Estimating the Role of Climate Change on International Tourism Flows: Evidence Form Regional Panel

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ABSTRACT

This study examines the role of climate changes on international tourist flows using regional panel. Initial examination has been done using regional and income group classifications while in the second stage small islands have been considered as sun beach destinations. Results prove our research question that climate changes exert significant effects on international tourist flows. These effects are positive in small islands while they are mixed of sings in the cases of regional and income groups classifications. In some developed regions such as Central Europe and the Baltics, a significant interaction between climate changes and tourist flows could not be obtained. Major results of this study contains important policy implications as discussed during this research.

Keywords: climate change, emission pollutants, tourism, global panel, islands.

ÖZ

Bu çalışma da, bölgesel panel kullanılarak iklim değişikliğinin uluslararası turizm akımları üzerindeki rolü incelenmiştir. İlk aşamada, bölgesel ve gelir grubu sınıflandırmaları kullanılarak yapılırken, ikinci aşamada ise küçük adalar (Malta, Kuzey ve Güney Kıbrıs) güneş ve sahil yerleri olarak kabul edilmiştir. Elde ettiğimiz sonuçlar neticesinde, iklim değişikliğinin uluslararası turist akışları üzerinde önemli etkiler yarattığı görülmektedir. Bu etkiler, küçük adalarda olumlu bir şekildeyken, bölgesel ve gelir grupları sınıflandırmalarında karışık olduğundan kesin birşey söylemek zordur. Orta Avrupa ve Baltıklar gibi bazı gelişmiş bölgelerde, iklim değişikliği ile turist akışları arasında önemli bir etkileşim elde edilememiştir. Bu çalışmanın ana sonuçları, bu araştırma sırasında tartışıldığı gibi önemli politika sonuçları içermektedir.

Anahtar Kelimeler: iklim değişikliği, emisyon kirleticiler, turizm, bölgesel panel, adalar.

DEDICATION

To My Family

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It is really spectacular to express my deepest thanks the ones who have supported and encouraged me throughout my PhD. Firstly, I want to express my greatest thanks to my supervisor Prof. Dr. Salih KATIRCIOĞLU who assisted me in the planning, searching, conducting and forming stages of my thesis study with utmost patience, motivation, enthusiasm, profound knowledge and experience.

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LIST OF ABBREVIATIONS

ARDL	Autoregressive Distributed Lag
CO2	Carbon Dioxide
DOLS	Dynamic Ordinary Least Squares
EC	Energy Consumption
ECM	Error Correction Model
ECT	Error Correction Term
EKC	Environmental Kuznets Curve
FDI	Foreign Direct Investment
FMOLS	Fully Modified Ordinary Least Squares
GDP	Gross Domestic Product
GHG	Greenhouse Gas Protocol
GMM	Generalized Methods of Moments
PP	Philips-Perron
SPO	State Planning Organization
VEC	Vector Error Correction
WHO	World Health Organizations
WWCC	Wavelet Window Cross Correlation

Chapter 1

INTRODUCTION

1.1 Background Information

On a global and regional scale, studies have demonstrated a progression on the economic impact of tourism, and predict that the tourism industry will remain a growth engine with a 3.5% to 4% yearly increase in international tourist arrivals through 2020 (Ghosh & Siddique, 2017; Klein & Osleeb, 2010; Ehmer et al., 2008). Bigano et al. (2006) also reports that the effects of economic development and climate change on tourism has experienced little scholarly attention. The study predicts a tilt in international tourist flows towards higher altitudes and latitudes which may affect the countries and regions that depend heavily on incomes in a negative way. This is in line with the studies that have reaffirmed the possible impact of climate change on tourism (Iordache & Cebuc, 2009) and environment (Göessling, 2006), as well as the fact that though, tourism is one of the largest industry in the world, literature on climate change impacts is grossly ignored (Scott et al., 2004). Some of the authors indicated that trade liberalization and economic improvements are of the important elements for the states. According to Arrow et al. (1995) strategies that aimed to speed up the economic growth could have harmful effects on the environment. Also, environmental problems such as impairment of the ozone layer or in other words the greenhouse effect, force scholars to spend their time on improving their knowledge on the impacts of economic progress on the environment. Similarly, Neumayer (2004) has also recognized that in improved economies sustaining the economic progress could be achieved by degrading the environment. Some other scholars have arranged studies in the corresponding field as well (Kalayci & Koksal, 2015; Heidari et al., 2015; De Vita et al., 2015; Katircioglu et al., 2016; Istaiteyeh, 2016; Cetin & Ecevit, 2017; Ozcan & Ari, 2017; Katircioglu & Katircioglu, 2018a; 2018b).

Furthermore, Jänicke et al. (1997) have mentioned that an increase in income can result in a rise in the trend for service and old school manufacturing sectors which as a result could achieve sustainable economic progress. Moreover, an increase in income can also act as a path to reduce the rates of population hence the degradation of the environment. A couple of researches by scholars have been executed to examine the connection between environmental pollution and economic growth (Cole & Neumayer, 2005; Stern, 2014). To test this linkage researcher have utilized Ecological Kuznets Curve as a hypothetical establishment that was presented and had ended up prevalent with the discoveries of Grossman & Kruger's executed in 1995. It could be mentioned that the Natural Kuznet Curve has some essential supposition. More precisely, Neumayer (2004) and Stern (2004) had regretted that the primer periods of financial development could produce ecological contamination until it achieves indicated dimension of pay that is additionally called as "turning point". At that state, monetary advancement could start. Additionally, the relationship among contamination and salary has displayed a converse U - shape relationship as booked as specific as the EKC. Farber et al. (2002) had referenced that nature of condition could diminish when until drawing in the speculations which may impact-sly affect ecological quality. On the other hand, the natural venture could be recognized as wonders which the prevalence of condition begins to once again recuperate by the improvement of the economy. Grossman & Krueger (1995) sketched out that with the assistance of an improved economy, it could be less demanding to draw in with the earth ecological friendly exercises or ventures which at that point assume an imperative job to decrease the dimension of the contamination.

Moreover, Neumayer (2004) had stated that developed countries are touchy about the ways to deal with the protection of the environment; subsequently, they tend to support the conditions that agree on environmental friendly novelties. Likely, Huan et al. (2008) had featured that advanced countries are bound to depend on effective energy, consequently advancing improvement in ecological quality as CO_2 emissions are diminishing. Correspondingly, Muller (2009) had focused on that, expanding the size of sustainable energy sources at modern period would go about as the real driving factor to produce better conditions as CO_2 emission would diminish. Sources of energy are viewed a nations key financial forces (Altinbas & Kapusuzoglu, 2011), and moreover is one of the primary issues which are the causes of wars. Schaeffer et al. (2012) recommended that the energy sector is one of the prominent drivers to invigorate financial development. Additionally, Güler (2009) stated that non-sustainable energy sources could have a negative effect on nature. Moreover, it may be demonstrated that the greater part of the countries are getting to be energy dependent countries over the years (Altinbas & Kapusuzoglu, 2011). In this way, countries may concentrate on finding non-sustainable energy sources and supplant them with sustainable once.

Additionally, since 2000, global emission growth has been propelled by the reversal of earlier deterioration movements in energy concentration, gross domestic product (GDP), the carbon density of energy (emissions/energy) as well as a progressive increase in population and per-capita GDP. This is in line with research investigations which show that a slightly constant increase in the carbon density of energy have been experienced in both developed and developing countries as no region is reducing its carbon energy supply (Raupach et al., 2007). Solving the problems of climate change remains a pro-growth tactic (Hwang & Yoo, 2014; Tiwari, 2011). In order to forecast future climate changes to improve environmental policies by government, a good understanding of the magnitudes and patterns influencing global CO2 emissions is essential. This will require a global effort and mitigation action (Hoffert et al., 2002; Field & Raupach, 2004). These alleviation measures are not only feasible but highly required on a social, ecological and economic aspects (Stern & Stern 2007). As suggested by Nordhaus (2007), the risks and total costs and of climate change on a small scale will be as much as losing at least 5% of global GDP annually. He also puts forward that the statistic could increase up to 20% if more risk assessment factors are considered.

A few researchers featured a linkage between accessibility of tourist flows and synthesis of the climate change. To be more precise, energy-dependent countries may buy non-sustainable power sources from developed bounteous countries (Al-Abdulhadi, 2014). This exchanging are bound to be financed by legislative getting which is one of the conspicuous denominators to support outside obligation and decreasing the nature of the condition of the countries. Reliably with this contention, researchers had investigated that there is a close connection between climate change and tourism development (Halkos & Paizonos, 2013; Zhang et al., 2017). Aside from these, it tends to be denoted that ecologically friendly energy sources are making opportunities to diminish carbon-dioxide outflows just as it advances tourism growth (Nasr et al., 2015). Panizza & Presbitero (2014) sketched out the relationship between climate change and GDP and discovered a negative relationship. In this manner, it could be fascinating to look at the linkage among energy field environment pollution rate through tourist flows amount of nations. Looking at a linkage among tourist flows and ecological quality and climate change part would add new experiences to the related writings. For example, several studies have shown that environmental projects can considerably decrease climate change and energy efficiency schemes within the renewable energy sectors will lead to reduce fuel dependency, cost reductions, and savings in the health and social sectors. (Howland et al., 2009; Artim et al., 2008). Thus, energy efficiency, climate change-related projects can significantly improve energy efficiency in low-carbon economies.

1.2 Aim of the Study

As documented in several studies, climate change is probably going to impact on international tourist flows either in a straightforward or non-straightforward way. Additionally, it could be expressed that such impacts could likewise shape the general energy utilization levels and carbon dioxide discharge in the states. In spite of the fact that the theoretical background of aggregated tourism models stems from the individual utility theory, the most prevalent approach has been the creation of regression models that explore the relationship between tourism flows and a set of determinants, mainly income. Thus, it is vital to mention that although, climate is considered a main factor in defining tourism, a key variable such as climate change has not usually been considered in tourism demand models till the date. This conjecture can be justified by the interest of researchers and planners in the relationship between income and tourism. Along these lines, the essential aim of this dissertation is to investigate the effects of climate changes on international tourist flows. In order to investigate such nexus, two different empirical studies have been carried out in this thesis. The first empirical chapter focuses on the regional, continental, and income groups' panel as ranked by World Bank (2019) while the second empirical chapter focuses on the selected small island states for comparison purposes.

