]	1981
Trend and Regime shifts	-10.192(−6.911)[a]	2009
m ≤ 2		
Level shifts	-8.282 (−5.839)[a]	1981; 2010
Level shifts with trend	-9.130(−6.055)[a]	1981; 2010
Regime shifts	-11.196(−7.244)[a]	1981; 2009
Trend and Regime shifts	-12.568(−7.638)[a]	1981; 2009
m ≤ 3		
Level shifts	-8.282(−5.992)[a]	1981; 1990; 2010
Level shifts with trend	-9.130(−6.214)[a]	1981; 1998; 2010
Regime shifts	-16.285(−7.803)[a]	1976;1981; 2009
Trend and Regime shifts	-12.568(−8.254)[a]	1975;1981; 2009
m ≤ 4		
Level shifts	-8.282(−6.132)[a]	1981;1990;2007;2010
Level shifts with trend	-9.130(−6.373)[a]	1981;1998; 2007;2010
Regime shifts	-16.691(−8.292)[a]	1976;1981;2000;2009
Trend and Regime shifts	-12.568(−8.871)[a]	1975;1981;1996;2009
m ≤ 5		
Level shifts	-8.282(−6.306)[a]	1966;1981;1990;2007;2010
Level shifts with trend	-9.130(−6.494)[a]	1969;1981;1998;2007;2010
Regime shifts	-16.847(−8.869)[a]	1976;1981;1995;2000;2009
Trend and Regime shifts	-12.568(−9.482)[a]	1975;1981;1989;1996;2009

Notes: *[a] denotes Maki(2012) Critical values for 5% level of significance.*

Table 4 illustrates that the coefficients of LGDP are significantly negative while the coefficients of $LGDP^2$ are significantly positive. This shows that tourism induced EKC hypothesis between LGDP and LEFP has not been validated for Turkey (U -shaped relationship). This result implies that, environmental degradation (represented by LEFP) will not start to decrease when real LGDP increases up to a certain threshold. This result is in line with the similar findings provided by the Godil et al. (2020) for Turkey. Moreover, the coefficients of LT and LTOTEN are significantly positive in both estimations except for the coefficient of LT in FMOLS estimation. Hence, our results confirm that international tourism arrivals exacerbate the environmental deterioration. The development of the tourism sector requires more natural resources and fossil fuels with a high negative impact on the environment. Moreover, LURBAN is found to be positive and statistically significant. Hence, urbanization creates heavy pressure on grazing land, cropland, forest area, and fishing grounds in Turkey.

After identifying the long-run relationship between variables in this model, we investigate the causal interactions between LEFP and their determinants. For this purpose, we perform the VECM Granger Causality test to determine the direction of causality for the short and long run. The results of the VECM Granger Causality test are summarized in Table 5 and displayed in Figure 1 and Figure 2 as well. These figures are shown in Appendix 1 part in order not to take up much space in the text. For our focus variable LEFP in Table 6, ECT_{t-1} of LEFP is negative and statistically significant at %1 level of significance. This result indicates the presence of long-run granger causality for EFP.

Table 4. FMOLS and DOLS Estimation Results

	FMOLS		DOLS	
Variables	Coefficient	p-value	Coefficient	p-value
LGDP	-20.2121* [-1.8286]	0.0739	-155.494* [-2.0596]	0.0639
$LGDP^2$	0.34397* [1.8426]	0.0718	2.48138* [1.9842]	0.0727
LT	0.09486 [0.4581]	0.6491	2.41561** [2.4156]	0.0343
LTOTEN	2.62895** [2.2005]	0.0328	20.1617** [2.2837]	0.0433
LURBAN	0.34499*** [1.9398]	0.0586	1.5214*** [3.3831]	0.0061
Constant	246.3789* [1.8268]	0.0742	1866.65* [2.0509]	0.0649

Notes: *i. *,**, *** show 10%, 5%, %1 level of significance.*
ii. Pharanthesis indicates t statistics.

