



International tourism, energy consumption, and environmental pollution: The case of Turkey



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ARTICLE INFO

Article history:

Received 7 August 2011

Received in revised form

7 April 2014

Accepted 27 April 2014

Available online 15 May 2014

Keywords:

Tourism

Energy consumption

Carbon emissions

Pollution

Autoregressive distributed lag

Turkey

ABSTRACT

This study investigates the long-run equilibrium relationship between tourism, energy consumption, and environmental degradation as proxied by carbon dioxide (CO₂) emissions in Turkey, which attracts more than 30 million tourists per year, making it the sixth most visited country in the world. The study results reveal that tourism and energy consumption are in a long-term equilibrium relationship with CO₂ emissions; in the tourism-induced model, CO₂ emissions converge to the long-term equilibrium path by a 91.01 percent speed of adjustment every year through the channels of tourism, energy consumption, and aggregate income. Further, the results of the impulse response and variance decompositions reveal that the reaction of energy consumption, and therefore CO₂ emissions, to changes in tourism development is positive and gains strength in the longer periods. This implies that tourism development in Turkey has resulted not only in considerable increases in energy use but also considerable increases in climate change, as demonstrated by the econometric analysis of this study.

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1. Introduction

There have been many attempts in the energy economics literature to determine the link between energy, environmental degradation or pollution, and economic growth. Climate change is regarded as one of the proxies for environmental degradation in the literature, and climate change has also been extensively

proxied by carbon dioxide (CO₂) emissions. However, the relationship of energy and climate change with particular segments or sectors of the economy deserves attention. One such sector is that of international tourism. Development in international tourism and an increase in the number of international tourists not only contribute to a country's economy but also lead to an increase in energy consumption. However, tourism development is also likely to bring about changes to the climate through different channels; for example, an increase in tourism activities comes with an increased demand for energy within various functions, such as transportation, catering, accommodation, and the management of

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tourist attractions [1–3], which is also likely to lead to environmental degradation and pollution. This degradation is, for example, channeled through fuel consumption. In this respect, an investigation of the relationship between tourism, the energy sector (that is, energy consumption), and climate change is of immense significance to both policy makers and practitioners. Furthermore, in 2002, the World Summit on Sustainable Development in Johannesburg acknowledged international tourism as one of the major energy-consuming sectors [4].

In general, the energy economics literature has focused on the link between economic growth, energy consumption, and climate change, but the results remain inconclusive [see, for example, 5–14]. Some studies have investigated the relationship between energy consumption and real income growth [5,15–17]; some have tested the validity of the environmental Kuznets curve hypothesis (in search of the relationship between climate change and real income growth) [18–22]; and some have investigated the joint impact of energy consumption and aggregate output on climate change in previous literature [23–26].

Since an increase in tourism activities comes with an increased demand for energy within various functions, as mentioned before, the importance of energy for the tourism sector is undeniable. Consequently, it is expected that as the tourism sector develops, it will rely increasingly on energy. Hence, it will lead to an increase in energy consumption. However, the increased energy consumption due to tourism development may have a negative impact on the quality of the environment via climate change. It is evident that environmental degradation is likely to occur also as a result of tourism development through the construction of hotels and other tourist establishments via energy consumption.

A relatively smaller strand of the literature has studied the issue of tourism and energy consumption mainly from the perspective of its implications regarding environmental issues, such as its contribution to greenhouse gas emissions and global warming [2,3,27–29]. On the other hand, only a few studies have focused on the link between tourism and electricity consumption [see, for instance, 1,2,4,30–35]. The link between energy, the environment, and international tourism has received little consideration from different perspectives in the related literature. Nepal [4] found that although primary energy sources include wood and kerosene, the use of renewable energy and locally developed energy-saving technologies has increased in the tourism sector of Nepal. On the other hand, Gossling [3] estimated that global tourism-related energy consumption is 14,080 PJ (power joule). Of this amount, 94 percent belongs to the transportation sector, 3.5 percent to accommodation, and the remainder to the activities sector. However, to the best of our knowledge, only the studies of Katircioglu et al. [36] and Lee and Brahmasrene [37] have investigated the empirical econometric interactions between tourism, energy consumption, and climate change. These two studies confirmed the long-term economic association between tourism growth, energy consumption, and climate change; Katircioglu et al. [36] found positive effects of tourism growth on climate change in the case of the south of Cyprus, while Lee and Brahmasrene [37] confirmed the negative effects of tourism on climate change in the case of European Union (EU) countries.