It could be expressed that countries endeavor to execute strategies for reducing and ultimately removing non-sustainable energy sources. Thus, it is expected that developing countries will participate in progressive sustainable practices to balance its reliance on energy over developed countries and accordingly decrease the ecological weakening. From this point of view, this investigation will serve as one of the underlying insightful research to give intriguing discoveries to the literature and also present direction to policy makers.

1.3 Contributions of the Study

Tourism being one of the biggest and fastest enlarging economic sectors is regarded as an extremely climate-sensitive sector, and thought to be affected by economic change at a great rate. As tourism is really based on climate, tourists would rather have outdoors activities in order to enjoy the landscape or sun; however, it is obviously surprising that the literature of tourism has focused less on climatic changes that is why the studies related to climate change and tourist flows are less in the literature of tourism. Therefore; this dissertation endeavors to add to existing literature to the extent that theoretical contention is concerned. The literature is with respect to climate change by applying comparable methods in tourist flows, however, we will build up a connection between climate change and international tourist flows based on different regions. To the best of our insight, this investigation is the first of its kind in the relevant literature. In this dissertation, we explore if climate changes are one of the determinants of tourist flows via econometric procedures. To the best of the author's knowledge, such investigation in research literature has not yet been done; thus, this reality makes this study a true and original contribution to the literature.

1.4 Brief Methodology

The Time series econometric methodologies was considered to evaluate the proposed research model. Unit Root Tests that likewise consider the series, which has auxiliary breaks and it will be utilized to test if factors are stationary as a rule of Classical Linear Regression Models. On account of non-stationary arrangement, co-integration test will be added to the examinations and explore whether the proposed research model could be assessed for the long-run inference. Short and long-run estimations were assessed for the proposed models in this research. To seek the relationships among the variables within the study in the long-run, the bounds test including ARDL (the autoregressive distributed lag) modelling approach was utilized. The approach developed by Pesaran et al. (2001) was utilized within irrespective order of integration of the variables (irrespective of whether regressors are mutually co-integrated, purely I [0], or purely I [1]).

As the first empirical chapter, the panel of tourist destination states sampled in this current study includes, Low Income, Lower & Middle Income, Low & Middle Income, Middle Income, Upper & Middle Income, High Income, Arab, Caribbean Small States, Central Europe and Baltics, East Asia & Pacific, Euro Area, Europe & Central Asia, European Union, Heavily indebted poor countries (HIPC), Latin America & Caribbean, Least developed countries: UN classification, Middle East & North Africa, North America, OECD members, Pacific island small states, Small states, South Asia, Sub-Saharan Africa, World. The second empirical chapter includes three small island states which are Cyprus (North), Cyprus (South), and Malta. This would enable us to make comparisons with the results to be reached in the first empirical chapters.

1.5 Structure of the Study

This dissertation is sectioned into 6 chapters. The first chapter discusses the introduction and background of the study, the aim of the study, methodology and contributions to the body of knowledge. Chapter 2 describes the Environmental Kuznets Curve hypotheses. On the Kuznets Curve hypothesis; firstly, Environmental Kuznets Curve Theory explained in detail. Also, Integration of Environment into Kuznets Curve was mentioned. Finally, sectoral effects on the Environmental Kuznets Curve and a recent debate on the Environmental Kuznets Curve were discussed. In the third chapter of the study, the theoretical framework was discussed. In the fourth chapter, the effects of climate changes in international tourist flow, and the evidence from selected regions was explored. In chapter 5, the effects of climate change on tourist flows, and Evidence of Mediterrean Small Island (Malta, North and South Cyprus) was examined. Chapter 6 summarizes and the study and presents future directions.

Chapter 2

ENVIRONMENTAL KUZNETS CURVE THEORY

2.1 Environmental Kuznets Curve Theory (EKC)

The dynamic perspective of the EKC theory is such that at the beginning of the industrialization, the first priority is to increase the output and this leads to an increase in pollution. More People become concerned about income than basic amenities such as clean water and air (Dasgupta et al., 2002). The EKC theorizes that if a nation is highly industrialized and mechanized especially in the agricultural sector, bulk of the nation's economy will migrate to the cities. The resultant impact is an internal migration of the farmers and unskilled labour force in search for suitable jobs that can meet their needs and increase their income. This ultimately creates a significant inequality gap where stakeholder make a profit and employees loose profit and are constantly found at the bottom of the socioeconomic pyramid as the lower class citizens (Katircioğlu, 2014). Conversely, economic growth also positively influences the environment through a composition effect because with an increase in income, comes a change in economic structure including a gradual increase in environmentally friendly activities that reduce pollution and excessive energy consumption (Dinda, 2004).

Environmental Kuznets Curve (EKC) has been described as the systematic correlation between environmental quality and income change (Dinda, 2004). Introduced by Simon Kuznets (Stern, 2004), the theory propounds that unfair distribution of the income first rises and then falls based on economic growth of the nation. Studies have demonstrated that the theory plays an important role in the quality of the environment and has been influenced by economic growth in three ways; technological effects, scale effects, and composition effects (Grossman & Krueger, 1995).

These factors provide investment opportunities for the people with financial capabilities and forces rural labors to move to cities with low wages (Dinda, 2004). According to Kuznets, (1955), he suggested that a partial distribution of income would result to an inverted "U" shape as it increases and subsequently decreases with an increase in income per-capita. Additionally, the Kuznets diagram shows an inverted U curve as shown in figure 2.1, although variables along the axes are frequently varied with time or per-capita incomes on the X axis and inequality or the Gini coefficient on the Y axis.

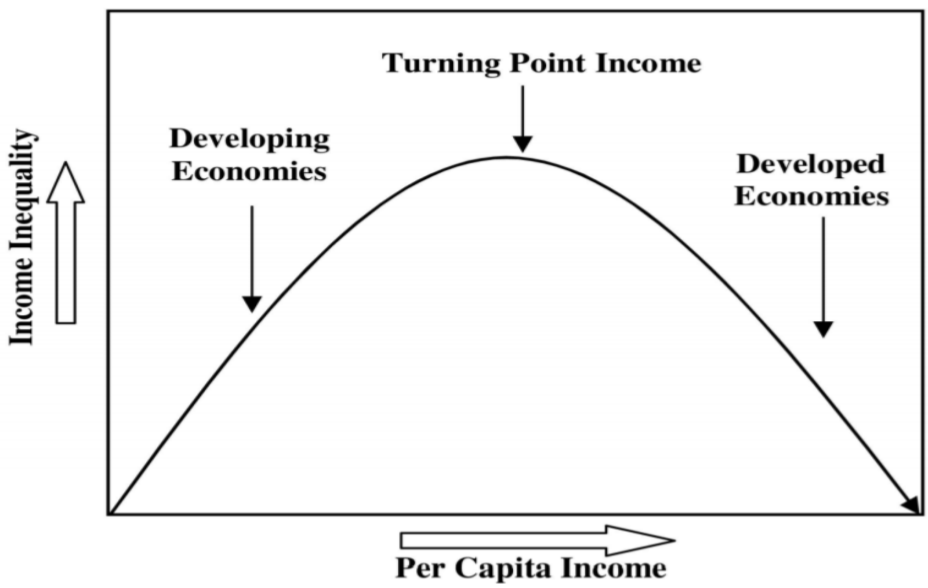

Figure 2.1: Original Kuznets Curve (Source: Stern, 2014)

Other indicators of EKC of environmental degradation, including pollution, may probably deteriorate as modern economic growth increases progressively until average income reaches to a certain point over the course of development. This growth rate unavoidably exerts pressure on the use of natural resources, ultimately resulting in pollution and degradation of environmental quality. The bi-directional increase in input and output implies the utilization of more natural resources in production. Higher output leads to more waste such as emissions from by-product which leads to a decline in natural capital in the long run.

There is evidence to support the assertion that U-shaped curve is an environmental health indicators. For example, Kuznets, (1995) documents that environmental pollutants, such as lead, sulfur dioxide, DDT, nitrogen oxide, chlorofluorocarbons, directly released into the air or water. Concretizing this assertion, Dinda, (2004) posits that other environmental indicators, including access to clean drinking water, urban sanitation, waste disposal, traffic control, and sustainable energy management are used to test the EKC. The ratio of energy per real GDP and increases in a total use of energy is on a decline in most developed nations. However, studies have inferred a dearth of evidence to support the relationship between other pollutants, natural resource and bio-diversity conservation. For example, Carlsson et al. (2006) suggests that key ecosystem services including freshwater provision and regulation, soil fertility, and fisheries have continued to degenerate in developed countries. The study adds that ecological footprint such as land and resource use do not decrease with an increase in income, rather, the greenhouse effect caused by the emission of gases increases in industrialized countries. However, some scholars argue that the EKC does certainly rescind the Kuznet hypothesis and the curves may reveal disparities when tested with diverse environmental factors and regions (Gill et al., 2017).

Countries who have thermodynamic economics reveal that production of degraded materials such as noxious wastes, will result to an unavoidable consumption of energy. Eliminating this wastes will be dependent on the use of technology by companies and regulatory bodies rather than income or production levels. The EKC reveals that "the solution to pollution is more economic growth" (Kuznets, 1955). This is consistent with Rammelt & Crisp, (2014) which posits that pollution is recognized as an unwanted output that should be reduced when the benefits of production exceeds the costs imposed on the ecosystem and health challenges. Figure 2.2, proves that EKC, which also has an inverted U-shaped argues that at further levels of income, alternative and renewable energy resources are efficiently utilized, and therefore, environmental degradation is likely to decline.