Moreover, Table 5 indicates a unidirectional causality running from LGDP to both LEFP and LURBAN but no causal relationship between LEFP and T in the long-run. Our results suggest that measures taken to improve environmental quality will not harm the EGR in Turkey. Moreover, since we have found no causal relationship between LGDP and TOTEN, our findings do not support the growth hypothesis (energy stimulates the EGR) for Turkey both in the short-run and long-run. Hence, efforts to save energy resources will not slower the EGR in the country. Similarly, our results indicate that there is no empirical evidence in favor of TLG hypothesis for Turkey. These results are in line with Ozturk et al. (2016) and Godil et al. (2020); however, contradict with results of Katircioglu(2014), Katircioglu et al. (2018), Isik and Shahbaz (2015), Kongbuamai et al., (2020).

Table 5. VECM Granger Causality Results for Empirical Model

	Direction of Causality				
	Short run				
Variables	ΔLEFP	ΔLGDP	ΔLT	ΔLTOTEN	ΔLURBAN
ΔLEFP	-	-6.8684***	-0.7754	3.4111	0.0773
ΔLGDP	0.0077	-	-0.0003	0.1881	0.0025
ΔLT	-0.0408	-0.2988	-	0.8514	-0.3099
ΔLTOTEN	0.0018	-0.1213	0.0016	-	-0.0149
ΔLURBAN	-0.0314	-1.2993***	-0.0166	0.7176	-
	Long run				
ECT_{t-1}	-	-0.0064	0.0861	0.0032	0.0872*

Notes: **,,**, *** show 10%, 5%, %1 level of significance.*

As a complementary diagnostic test for the VECM Granger Causality test, we present the VEC residual heteroskedasticity test and VEC residual serial correlation test for residual (Lütkepohl, 2005). The results of these diagnostic tests for our model are illustrated in Table 6.

Table 6. Diagnostic Tests for Empirical Model

Diagnostic Tests		**Empirical Model**	
VEC Residual Serial Correlation LM Tests		**Test Statistic**	**p-value**
Lags	1	1.326601	0.1559
	2	0.928650	0.5662
	3	1.030773	0.4332
	4	1.268805	0.1951
VEC Residual Heteroskedasticity Tests		**Chi-sq**	**p-value**
		202.3158	0.1219

Table 6 reveals that serial correlation and heteroskedasticity do not affect our estimation. Therefore, these results indicate that our empirical model investigating the impact of LGDP, LGDP^2, LT, LTOTEN, and LURBAN on LEFP is appropriate. Finally, we apply CCR as a robustness test to control the validation of FMOLS and DOLS results and show CCR Estimation Results in Table 7.

Table 7. Robustness Test (CCR) Results

Variables	**Coefficient**	**t-statistic**	**p-value**
LGDP	-20.63399*	-1.708417	0.0943
LGDP^2	0.348428*	1.713427	0.0934
LT	0.163267	0.757652	0.4525
LTOTEN	2.690716**	2.056461	0.0454
LURBAN	0.404726**	2.297288	0.0262
Constant	251.8060*	1.710069	0.0940

Notes: **,**, *** show 10%, 5%, %1 level of significance.*

Table 7 indicates that CCR Estimation Results confirm the results of FMOLS and DOLS Estimations. That is to say, the coefficient of LGDP is significantly negative, and the coefficient of LGDP^2 is significantly positive. However, the coefficient of LT is insignificantly positive as in FMOLS estimation. Table 7 also indicates that the coefficients of LTOTEN, and LURBAN in our model are significantly positive.

5. Conclusion

Two critical gaps in environmental economics arise. First, most studies use CO_2 emissions when testing the EKC hypothesis, representing only a part of environmental degradation. This is also the case for the tourism-induced EKC hypothesis. Second, there is no study analyzing the role of LT, LTOTEN, LURBAN, and EGR on environmental quality with EFP for Turkey. Therefore, to better understand the validity of the EKC hypothesis with a more comprehensive indicator, this study tests the EKC hypothesis by using LEFP for Turkey during the 1963-2015 period by controlling LT, LTOTEN, and LURBAN. The tourism sector is one of the critical sectors in the Turkish economy and leads to increase in LTOTEN and resource use. Although most studies have focused on the causality between LT and EGR, the current paper fills the gap by highlighting the rationale for integrating tourism development within the tourism-induced EKC model.

The main empirical findings and some policy recommendations can be summarised as follows.