1.1. Aim and importance of the study

Against this backdrop, the present study employs bounds tests to level the relationships, conditional error correction model, impulse response, and variance decomposition analyses in order to investigate the long-run equilibrium relationship between tourism and energy/climate change in Turkey. Turkey is a large country located in a strategic region of the world. International tourist arrivals to Turkey were about 34.038 million (46.59 percent

Table 1

Overview of tourism, CO₂ emissions, and energy use in Turkey. Source: World development indicators [45].

Years	International tourist arrivals (thousands)	CO ₂ emissions (kt)	Energy use (kt of oil equivalent)
1960	124.2	16,806.8	10,690.0
1965	361.8	27,366.4	13,811.0
1970	724.8	42,605.0	18,212.0
1975	1148.6	65,644.2	26,756.0
1980	1057.4	75,701.9	31,445.0
1985	2190.2	106,629.7	39,316.0
1990	5397.7	150,667.3	52,756.0
1995	7747.4	176,560.8	61,545.0
2000	10,428.2	215,970.8	76,348.0
2001	11,619.9	194,378.9	70,402.0
2002	13,248.2	205,510.1	74,248.0
2003	13,956.4	218,330.4	77,834.0
2004	17,548.4	225,222.4	80,858.0
2005	21,124.9	237,174.4	84,379.0
2006	19,819.8	261,356.8	93,035.0
2007	26,122.0	288,658.2	100,005.0
2008	29,637.0	285,274.3	98,501.7
2009	30,435.0	277,844.9	97,660.6
2010	31,396.0	298,002.4	105,133.1

of the country's population) in 2011, ranking it sixth in the world for attracting international tourists [38], and, again in 2011, tourism receipts totaled 28.05 billion USD (3.62 percent of the gross domestic product), which ranks tenth out of generating tourism receipts in the globe [36]. Table 1 provides an overview of the tourist arrivals to Turkey in addition to the CO₂ emissions and energy consumption. These figures suggest that tourism development in Turkey is likely to affect climate change and energy consumption.

On the other hand, we must note that although these figures show how important international tourism is for the Turkish economy, the results of the investigations into the role of international tourism in the economic growth of this developing country are inconclusive in the literature. Utilizing leveraged bootstrap causality tests, Gunduz and Hatemi-J [39] empirically confirmed the Tourism-Led Growth (TLG) hypothesis for Turkey. They found unidirectional causality running from international tourist arrivals to Turkey's economic growth. Using the Johansen technique and vector error correction modeling, Ongan and Demiroz [40] investigated the impact of international tourism receipts on Turkey's long-term economic growth. They found bidirectional causality between international tourism and economic growth, suggesting that an expansion in international tourism stimulates growth in the Turkish economy, and growth in the Turkish economy stimulates an expansion in international tourism. However, unlike the findings of Gunduz and Hatemi-J [39] and Ongan and Demiroz [40], Katircioglu [41] rejected the TLG hypothesis for the Turkish economy using the Johansen approach and the bounds test for level relationships. Katircioglu [41] ran two tests using the whole data period of 1960–2006, but neither revealed any long-run relationship between international tourism and economic growth in Turkey. Finally, Arslanturk et al. [42] investigated the time-varying linkages between tourism receipts and economic growth in Turkey and found that the results from the full sample suggested no Granger causality between tourism receipts and real income, while the findings from the time-varying coefficients model based on the state-space model and rolling window technique showed that tourism receipts had positive-predictive content for real income following the early 1980s.

Previous research has shown that further investigations are required into international tourism in Turkey; therefore, the results of the present study will offer further insight to other

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