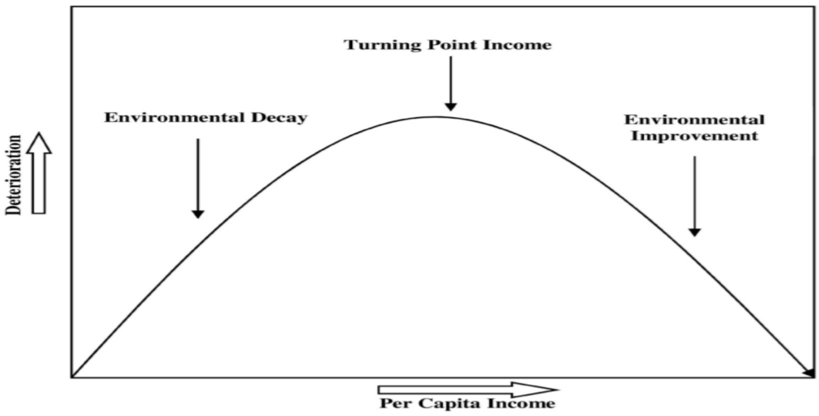

Figure 2.2: Environmental Kuznets Curve (Source: Khajuria et al., 2012)

2.1.1 Integration of Environment into Kuznets Curve

Economic development, material growth and improved well-being of communities are some of the chief goals of governments. Although, income distribution inequality is bound to increase at the early stages of the growth and definitely degenerate as economic growth continues (Kuznets, 1955). This affirms the assertions of Kang et al. (2016) and Arrow et al. (1995) which suggests that industrialization exerts a significant impact on economic development which in turn affects natural resources and environmental quality triggered by high consumption rates. Generally, the link between environmental quality and economic development could be explained by composition and technical effects. Composition effect emphasizes that economic activity level are considered as an important requirement of economic development and if the structure of economic activity is mostly centered on primary sectors that are more pollution-more intensive than economic development, it may result to a drain in resources and reduced environmental quality. According to Dinda, (2004) the effects environmental quality on economic growth has remained a heated discuss for economists over the years. He also emphasized that the EKC theory elucidates the relationship between economic growth and environmental degradation where income per capita rises as environmental degradation depreciates. This suggests that the EKC proves that environmental improvement might be achieved with the pre-condition of economic growth, such that, as more attention is given to the environmental facilities and standards of living, income per capita increases (Pezzey, 1989; Selden & Song, 1994). However, with population and urbanization on the increase, as well as a vast awareness of environmental degrading, communities have begun to implement regulations and best practices regardless of the increase in the production that leads to reduced pollution rates. For instance, air pollution can be prevented by strong environmental regulations (Martínez-Zarzoso & Maruotti, 2011). According to the World Health Organization (WHO) (2009), communities now insist on a better tomorrow and healthier future for their children. This can be accomplished by investing in the latest technologies, strong policy reforms and public environmental education which ultimately reduces environmental degradation. Additionally, Dinda, (2004) puts forward that ultimately, a solution can be found only by educating the public on environmental standards which will significantly improve the knowledge about polluters, damages, local environmental quality and abatement.

2.2 Sectorial Effects on the Environmental Kuznets Curve

This chapter represents a descriptive review on recent studies including both empirical and theoretical ones related to EKC. There have been various empirical studies conducted on Environmental Kuznets Curve (EKC) on diverse fields such as tourism (Zaman, et al.,2016, Katırcıoğlu, 2014; Katırcıoğlu, Feridun & Kılınç, 2014; Paramati, Alam & Chen, 2017); studies specifically on country are also conducted (Zhang & Cheng; 2009; Soytaş & Sari, 2009; Halıcıoğlu, 2009; Erdal et al., 2008; Ang, 2008; Karanfil, 2008; Lee & Chang, 2005; Oh & Lee, 2004; Wolde- Rafael, 2004; Gleasure, 2002; Fatai et al., 2002; Aqeel & Butt, 2001; Soytaş, 2001).

Some scientific studies have been conducted to explore the impact of energy consumption on economic growth (Erol & Yu, 1987; Lee, 2005; Al Irani, 2006; Huang et al, 2008; Lee & Chang, 2008; Mohammadi & Parvaresh, 2014; Jammazi & Aloui, 2015; Heid et al., 2015). Additionally, there is a large number of scientists aiming to investigate the causality between economic growth and pollution variables (Ang, 2007; Zhang & Cheng, 2009; Lean & Smyth, 2010; Fodha & Zaghdoud, 2010; Saboori et al., 2012; Yavuz, 2014; Apergis & Öztürk, 2015; Jula et al., 2015). Also, many experimental studies have been conducted to find out the impact of FDI on economic growth and CO2 emissions (Elliott et al., 2013; Ren et al, 2014; Lau et al, 2014; Kivyiro & Arminen, 2014; Tang & Tan, 2015). Next, several studies have been conducted to explore the relationship between the use of renewable and non-renewable energy sources and CO2 emissions recently (Jebli et al., 2016; Doğan & Şeker, 2016).

Some studies have been conducted to examine the relationship between economic growth and tourism a shown table 2.1. In terms of economic growth and CO2 emissions, researchers utilized multiple methods to explore the direction and link of tourism-driven growth. Multiple studies have been conducted to identify the existence of the EKC in economies since the early 1990s, and there have been new studies investigating the role of specific sectors in this area. The following section describes the literature on the different fields applied in this study. Several studies have been worked out to examine the link between tourism and economic growth. The researchers benefited from various methods to investigate the direction and link of tourism growth in the context of economic growth and CO2 emissions.

Katırcıoğlu et al. (2014) examined the relationship between energy consumption, tourism and CO2 emissions, and the causality path among these variables in Cyprus in the long term. The researcher used the Error Correction models and the conditional Granger Causality model. The current study pinpoints that international tourists will lead an important, non-elastic and positive effect on the level of energy consumption and will give rise to CO2 emissions in Cyprus. Katırcıoğlu (2014) attempted to find out the linkages among CO2 emissions and tourism boosting in Singapore with the utilization of Granger causality method. The results showed that Singapore's long-term economy was a one-way causality resulting from tourism and CO2 growth. Zhang & Gao (2016) tried to examine the effects of energy consumption, economic growth and environmental pollution in China in terms of international tourism by implementing panel data during the period of 1995-2011. The findings indicated that the causes of tourism affects long-term economic growth and CO2 emissions and a bi-directional causality between CO2 emissions and economic growth occurs. Zaman et al (2016) attempted to examine the linkages between health expenditures, energy demand, and domestic investment and tourism development, economic growth and CO2 emissions in 34 developed and developing counties during the period of 2005-2013.

De Vita et al. (2015) conducted another study based on the extended version of EKC. In the study, it was indicated that tourists coming to Turkey compound income and energy consumption with CO2emissions. Tourist arrivals, growth and energy consumption have a positive and important effect on CO2 emissions in the long run. The results showed that empirical support to the EKC hypothesis highlighting the decrease of CO2 emissions at exponential growth levels. The findings also assert that policies for environmental protection should not be pursued at the expense of tourism-driven growth despite the environmental degradation resulting from tourism development. Paramati et al. (2017) carried a survey to check the correlation among economic growth, CO2, and tourism, and at the same time compared the effect of the light and potent econometric analysis of CO2 and tourism emissions. The results of the survey indicated that Tourism contributes significantly to economic growth for both developed and developing countries. In addition, the findings also indicated that the amount of CO2 in developed countries decreased faster than in developing countries.

Several studies have applied to examine causality among FDI, CO2 and economic growth. Some studies explore FDI, economic growth and energy. Elliot et al. (2013) conducted a study to find out the relation between FDI and economic growth. Study pinpointed the availability of a non-linear inverse U-shaped interaction between the per capita national income and the majority of cities on the downward trend and energy intensity. The study also revealed that there was a significant and negative relationship between energy intensity and FDI flows; however, it may result in geographical changes, which means that the regions are capable of absorbing and utilizing environmental emissions.

Lau et al. (2014) have sought to investigate the causality among CO2, FDI and economic growth in the light of the Granger Causality method in Malaysia. The results are indicative of the fact that FDI supports economic growth, which results in higher environmental degradation. In addition, it emphasized that CO2 emissions and economic growth are formed by direct trade and FDI. A proposed study is centered on more technology-oriented FDI to boost environmental quality.

Ren et al. (2014) conducted a study to check out the CO2 emissions of international trade in China between 2000 and 2010 by applying input-output tests. Panel data were applied to find out the impact of direct foreign investment, trade deficit, export and import, and per capita income on CO2 emissions in order to measure the two-tier GMM method. The study indicated that the increasing trade surplus in China could be considered as one of the critical reasons for the rise of CO2 emissions. In addition, a larger amount of FDI inflows triggers China's CO2 emissions. Meanwhile, the per capita income and CO2 emission correlation in industry will highlight the reverse U-circumferential Kuznets curve; hence, China should make a great effort to alter its trade growth and adapt its foreign investment structure, and implement a low-carbon economy strategy as well as rises of energy efficiency in order to achieve economic development.

Table 2.1: Summary of Empirical Studies on Tourism EKC on Economic Growth

Reference(s)	The aim of study	Method(s)	Findings
Katırcıoğlu et al. (2014)	To explore the relationship between energy consumption, tourism and CO2 emissions, and the causality path among these variables in Cyprus in the long term.	Error Correction models and The conditional Granger Causality model	International tourists will lead an important, non-elastic and positive effect on the level of energy consumption and will give rise to CO2 emissions in Cyprus.
Katırcıoğlu (2014)	The linkages among CO2 emissions and tourism boosting in Singapore	Granger Causality Model	Singapore's long-term economy was a one-way causality resulting from tourism and CO2 growth.
Zhang & Gao (2016)	To examine the effects of energy consumption, economic growth and environmental pollution in China in terms of international tourism during the period of 1995-2011.	Panel Data	The causes of tourism affects long-term economic growth and CO2 emissions and a bi-directional causality between CO2 emissions and economic growth occurs.
Zaman et al. (2016)	To examine the linkages between health expenditures, energy demand, and domestic investment and tourism development, economic growth and CO2 emissions in 34 developed and developing counties during the period of 2005-2013	Panel Data	Study revealed that inverted U shaped relationship among CO2 emissions per capita income in the regions
Vita et al. (2015)	To indicate that tourists coming to Turkey compound income and energy consumption with CO2emissions.	Co-integration tests and DOLS method	The EKC hypothesis highlighting the decrease of CO2 emissions at exponential growth levels.
Paramati et al. (2017)	To check the correlation among economic growth, CO2, and tourism, and at the same time compared the effect of the light and potent econometric analysis of CO2 and tourism emissions.	Panel Co-integration and FMOLS approach	Tourism contributes significantly to economic growth for both developing and developing countries. In addition, the findings also indicated that the amount of CO2 in developed countries decreased faster than in developing countries.