Firstly, our results do not provide empirical support to EKC, revealing that a long-run relationship exists between tourism development, income level, and LEFP in Turkey. This means that environmental degradation is not expected to decrease at a higher level of income. EGR itself can not enable Turkey to mitigate environmental degradation. Results from the long-run estimators indicate that LT, EGR, LTOTEN, and LURBAN are the vital determinants of environmental degradation. It seems that LGDP is increasing, and economic development is accelerating at the expense of the country's environmental quality. According to the causality analysis, our results confirm the unidirectional causality running from LGDP to both LEFP and LURBAN but no causal relationship between other variables in the long-run. Hence measures taken to improve environmental quality and energy conservation policies will not harm the EGR in Turkey.

Secondly, tourism seems to deteriorate the pollution and/or environmental quality since most tourism-related activities involve energy directly in the form of crude oil, natural gas, and coal or indirectly in the form of electricity mainly generated from fossil fuels. Since tourism worsens environmental degradation, policymakers in Turkey can promote environmental awareness to tourism service providers and support green tourism, alternative tourism, green hotels, green transportation, eco-tourism, etc. Moreover, environmental awareness should be promoted in both tourism facilities and tourism service providers such as green hotels, green restaurants, and green transportation. There is a need for a policy to adopt a circular economy (CE) strategy in the tourism sector. In this context, implementing waste management strategies like the zero-waste approach and recycling of waste should be sped up in the tourism industry. Additionally, accelerating digital transformation in the tourism sector (e.g., Cloud computing, big data analysis, blockchain, artificial intelligence, etc.) will increase efficiency in the tourism value chain and reduce the pressure on natural resources. Hence, the implementation of policies that will accelerate the penetration of CE principles and productivity-enhancing technologies into the tourism industry will contribute to the sustainable tourism goal of the United Nations.

Thirdly, since LTOTEN increases the LEFP, our results highlight the crucial role of renewable energy in protecting the environment in Turkey. Policymakers should take necessary actions to accelerate the transition from fossil fuels to alternative energy sources such as solar, wind, and biomass. Moreover, the government should ensure incentives such as tax reductions and/or tax exemptions, subsidies, green certificates, net metering, green certificates, etc., for more significant deployment of renewable energy in the country. Renewable energy incentives should be enlarged in many subsectors of the economy to achieve sustainable economic development. Renewable energy incentive policies should be supported by energy efficiency policies as well. Hence a shift in energy mix towards environmentally friendly technologies would be significant to ensure sustainable tourism and sustainable EGR.

Fourthly, urbanization also creates pressure on natural resources, which their usage causes environmental deterioration. Indeed, urbanization creates extraordinary demand for natural resources and creates exceptional stress on a natural system, such as degraded water, destruction of habitats, degraded land, deforestation, and biodiversity loss. This destructive impact of higher urbanization should be limited through proper planning and design. For example, smart cities can be developed, and public transportation can be promoted to increase energy efficiency, energy saving. More attention should be given to reducing the generation of solid waste public awareness in the country. Moreover, a circular economy system should be implemented to ensure sustainable cities and EGR.

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Appendix

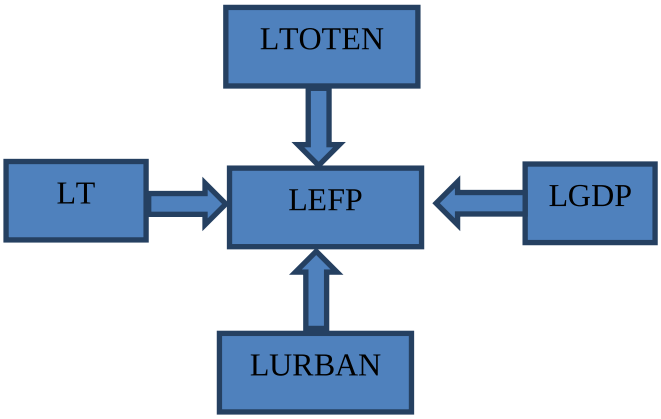

Fig.1 Granger Causality in the long run

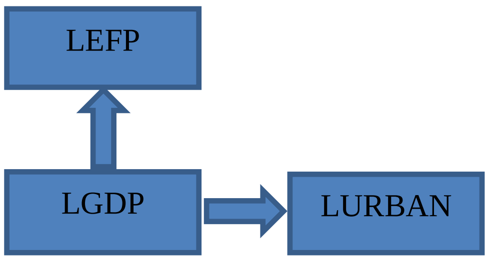

Fig.2 Granger Causality in the short run