Kivyiro & Arminen (2014) have applied Granger causality test in sub-Saharan countries, taking into consideration the relationship between CO_2 emissions, energy consumption, economic development and FDI in sub-Saharan countries. The results indicate a proportional relationship between CO_2 emissions and FDI. Tang & Tan (2015) conducted a study to determine the mutual effect between energy consumption, CO_2 (carbon dioxide) emissions, FDI and economic growth from 1976 to 2009, in Vietnam. The Granger causality method was assigned. The study summarized the long-term stability among the variables of interest. In addition, revenue and energy consumption are positively affecting CO_2 emissions; on the other hand, the revenue squared are impacting CO_2 emissions negatively in Vietnam. The results emphasized the EKC assumptions acknowledging the existence of U-forms between economic growth and CO_2 emissions in Vietnam. The findings of the present thesis also emphasized the existence of bi-directional causality between CO_2 emissions and FDI revenues and income and CO_2 emissions in Vietnam. Also, the results show that energy consumption has Granger causality impact on CO_2 emissions short and long terms. FDI, energy consumption and income are the main causes of CO_2 emissions in Vietnam; hence, the utilization of environmentally friendly technological devices through international investors is of great importance in reducing CO_2 emissions and boosting economic development in the country. In addition, some researchers are exploring the advantages of renewable energy for energy development. Bilen et al. (2008) describe the importance of sustainable energy development of renewable energy sources. Also, he discusses that Turkey is much dependent on expensive imported energy sources such as gas and fuel, all of which contribute to the problem of air pollution in the country; however, this problem can be easily worked out thanks to Turkey’s geographic position as it conveys some advantages of renewable energy resources.

2.3 Recent Debate on the Environmental Kuznets Curve

From the 1990s - 2000s, several studies focused on assessing the EKC globally, on the assumption that all countries have the same perspectives on economic growth and environmental development. However, depending on a countries situation, various conditions, including natural and social situations can affect economic development. Also, there is a possibility that the curve can shift to the lower left on account in developing countries.

Research evidence has demonstrated the progressive findings on the EKC curve with a focus on economic growth and energy consumption applying Granger causality test (Zhang & Cheng, 2009; Wolde - Rafael, 2004), Co-integration and Granger causality test (Aqeel & Butt, 2001; Soytaş et al., 2001; Karanfil, 2008), Granger causality and ARDL (Fatai et al., 2002), Co-integration, error correction and variance decomposition tests (Gleasure, 2002), Executed Johansen Co-integration and VEC test (Ang, 2008) as shown in table 2.2. Investigators have applied the Granger Causality tests in China using a timeline of 1960-2007 to investigate linkage between economic growth and energy consumption. The findings revealed that causality comes from economic development to energy consumption (Zhang & Cheng, 2009). This is consistent with another study, which applied the Toda & Yamamoto (1995) procedure to test for Granger causality, Wolde- Rafael (2004) explored the connection between economic growth and energy consumption in Shangai from 1952–1999. The findings demonstrated that causality comes from energy consumption to economic growth.

To investigate the causality among economic growth and energy consumption, using Co-integration, Granger causality test between 1960 to 1995, Soytaş et al. (2001) carried out a research in Turkey and the results revealed that causality runs from economic growth and energy consumption. However, Karanfil (2008) found no sign of causality from economic development to energy consumption in turkey from 1970–2005. Additionally, Aqeel & Butt, (2001) applied the Granger Causality by Hsiao's version and Co-integration method in Pakistan between 1955–1996, and revealed that the causality moves from the point of economic growth to energy consumption. Using Co-integration, and variance decomposition models, the relationship between economic growth and energy consumption was investigated in Korea by executing error correction between 1961–1990, (Gleasure, 2002), and in Malaysia using Johansen Co-integration, VEC model between 1971–1999 (Ang, 2008). The findings of both studies conclude that a bi-directional causality that runs from economic development and energy consumption exists. Conversely, Fatai et al. (2002), revealed that causality does not exist among economic growth and energy consumption in their investigation in New Zealand between 1960–1999, when the Toda and Yamamoto procedure method is applied with Granger causality, and ARDL.

Table 2.2: A Summary of Selected Studies on Energy Consumption and Growth Progression

Reference(s)	Period/Country	Method(s)	Findings
Soytaş et al., (2001)	1960-1995, Turkey	Co-integration and Granger causality test.	The results of this study showed that there is a causality effect of energy consumption to economic growth.
Aqeel and Butt (2001)	1955–1996, Pakistan	Granger causality and Co- Integration test.	The study revealed that the causality exists, and runs from economic growth in energy consumption.
Fatai et al (2002)	1960–1999, New Zealand	Granger causality, ARDL.	The study revealed that no causality exists in relation from economic growth to energy consumption.
Gleasure (2002)	1961–1990, Korea	Co-integration, error correction and variance decomposition tests.	The study posits that bi-directional causality runs from energy consumption and economic development.
Wolde-Rafael (2004)	1952–1999, Shanghai	Granger causality test.	The research suggests that by using a modified version of Granger causality test, causality runs from energy consumption to economic growth.
Karanfil (2008)	1970–2005 Turkey	Granger causality test, Co-integration test.	The findings show that there is no causality from economic development to energy consumption.
Ang (2008)	1971–1999 Malaysia	Executed Johansen co-integration and VEC test.	The study concluded that causality drives from economic growth to energy consumption.
Zhang and Cheng (2009)	1960-2007, China	Granger Causality to test.	The findings of the study concluded that causality drives from economic development to energy consumption.

As shown in table 2.3, several studies have examined causality among EC and GDP on a multi-country basis and it could be argued that the results are conflicting. The Granger causality Method has been employed to test causality in various countries, including Germany, France, Japan, Italy, Canada, and lastly United Kingdom. Their findings revealed that EC and GDP have a bi-directional causality (feedback hypothesis) in Japan while, causality runs from GDP to EC in Germany and Italy (conservation hypothesis). Furthermore, found that (growth hypothesis) runs from EC to GDP in Canada. However, they also reported a (neutrality hypothesis) which suggest a null casualty in France and UK (Erol & Yu, 1987). A study analyzed 82 nations and categorized them as low, middle and high income, respectively, in an investigation of causality among EC and GDP by employing GMM-SYS Panel and VAR model. They conclude that causality doesn't exist among GDP and EC in poor economy nations, thus supporting feedback hypothesis. Furthermore, causality positively runs from GDP to EC in Middle Income nations which implies that conservation hypothesis was supported. However, for high income nations, causality negatively runs from GDP to EC (Huang et al., 2008).

The causality among Saudi Arabia, Bahrain, Oman, Kuwait, UAE and Qatar, were examined using Panel Co-integration, GMM technique in a thirty-two (32) years' time line, 1970-2002. The study findings supported the growth hypothesis (Al Irani, 2006). Conversely, the findings of a recent study in the same countries supported the feedback hypothesis when examined with Wavelet Window Cross Correlation (WWCC) method, combined with multi scaled decomposition and lead/lag cross correlations in a thirty-three (33) years' time line, 1980-2013 (Jammazi & Aloui 2015). A more recent study on selected European Union (EU) countries including Cyprus, Hungary, Poland, Slovenia, Czech Republic and Bulgaria to test the causality between EC and GDP in a nineteen (19) years' time line, 1990-2009 using a symmetric causality and ARDL method. The findings revealed that neutrality hypothesis was supported for Cyprus, Hungary, Poland, and Slovenia while conservation hypothesis was supported in the case of the Czech Republic. Furthermore, growth hypothesis was supported in the case of Bulgaria (Gill et al., 2017).

Table 2.3: Summary of Selected Empirical Studies on the Causality Effects on EC and GDP with Related Hypothesis

Refrence(s)	Countries	Timeline	Method	Results/findings
Erol & Yu (1987)	Germany, France, Japan, Italy, Canada, and United Kingdom	1952-1982	Granger-cause	EC $\leftrightarrow$ GDP (Japan) GDP $\rightarrow$ EC (Italy, Germany) EC $\rightarrow$ GDP (Canada) GDP------ EC (France, UK)
Huang et al.(2008)	82 Nations were examined	1972-2002	GMM-SYS Panel and VAR	a. For low income group: EC- - -GDP b. Middle income group: GDP $\rightarrow$ EC positively. c. High income group: GDP $\rightarrow$ EC negatively.
Al Irani (2006)	Saudi Arabia, Bahrain, Oman, Kuwait, UAE and Qatar	1970-2002	Panel Co-integration, GMM	EC $\rightarrow$ GDP
Jammazi & Aloui (2015)	Saudi Arabia, Bahrain, Oman, Kuwait, UAE and Qatar	1980-2013	Wavelet Window Cross Correlation (WWCC)	EC $\rightarrow$ GDP

Note: $\rightarrow$ GDP to EC (conservation hypothesis), $\rightarrow$ EC to GDP (growth hypothesis),- · - · (neutrality hypothesis), $\leftrightarrow$ bi-directorial causality (feedback hypothesis)

The link between economic growth and pollution variables have been analyzed by several investıgators as shown in table 2.4. Applying the Co-integration vector correction modelling techniques, the dynamic causal link between energy consumption, pollution emissions, and output in France was investigated by Ang (2007). The findings suggested a significant influence of economic growth, which ultimately exerts a causal influence of growth of pollution and energy consumption. The long run equilibrium correlation between CO2 emissions per capita, income per capita and energy consumption per capita over the time period of 1960-2007 was investigated by Yavuz (2014) with the Gregory-Hansen co-integration test. The findings revealed an equilibrium correlation between the variables conducted in the empirical model, and further highlighted the validity of EKC hypothesis.

Likewise, to test the correlation between CO2 emissions, electricity consumption as an energy consumption indicator and economic growth, Lean & Smyth (2010) considered five Association of Southeast Asian Nations (ASEAN) countries by in a time line of 1980-2006. The study revealed a positive link between electricity consumption and CO2 emissions. Conversely, the causality among energy consumption, economic growth and carbon emissions in China was studied by Zhang & Cheng (2009) using the Granger causality method. Their findings revealed that carbon emissions and energy consumption does not contribute to the economic growth. They recommended that the Chinese policy makers should develop energy conservative policies to eventually reduce carbon emission.

Using the Granger causality test, to analyze the relationship between economic growth and CO2 emissions, Saboori et al. (2012) found an inverted U shape relationship, both in the long and short run. The study also suggested that there is a bi-directional causation from income growth towards emission levels in the long – term period.

The effects of renewable and non-renewable energy sources on CO2 have been extensively explored by several studies applying various methods including; the Autoregressive Distributed Lag (ARDL) (Bölük & Mert, 2015), the Panel Method for international trade (Jebli et al., 2016), the fully modified ordinary least squares (FMOLS) and the dynamic ordinary least squares (DOLS) (Doğan & Şeker, 2016).

Table 2.4: Summary of Empirical Studies Investigating Causality between Pollution Variables and Economic Growth

Reference(s)	Results/Findings
Ang, (2007)	The findings suggested a significant influence of economic growth, which ultimately exerts a causal influence of growth of pollution and energy consumption.
Zhang & Cheng, (2009)	Their findings of this study suggest that carbon emissions and energy consumption does not contribute to the economic growth. It recommended that energy conservative policies should be developed by the Chinese policy makers to reduce carbon emission.
Lean & Smyth, (2010)	A positive link between electricity consumption and CO2 emissions was established by the study.
Saboori et al., (2012)	The study found an inverted U shape relationship, both in the long and short run. It also suggested that there is a bi-directional causation from income growth towards emission levels in the long – term period.
Yavuz, (2014)	An equilibrium correlation between the variables conducted in the empirical model was revealed. It further emphasized the validity of EKC hypothesis.

The Autoregressive Distributed Lag (ARDL) method was applied between 1961 and 2010 in Turkey to investigate the impact of GHG emissions by testing the validity of EKC hypothesis, considering the relationship among GDP, CO2 emissions, and electricity generated using renewable energy sources. The findings revealed a U-shaped EKC correlation between income and per capita GHGs, and suggested that environmental improvements may strengthen the advantages of renewable electricity production (Bölük & Mert, 2015).

Applying the Panel Method for international trade in 25 OECD countries between 1980 to 2010, on the causal relationships among GDP, per capita CO2 emissions, renewable and non- renewable energy consumption, Jebli et al. (2016) found both a unidirectional and bi-directional casualty, running from exports to renewable energy, trade to CO2 emissions, and output to renewable energy. The study ultimately suggests that an intensive use of non- renewable energy sources will increase CO2 emissions, whereas using renewable energy sources will reduce CO2 emissions. To test the link between several factors including; carbon emissions CO2, renewable energy consumption, trade openness and financial development, Doğan & Şeker (2016) used the FMOLS and the DOLS Long-run estimations, and suggested an indication that CO2 emissions can be minimized by an upsurge in renewable energy consumption, trade openness and financial developments. However, when non-renewable energy consumption proliferates, it adds to the level of emission. These findings concretizes the EKC hypothesis for the top renewable energy countries.

Chapter 3

THEORETICAL SETTING

This thesis argues that climate changes exerts statistically significant effects on international tourist flows between countries and regions. Therefore, based on the previous and similar works (Witt & Witt, 1995; Maddison, 2001; Scott & McBoyle, 2001; Amelung et al., 2007; Katircioglu & Yorucu, 2009; Atzori et al., 2018; Dogru et al., 2019), the following functional relationship is then proposed in this research study:

$$T_t = f\,(y_t, K_t, L_t, C_t, P_t, CV_t) \tag{3.1}$$

Where T_t is tourist arrivals in period i to a country or region; y_t is real income level of tourist receiving country denoting that tourist attracting activities are driven by income (Katircioglu, 2009); K_t is capital volume in tourist receiving country to represent investments towards tourism, L_t is labor force in tourist receiving country, C_t is the proxy of climate change variable, P_t is international and/or relative prices (Katircioglu & Yorucu, 2009), and CV_t is the other relevant control variables to be adopted into model estimation as advised in the relevant literature as well.

Equation 3.1 can be transformed into linear and double logarithmic form as the following to estimate growth effects of regressors on tourist arrivals (Katircioglu, 2010):

$$\ln T_t = \beta_0 + \beta_1 y_t + \beta_2 K_t + \beta_3 L_t + \beta_4 C_t + \beta_5 P_t + \beta_6 CV_t + \varepsilon_t \tag{3.2}$$

Where the term "ln" stands for the natural logarithmic form of series to capture growth effects as mentioned earlier. Beta coefficients from 0 to 6 are estimated and long-term coefficients of series in equation (3.2). The term ε_t is error disturbance. In case where series are non-stationary but there exists co-integration in equation (3.2), then the following error correction model (ECM) is estimated in order to obtain estimated short run coefficients and error correction terms (ECT) as advised in the econometrics literature (Gujarati, 2003):

$$\Delta \ln T_t = \beta_0 + \sum_{i=1}^{n} \beta_1 \Delta \ln T_{t-j} + \sum_{i=0}^{n} \beta_2 \Delta \ln y_{t-j} + \sum_{i=0}^{n} \beta_3 \Delta \ln K_{t-j} + \sum_{i=0}^{n} \beta_4 \Delta \ln L_{t-j}$$

$$+ \sum_{i=0}^{n} \beta_5 \Delta \ln C_{t-j} + \sum_{i=0}^{n} \beta_6 \Delta \ln P_{t-j} + \sum_{i=0}^{n} \beta_7 \Delta \ln CV_{t-j} + \beta_8 \varepsilon_{t-1} + u_t \qquad (3.3)$$

Where Δ is the first difference operator and ε_{t-1} is one lagged error correction term (ECT) to capture the adjustment rate between long-run and short-run dependent variable values which is tourist arrivals (Gujarati, 2003). Taking the first difference of each series in equation (3.3) would enable us to estimate short-term coefficient of each independent variable with respect to dependent variable (Gujarati, 2003).

The following section will present the first empirical chapter of this thesis which focuses on the effects of climate changes on tourist flows in the cases of regional panels. Theoretical setting put forward in this section will be adopted to empirical analysis in chapters 4 and then after chapter 5 of this thesis.

Chapter 4

ESTIMATING THE EFFECTS OF CLIMATE CHANGES ON INTERNATIONAL TOURIST FLOWS: EVIDENCE FROM GLOBAL PANEL

4.1 Introduction

Tourism is one of the highest income generating activities and sector around the world. Millions of tourists visits other countries or regions for traveling, business, and leisure purposes. Factors behind tourist arrivals and flows have been estimated through tourism demand functions more than three decades. It has been well established that international prices and relative incomes are major drivers for tourist flows (Witt & Witt, 1995; Katircioglu & Yorucu, 2009). However, the other external factors affecting tourist flows across countries and regions have been quite limited in the relevant literature. Some studies find that international trade activities drive tourism volume significantly as well (Katircioglu, 2009; Shan & Wilson, 2001; Kulendran & Wilson, 2000; Kammas & Salehi-Esfahani, 1992). Yacht tourism also has been found significant contributor to tourist flows (Bicak et al., 2006).

On the other hand, climate changes are one of the essential factors behind tourist decisions for traveling which has not been yet empirically investigated through econometric analyses to the best of our knowledge. However, there are some rare studies which support this argument that climate changes are effective in decision making of tourists. For example, the studies of Amelung et al. (2007), Maddison (2001), Scott & McBoyle (2001), Dogru et al. (2019), and Atzori et al. (2018) prove how tourism industry is very sensitive to climate changes. Therefore, investigating the effects of climate changes on international tourist arrivals would be a quite new and original research debate in this field.

4.1.1 The Aim of the Study

Against this backdrop, this part of the thesis investigates the effects of global climate changes on international tourist arrivals across countries and continents. A global panel of regions and continents as well as income groups as ranked by World Bank (2019) has been constructed with this respect. Data period, therefore, has been set to 1995-2014 due to availability in World Bank. To the best of our knowledge, this study is the first of its kind in the relevant literature not because of sample selection but of research idea developed. Therefore, the following is that research question designed for this original research study:

H1: Climate changes exerts statistically significant effects on international tourist flows

This research question will be tested using time series econometric procedures to be described in details in the following sections. It is expected that climate changes exert significant effects on tourist arrivals between countries or continents.

4.1.2 Structure of the Study

This section of the thesis is organized as follows: Section 4.2 attempts to identify the theoretical setting of the current study; section 4.3 presents the data and methodology; section 4.4 displays the empirical results and discussion, and section 4.5 is the conclusion of the study.

4.2 Theoretical Setting

Tourism is proxied extensively by two measures which are (1) international tourist arrivals visiting and accommodating in the host countries, and (2) international tourism receipts (Perkov et al., 2016; Munandar, 2017; Katircioglu et al., 2018a; 2018b; Katircioglu, 2010; 2009). Thus, this study will use international tourist arrivals as a proxy for tourism volume based on data availability. On the other hand, climate change is mostly identified by carbon dioxide emissions (kt) (CO_2) in several studies in the relevant literature (Borhan & Ahmed, 2012; Kapusuzoglu, 2014; Anatasia, 2015; Kalayci & Koksal, 2015; Katircioglu & Katircioglu, 2018a; 2018b; Katircioglu et al., 2018c). Again in parallel to such studies this study will use CO2 emissions as a proxy of climate change. The main research question of this study is that climate change is likely to affect tourist flows to countries. It is here argued that climate levels in tourist destinations are significant determinants of tourist decisions for visiting targeted destinations. Therefore, volume of foreign visits to countries will be affected from these decisions owing to climate changes.

Literature studies have shown that energy consumption and income level of countries are drivers of carbon emission levels (Cetin & Ecevit, 2017; Ozcan & Ari, 2017; Istaiteyeh, 2016). Growth in income also results in growth in tourism as a result of investments and the other related activities which also generates additional energy usage. Thus, overall energy consumption and gross domestic product (GDP) are also considered in the theoretical model construction of this study. Previous studies have also shown that capital and labor force of countries are significant determinants of not only income but also touristic investments in the countries (Turekulova et al., 2016; Bayram, 2007). So, capital and labor also have been augmented into theoretical modelling of current study. Finally, urbanization has also been linked to carbon emissions in the relevant literature and it has been found that urban growth leads to energy growth which results in significant changes in emissions (Katircioglu & Katircioglu, 2018a; 2018b). Hence, the following modelling of climate change and tourism nexus is then proposed in the present study:

$$T_t = f\,(y^{\beta_1}, K^{\beta_2}, L^{\beta_3}, CO_{2t}^{\beta_4}, E_t^{\beta_5}, U^{\beta_6}) \tag{4.1}$$

where T stands for tourist arrivals, y is real income, K is capital, L is labor force, CO_2 is carbon dioxide emission (kt), E is overall energy consumption (kt of oil equivalent), and U is urban proxy. The symbols β_1, β_2, β_3, β_4, β_5, and β_6 are regression coefficients of regressors respectively.

Equation (4.1) can be revised in logarithmic formula in order to obtain the effects of growth in regression analysis (Sodeyfi & Katircioglu, 2016):

$$\ln T_t = \beta_0 + \beta_1 \ln y_t + \beta_2 \ln K_t + \beta_3 \ln L_t + \beta_4 \ln CO_{2t} + \beta_5 \ln E_t + \beta_6 \ln U_t + \varepsilon_t \tag{4.2}$$

Where the terms “ln” stand for logarithmic base of series and ε is error term.

The econometrics theory states that regressed in equation (4.2) which is $\ln T_t$ will not react to its long-term equilibrium level after changes in its repressors (Katircioglu et al., 2017); hence, the convergence rate between the short-run and the long-run stages of $\ln T_t$ should be then estimated via the following ECM:

$$\begin{aligned}\Delta \ln T_t = \beta_0 &+ \sum_{i=1}^{n} \beta_1 \Delta \ln T_{t-j} + \sum_{i=0}^{n} \beta_2 \Delta \ln y_{t-j} + \sum_{i=0}^{n} \beta_3 \Delta \ln K_{t-j} + \sum_{i=0}^{n} \beta_4 \Delta \ln L_{t-j} \\ &+ \sum_{i=0}^{n} \beta_5 \Delta \ln CO_{2t-j} + \sum_{i=0}^{n} \beta_6 \Delta \ln E_{t-j} + \sum_{i=0}^{n} \beta_7 \Delta \ln U_{t-j} + \beta_8 \varepsilon_{t-1} + u_t \end{aligned} \tag{4.3}$$

Where Δ represents changes in series and ε_{t-1} is the one period lagged ECT, which is predicted from equation (4.2). The ECT in equation (4.3) then indicates the speed between the short-run and the long-run levels of lnT_t is periodically eliminated. The supposed indicator of ECT is negative by theory (Karacaer & Kapusuzoglu, 2010).

4.3 Data and Methodology

4.3.1 Data

This study focuses on climate change and tourist flows nexus around the world. Therefore, classification of World Bank by regions, income levels, and various unions as presented in Table 4.1 has been used with this respect. Quarterly data that ranges from 1995:Q1 to 2014:Q4 as available from World bank has been generated from annual data sets of World Bank (2019) using linear approach from Econometric Views (EVIEWS) software in order to have sufficient number of observations in econometric analysis. Variables of empirical analysis in this study are tourist arrivals (T), gross domestic product (GDP) (y) at constant 2010 USD prices, carbon dioxide emissions (kt) (CO_2), gross fixed capital formation (K) as percent of GDP, labor force, energy consumption (kt. of oil equivalent per capita) (E), and urban population as a proxy of urbanization (U). Table 4.1 presents descriptive statistics of series under consideration.

Table 4.1: Descriptive Statistics

	GDP (Constant 2010 Trillion USD)	CO2 Emissions (kt)	Energy Consumption (kt. Of oil equivalent per capita)	Urban Pop (million)	Tourist Arrivals (Million)
Segments					
Low Income					
Mean	0.31	200,561	-	151	9.48
Std.Dev.	0.08	24,511	-	34.11	3.45
Min	0.20	157,077	-	103	5.12
Max	0.48	237,055	-	212	15.01
Lower & Middle Income					
Mean	3.42	2,975,535	567.095	858	76.68
Std.Dev.	1.13	726,098	49.494	139	34
Min	2.03	2,075,525	511.223	651	31.49
Max	5.56	4,197,374	646.284	1100	129
Low & Middle Income					
Mean	15.50	14,475,421	1,048.423	2280	292
Std.Dev.	5.11	4,094,540	170.569	360	106
Min	9.21	9,975,871	862.411	1740	144
Max	24.90	21,009,992	1,324.810	2890	468
Middle Income					
Mean	15.20	14,271,664	1,093.224	2130	280
Std.Dev.	5.02	4,074,179	187.238	326	102
Min	9.01	9,812,759	889.400	1640	138
Max	24.40	20,786,783	1,395.789	2680	449
Upper & Middle Income					
Mean	11.81	11,295,256	1,645.741	1270	204
Std.Dev.	3.89	3,352,999	356.123	187	68.38
Min	6.98	7,736,480	1,260.993	989	106
Max	18.80	16,588,791	2,204.168	1580	322
High Income					
Mean	41.80	13,253,588	4,840.612	906	508
Std.Dev.	4.90	462,339	127.548	56.66	85.97
Min	33.00	12,265,205	4,637.542	819	377
Max	48.80	13,928,700	5,022.596	994	684

	GDP (Constant 2010 Trillion USD)	CO2 Emissions (kt)	Energy Consumption (kt. Of oil equivalent per capita)	Urban Pop (million)	Tourist Arrivals (Million)
Arab					
Mean	1.71	1,291,745	1,512.553	173	51.92
Std.Dev.	0.44	348,771	224.158	29.21	22.68
Min	1.11	833,006	1,257.278	132	21.15
Max	2.46	1,895,700	1,953.287	224	84.59
Caribbean Small States					
Mean	0.58	56,709	4,055.904	3.42	5.47
Std.Dev.	0.06	8,152	738.068	0.09	0.40
Min	0.48	42,493	3,056.747	3.27	4.84
Max	0.64	64,792	5,021.547	3.57	6.02
Central Europe and Baltics					
Mean	0.35	738,038	2,568.027	65.80	50.37
Std.Dev.	0.02	53,500	99.394	1.10	7.94
Min	0.37	636,385	2,377.398	64.28	39.22
Max	0.38	841,616	2,703.236	67.71	66.80
East Asia & Pacific					
Mean	13.8	9,520,334	1,545.374	986	147
Std.Dev.	3.46	3,075,780	349.878	169	54.88
Min	9.34	6,122,093	1,144.911	729	77.64
Max	20.20	14,272,115	2,135.565	1026	249
Euro Area					
Mean	11.80	2,583,207	3,647.520	243	267
Std.Dev.	1.07	164,781	164.222	97.64	37.37
Min	9.75	2,191,542	3,266.189	229	197
Max	13.00	2,767,041	3,857.958	258	336
Europe & Central Asia					
Mean	19.20	6,713,278	3,267.988	606	425
Std.Dev.	2.18	173,673	78.546	18.48	77.78
Min	15.40	6,390,991	3,155.062	582	296
Max	22.10	7,002,692	3,399.898	639	566
European Union					
Mean	15.70	3,844,286	3,447.105	361	347
Std.Dev.	1.59	246,732	149.031	11.96	50
Min	12.80	3,241,844	3,079.084	344	259
Max	17.60	4,071,767	3,614.242	380	440

	GDP (Constant 2010 Trillion USD)	CO2 Emissions (kt)	Energy Consumption (kt. Of oil equivalent per capita)	Urban Pop (million)	Tourist Arrivals (Million)
Heavily indebted poor countries (HIPC)					
Mean	0.40	116,293	401.578	179	11.69
Std.Dev.	0.08	30,632	16.852	30.47	4.39
Min	0.28	77,062	383.466	136	6.01
Max	0.39	174,501	439.222	231	18.62
Latin America & Caribbean					
Mean	4.55	1,525,588	1,222.833	428	62.99
Std.Dev.	0.84	227,624	94.060	43.71	12.31
Min	3.39	1,140,823	1,074.969	356	47.00
Max	5.96	1,912,532	1,378.978	497	89.13
Least developed countries: UN classification					
Mean	0.50	166,785	320.341	206	12.71
Std.Dev.	0.17	63,478	22.123	48.89	7.53
Min	0.28	94,289	296.362	137	4.35
Max	0.82	293,488	364.737	294	28.55
Middle East & North Africa					
Mean	2.25	1,802,445	1,803.447	211	55.15
Std.Dev.	0.54	470,076	286.433	33.34	23.20
Min	1.50	1,153,543	1,449.550	163	24.17
Max	3.15	2,593,274	2,337.881	269	89.84
North America					
Mean	15.10	5,997,648	7,614.327	260	71.32
Std.Dev.	1.98	249,414	377.306	18.38	8.60
Min	11.40	5,601,089	6,954.776	229	59.00
Max	18.00	6,347,727	8,075.119	289	91.78
OECD Members					
Mean	41.10	12,627,703	4,438.365	927	473
Std.Dev.	4.66	420,813	151.527	59.14	74.18
Min	32.50	11,863,123	4,141.007	834	358
Max	47.60	13,281,309	4,614.028	1020	627

	GDP (Constant 2010 Trillion USD)	CO2 Emissions (kt)	Energy Consumption (kt. Of oil equivalent per capita)	Urban Pop (million)	Tourist Arrivals (Million)
Pacific Island Small States					
Mean	60.30	426.318	2,320.294	0.739	0.836
Std.Dev.	1.60	34.683	100.486	0.082	0.219
Min	58.40	394.790	2,192.866	0.613	0.544
Max	62	475.133	2,438.335	0.885	1.184
Small States					
Mean	0.30	201,217	2,501.283	16.63	27.91
Std.Dev.	0.03	21,027	204.980	6.74	2.51
Min	0.27	177,437	2,289.644	15.88	25.03
Max	0.34	225,785	2,740.791	17.44	30.89
South Asia					
Mean	1.50	1,545,363	445.553	436	7.22
Std.Dev.	0.57	492,623	68.740	71.07	3.71
Min	0.79	928,543	365.118	330	3.80
Max	2.60	2,516,435	576.130	556	18.91
Sub-Saharan Africa					
Mean	1.08	653,589	672.469	260	24.16
Std.Dev.	0.30	107,642	11.599	61.59	7.79
Min	0.68	500,758	649.080	174	12.93
Max	1.64	822,819	690.949	372	36.63
World					
Mean	57.40	29,044,557	1,744.811	3190	804
Std.Dev.	9.85	4,623,108	112.868	417	192
Min	42.20	23,037,524	1,609.065	2560	524
Max	73.70	36,138,285	1,920.580	3890	1160

Source: World Bank, 2019

4.3.2 Methodology

Prior to econometric estimations, unit root tests for stationary nature of series needs to be investigated. Therefore, Phillips-Perron (PP) (1988) unit root tests are adapted in this study with this respect. Expecting that regressors might be of mixed order of integration as a result of PP (1988) unit root tests, bounds tests for level relationships under the autoregressive distributed lag (ARDL) methodology which were developed by Pesaran et al. (2001) are adapted in the study. Bounds F-tests by Pesaran et al. (2001) suggest the null hypothesis of no level relationships in the proposed models (namely equation (4.2) in this study). Once level (long-term) relationships are obtained, then long-term (equation (4.2)) coefficients through the ARDL approach will be used to estimate in this study. Through this methodology, mixed order of integration for repressors will be allowed in equations (4.2) and (4.3) of the current study.

4.4 Results And Discussion

Results of PP (1988) unit root tests have been presented in Table 4.2. It is important to note that although the ARDL methodology allows for mixed order of integration in regressors in equation (4.2), if dependent variable are integrated of the first order, then after, bounds F-tests can be run for estimating long-term coefficients (Pesaran et al., 2001; Katircioglu, 2009). Table 4.2 shows that dependent variable, lnT, in equation (4.2) is non-stationary at level forms but becomes stationary at first differences for all of the regional and income level groups. It is concluded that tourist arrivals around the world are not stationary at level forms, yet stationary at first differences; thus, tourist arrivals are united of order one, I (1). Among regressors, there are some few series which are stationary at level forms in Table 4.2 according to the PP (1988) approach.

Table 4.2: Phillips-Perron Unit Root Tests

	Statistics (Level)			Statistics (First Difference)			
	PP_T	PP_I	PP_N	PP_T	PP_I	PP_N	**C**
Low Income							
LnT	-1.823	-0.568	4.239	-3.517**	-3.538*	-2.786*	I (1)
lnCO2	-1.109	-2.003	1.824	-3.706**	-3.572*	-3.398*	I (1)
lnGDP	-0.284	3.976	13.955	-3.655**	-2.513	-0.586	I (1)
lnGCF	-2.130	0.721	16.478	-3.037	-3.012**	-0.813	I (1)
lnLabor	-3.834**	1.910	128.779	-2.256	-2.502	0.540	I (0)
lnEnergy	-	-	-	-	-	-	-
Lower&Middle Income							
LnT	-0.783	-1.526	5.725	-3.766**	-3.593*	-2.409**	I (1)
lnCO2	-2.160	0.361	6.506	-3.529**	-3.493**	-2.038**	I (1)
lnGDP	-1.944	1.710	13.558	-3.765*	-3.396**	-0.668	I (1)
lnGCF	-1.767	0.333	5.013	-5.485*	-4.464*	-1.585	I (1)
lnLabor	-0.889	-3.315**	12.382	-1.840	-1.478	-0.614	I (0)
lnEnergy	-2.702	1.117	5.465	-3.367***	-3.344**	-1.960**	I (1)
Low&Middle Income							
LnT	-1.604	-1.391	7.433	-3.916**	-3.852*	-2.312**	I (1)
lnCO2	-2.265	0.534	5.232	-1.734	-1.855	-1.149	-
lnGDP	-2.014	1.104	12.808	-2.753	-2.634***	-0.769	I (1)
lnGCF	-	-	-	-	-	-	-
lnLabor	-0.591	-5.477*	14.735	-2.088	-1.299	-1.098	I (0)
lnEnergy	-2.693	0.934	4.256	-3.953*	-4.039*	-1.148	I (1)
Middle Income							
LnT	-1.625	-1.387	7.267	-3.945**	-3.881*	-2.356**	I (1)
lnCO2	-2.277	0.547	5.194	-4.695*	-4.824*	-1.138	I (1)
lnGDP	-2.018	1.075	12.722	-2.756	-2.644***	-0.778	I (1)
lnGCF	-	-	-	-	-	-	-
LnLabor	-0.592	-5.755*	12.002	-2.104	-1.279	-1.202	I (0)
lnEnergy	-2.682	0.910	4.346	-4.873*	-2.000	-1.143	I (1)
Upper&Middle Income							
LnT	-2.299	-1.162	6.991	-4.002**	-4.001*	-2.493**	I (1)
lnCO2	-2.279	0.496	4.618	-4.483*	-4.683*	-1.120	I (1)
lnGDP	-2.022	0.887	12.130	-2.904	-2.893***	-0.882	I (1)
lnGCF	-	-	-	-	-	-	-
LnLabor	0.181	-9.324*	9.672	-3.437***	-1.343	-1.694***	I (0)
lnEnergy	-2.487	0.634	4.217	-3.538**	-1.776	-1.152	I (1)
High Income							
LnT	-1.987	-0.011	4.649	-3.159	-3.155**	-1.988**	I (1)
lnCO2	-1.420	-2.489	0.973	-4.062**	-3.752*	-3.738*	I (1)
lnGDP	-1.501	-2.530	5.618	-3.360***	-3.069**	-1.825***	I (1)
lnGCF	-2.105	-2.223	2.171	-2.712	-2.728***	-2.448**	I (1)
LnLabor	-0.776	-1.777	14.743	-4.578*	-4.312*	-3.775**	I (1)
lnEnergy	-1.610	-1.009	-0.154	-4.240*	-3.900*	-3.917*	I (1)

	Statistics (Level)			Statistics (First Difference)			
	PP_T	PP_I	PP_N	PP_T	PP_I	PP_N	**C**
Arab							
LnT	-0.538	-1.632	5.248	-4.223^{*}	-4.136^{*}	-2.894^{*}	I (1)
lnCO2	-3.220^{***}	0.310	5.308	-4.077^{**}	-4.084^{*}	-2.762^{*}	I (0)
lnGDP	-1.775	-0.285	9.618	-3.343^{***}	-3.361^{**}	-1.470	I (1)
lnGCF	-0.749	-1.009	4.668	-3.140^{**}	-3.957^{*}	-2.971	I (1)
lnLabor	-1.665	0.015	10.042	-3.630*	-3.778^{*}	-3.669^{*}	I (1)
lnEnergy	-1.807	1.439	4.728	-3.967^{**}	-3.663^{*}	-2.588^{**}	I (1)
Caribbean Small States							
LnT	-1.992	-0.732	2.959	-3.235^{***}	-3.263^{**}	-2.635^{*}	I (1)
lnCO2	-0.163	-2.285	3.491	-3.709^{**}	-3.417^{**}	-2.986^{*}	I (1)
lnGDP	-0.107	-2.314	4.644	-3.794^{*}	-3.268^{**}	-3.595^{*}	I (1)
lnGCF	-	-	-	-	-	-	-
lnLabor	-2.310	1.359	18.081	-3.447^{**}	-3.601^{*}	-3.339^{**}	I (1)
lnEnergy	-1.716	-0.976	1.279	-3.056	-3.084^{**}	-3.001^{*}	I (1)
Central Europe and Baltics							
LnT	-1.811	0.010	3.006	-3.073	-3.021^{**}	-2.498^{**}	I (1)
lnCO2	-1.585	-0.672	-1.893^{***}	-3.388^{***}	-3.405^{**}	-3.148^{*}	I (0)
lnGDP	-1.129	-2.778^{***}	2.552	-3.439^{***}	-2.991^{**}	-2.493^{**}	I (0)
lnGCF	-1.675	-1.957	2.461	-2.749	-2.742^{***}	-2.416^{**}	I (1)
lnLabor	-0.817	-2.566	-1.486	-3.532^{**}	-3.088^{**}	-3.074^{*}	I (1)
lnEnergy	-1.521	-1.552	-0.445	-3.227^{***}	-3.255^{**}	-3.236^{*}	I (1)
East Asia & Pacific							
LnT	-2.628	-0.185	5.034	-4.099^{*}	-4.120^{*}	-2.987^{*}	I (1)
lnCO2	-1.981	0.192	4.571	-4.894^{*}	-4.963^{*}	-4.429^{*}	I (1)
lnGDP	-1.679	1.503	12.221	-3.496^{**}	-3.296^{**}	-1.150	I (1)
lnGCF	-	-	-	-	-	-	-
LnLabor	-5.482*	-23.857^{*}	9.222	-2.936	-2.514	-3.927^{*}	I (0)
lnEnergy	-2.280	0.740	5.508	-4.472^{*}	-4.399^{*}	-3.242^{**}	I (1)
Euro Area							
LnT	-2.291	-1.411	3.979	-2.751	-2.686^{***}	-1.793^{***}	I (1)
lnCO2	0.037	1.957	-1.510	-4.119^{*}	-3.146^{**}	-2.944^{*}	I (1)
lnGDP	-0.886	-2.759^{***}	3.335	-3.378^{***}	-2.963^{**}	-2.244^{**}	I (0)
lnGCF	-0.985	-2.332	1.211	-3.021	-2.585	-2.478^{**}	I (1)
LnLabor	0.459	-2.079	5.924	-3.669^{*}	-3.088^{**}	-3.298^{**}	I (1)
lnEnergy	-0.387	0.812	-0.887	-4.409^{*}	-3.576^{*}	-3.480^{*}	I (1)
Europe&Central Asia							
LnT	-2.454	-1.071	5.164	-3.037	-3.001^{**}	-1.871^{***}	I (1)
lnCO2	-1.803	-1.819	-0.454	-4.029^{**}	-4.047^{*}	-4.052^{*}	I (1)
lnGDP	-0.946	-1.952	4.915	-3.355^{***}	-3.160^{**}	-1.998^{**}	I (1)
lnGCF	-1.108	-1.664	2.179	-3.157	-2.995^{**}	-2.641^{*}	I (1)
LnLabor	-2.972	1.242	5.514	-3.081	-2.999^{**}	-1.573	I (1)
lnEnergy	-1.403	-1.691	0.096	-4.213^{*}	-4.166^{*}	-4.192^{*}	I (1)

	Statistics (Level)			Statistics (First Difference)			
	PP_T	PP_I	PP_N	PP_T	PP_I	PP_N	**C**
European Union							
LnT	-2.319	-1.016	4.204	-2.775	-2.806***	-1.801***	I (1)
lnCO2	-0.009	2.206	-1.929***	-4.061**	-3.486**	-3.182*	I (0)
lnGDP	-0.959	-2.693***	3.942	-3.369***	-2.943**	-2.053**	I (0)
lnGCF	-1.259	-2.330	1.529	-2.990	-2.712***	-2.535**	I (1)
lnLabor	-1.144	-0.620	6.753	-2.768	-2.715***	-1.210	I (1)
lnEnergy	-0.420	1.293	-1.203	-4.287*	-3.783*	-3.623*	I (1)
Heavily indebted poor countries (HIPC)							
LnT	-1.464	-0.390	6.752	-2.063	-5.074*	-3.491**	I (1)
lnCO2	-1.263	3.200	6.844	-3.429***	-4.538*	-1.114	I (1)
lnGDP	-1.088	2.629	16.835	-3.655**	-4.883*	-4.325*	I (1)
lnGCF	-1.799	-0.320	12.883	-3.448***	-3.479**	-1.290	I (1)
lnLabor	-1.426	4.029	138.444	-4.636*	-4.637*	0.786	I (1)
lnEnergy	-0.164	2.101	2.706	-2.919	-2.666***	-2.023**	I (1)
Latin America & Caribbean							
LnT	-1.735	0.600	3.877	-3.179***	-3.049**	-2.066**	I (1)
lnCO2	-2.866	-1.424	6.664	-3.863**	-3.832*	-2.370**	I (1)
lnGDP	-1.719	-0.140	6.669	-3.327***	-3.351**	-1.933***	I (1)
lnGCF	-1.616	-0.546	3.093	-3.131	-3.152**	-2.604*	I (1)
lnLabor	0.581	-5.480*	13.262	-3.279***	-1.742	-1.069	I (0)
lnEnergy	-1.762	-1.199	3.321	-3.110	-3.048**	-2.664*	I (1)
Least developed countries: UN classification							
LnT	-1.550	0.148	6.138	-2.907	-2.840***	-1.897***	I (1)
lnCO2	-2.861	1.704	8.977	-3.845**	-3.567*	-1.436	I (1)
lnGDP	-1.699	0.833	16.339	-3.135**	-4.065*	-0.538	I (1)
lnGCF	-0.732	-1.127	12.556	-2.657	-3.496**	-0.769	I (1)
LnLabor	-1.832	-2.849***	66.298	-1.549	-1.449	-0.325	I (0)
lnEnergy	-1.194	3.055	5.269	-3.992**	-3.413**	-2.067**	I (1)
Middle East & North Africa							
LnT	-0.897	-1.304	5.403	-4.230*	-4.223*	-2.943*	I (1)
lnCO2	-2.626	-0.093	6.103	-3.774**	-3.801*	-2.161**	I (1)
lnGDP	-1.463	-0.565	10.541	-3.384***	-3.385*	-1.389	I (1)
lnGCF	-0.532	-1.483	4.652	-4.392*	-5.226*	-2.338	I (1)
LnLabor	2.062	-2.213	15.870	-4.350*	-5.450*	-0.720	I (1)
lnEnergy	-2.183	0.994	5.471	-3.873**	-3.737*	-2.373**	I (1)
North America							
LnT	-1.083	0.248	2.130	-3.448***	-3.382**	-3.005*	I (1)
lnCO2	-1.960	-1.695	0.347	-3.522**	-3.280**	-3.292*	I (1)
lnGDP	-1.850	-3.104**	5.335	-2.694	-2.340	-1.140	I (0)
lnGCF	-2.186	-2.675***	2.092	-2.324	-2.327	-2.094**	I (0)
LnLabor	-1.370	-4.688*	6.779	-2.698	-1.827	-1.292	I (0)
lnEnergy	-1.920	0.039	-1.342	-3.466***	-3.445**	-3.378*	I (1)

	Statistics (Level)			Statistics (First Difference)			
	PP_T	PP_I	PP_N	PP_T	PP_I	PP_N	**C**
OECD members							
LnT	-1.964	-0.013	4.595	-3.065	-3.059**	-1.931***	I (1)
lnCO2	-1.464	-1.793	0.291	-4.007**	-3.581*	-3.616*	I (1)
lnGDP	-1.599	-2.634***	5.368	-3.310***	-2.963**	-1.843***	I (0)
lnGCF	-2.109	-2.267	2.097	-2.719	-2.733***	-2.473**	I (1)
lnLabor	-1.416	-1.775	14.923	-2.737	-2.536	-0.873	I (1)
lnEnergy	-1.536	0.228	-0.837	-4.088*	-3.680*	-3.600*	I (1)
Pacific island small states							
LnT	-1.925	-0.555	3.438	-3.634**	-3.661*	-2.993*	I (1)
lnCO2	-2.300	-1.356	1.359	-4.023**	-4.048*	-3.935*	I (1)
lnGDP	-1.819	1.058	6.517	-3.815**	-3.639*	-2.078**	I (1)
lnGCF	-	-	-	-	-	-	-
lnLabor	-1.441	1.334	20.798	-4.575*	-3.419**	-0.293	I (1)
lnEnergy	-2.426	-5.133*	-3.829*	-1.447	-1.440	-1.753***	I (0)
Small states							
LnT	-2.137	-0.511	6.238	-4.245*	-4.263*	-2.765*	I (1)
lnCO2	-1.942	0.170	5.631	-3.202***	-3.185**	-1.763***	I (1)
lnGDP	-1.461	-0.300	8.936	-5.553*	-4.569*	-3.083*	I (1)
lnGCF	-	-	-	-	-	-	-
lnLabor	-3.133	3.587	14.388	-3.368**	-4.721**	0.464	I (1)
lnEnergy	-2.507	0.455	7.063	-4.304**	-4.622*	-2.251	I (1)
South Asia							
LnT	-0.117	2.313	3.553	-4.988*	-3.346**	-1.470	I (1)
lnCO2	-1.172	0.957	8.588	-3.577**	-3.380**	-1.542	I (1)
lnGDP	-1.725	1.219	16.229	-3.175***	-3.058**	-0.701	I (1)
lnGCF	-1.615	-0.246	6.598	-2.828	-2.860***	-1.457	I (1)
LnLabor	-0.971	-2.460	7.015	-4.567*	-4.481*	-3.748**	I (1)
lnEnergy	-1.278	2.203	6.989	-3.583**	-3.139**	-1.359	I (1)
Sub-Saharan Africa							
LnT	-1.906	-1.294	5.376	-3.668**	-3.665*	-2.599*	I (1)
lnCO2	-1.879	-0.531	3.805	-3.699**	-3.722*	-2.928*	I (1)
lnGDP	-1.866	1.136	14.264	-5.596*	-5.418*	-4.680*	I (1)
lnGCF	-1.586	0.085	5.876	-2.865	-2.850***	-1.676***	I (1)
LnLabor	-0.230	4.094	154.636	-3.496**	-2.627***	0.362	I (1)
lnEnergy	-1.943	-1.192	0.381	-4.007**	-3.954*	-3.964*	I (1)
World							
LnT	-2.377	-0.417	6.553	-3.639**	-3.664*	-2.145**	I (1)
lnCO2	-1.831	0.006	6.136	-3.008	-3.040**	-1.740***	I (1)
lnGDP	-1.796	-1.098	10.261	-3.485**	-3.439**	-1.346	I (1)
lnGCF	-2.153	-1.317	3.355	-3.093**	-3.037**	-2.423**	I (1)
LnLabor	-0.418	-5.428*	15.825	-2.128	-1.284	-1.068	I (0)
lnEnergy	-2.115	0.235	3.411	-3.611**	-3.632*	-2.912*	I (1)

Notes: PP_T represents the model with trend and intercept; PP_I is the model with an intercept but without trend; PP_N is the model without intercept and trend. $^{*, **,}$ and *** denote the rejection of the null hypothesis at the 1, 5, and 10 percent levels respectively. Tests for unit roots were carried out in E-VIEWS 10.0.

In the next step, Tables 4.3 presents bounds F-test results, long-run estimations of equation (4.2), error correction terms (ECTs), and some diagnostic test results. All the estimations in Table 4.3 have been done under four model options proposed by Pesaran et al. (2001), which are models with (1) Case II: restricted intercepts and no trends, (2) Case III: unrestricted intercepts and no trends, (3) Case IV: unrestricted intercepts and restricted trends, and (4) unrestricted intercepts and unrestrictred trends. Table 4.3 shows that generally computed F-values in the case of groups and regions are statistically significant using various model options of Pesaran et al. (2001). Thus, the no level relationship of null hypothesis in equation (4.2) is strongly disapproved and its alternative level relationship is adopted revealing that equation (4.2) is a co-integrating or long-run model. Therefore, further steps for estimating long-term coefficients in equation (4.2) can be initiated.

Beta coefficients in equation (4.2) have been estimated by using the ARDL approach with five different model options and results are presented in Table 4.3. Additionally, the bounds F-statistics and long-run coefficient estimations, error correction terms (ECTs) from equation (4.3), and diagnostic tests' results have been also provided in Table 4.3.

Table 4.3: ARDL (Long Term Coefficients and Error Correction Terms)

	Low Income				**Lower – Middle Income**			
	Case II	Case III	Case IV	Case V	Case II	Case III	Case IV	Case V
Dep.var.: lnT								
Intercept	128.267*	-	-	-	-57.086*	-	-	-
Trend	-	-	1.122	-	-	-	0.027	-
lnGDP	2.276**	2.276**	6.137	6.137	-1.043***	-1.043***	-2.368***	-2.368***
lnGCF	-3.685**	-3.685**	-1.881	-1.881	0.954*	0.954*	1.520**	1.520**
lnLabor	-41.962*	-41.962*	152.779	152.779	3.841*	3.841*	1.289	1.289
lnCO2	1.440*	1.440*	1.287**	1.287**	-0.461	-0.461	-0.606	-0.606
lnEnergy	-	-	-	-	1.040	1.040	-0.633	-0.633
lnUrban	37.740*	37.740*	-	-	-	-	-	-
Lag Structure	2,1,1,1,0,4	2,1,1,1,0,4	2,1,1,1,4	2,1,1,1,4	2,2,2,1,2,2	2,2,2,1,2,2	2,2,2,1,2,4	2,2,2,1,2,4
Bounds F-Stat.	14.342*	15.823*	21.923*	23.285*	2.939	3.377***	3.461	3.934
Bounds t-Stat.	-	-5.980*	-	-2.236	-	-4.110***	-	-4.637**
Adj. R-Square	0.898	0.896	0.890	0.656	0.895	0.893	0.898	0.897
ECT_{t-1}	-0.147*	-0.147*	-0.068*	-0.068*	-0.141*	-0.141*	-0.187*	-0.187*
F-stat.	-	53.935*	50.518*	12.699*	-	57.682*	50.209*	45.832*
Durbin Watson	1.778	1.778	2.080	1.166	2.135	2.135	2.309	2.309
$\chi2$ (Ser. Corr.)	2.450	2.450	3.456	3.456	0.740	0.740	4.130	4.130

Note: *, **, and *** denote the rejection of the null hypothesis at the 1, 5, and 10 percent levels respectively. Numbers in brackets are t-ratios.

Table 4.3: ARDL (Continue)

	Low – Middle Income				**Middle Income**			
	Case II	Case III	Case IV	Case V	Case II	Case III	Case IV	Case V
Dep.var.: lnT								
Intercept	-53.400*	-	-	-	-56.562*	-	-	-
Trend	-	-	-0.031*	-	-	-	-0.026**	-
lnGDP	2.469*	2.469*	1.962*	1.962*	2.166*	2.166*	1.974*	1.974*
lnGCF	-	-	-	-	-	-	-	-
lnLabor	4.077*	4.077*	2.947*	2.947*	3.846*	3.846*	2.663*	2.663*
lnCO2	0.773**	0.773**	0.186	0.186	0.509	0.509	0.284	0.284
lnEnergy	-2.360*	-2.360*	-1.249*	-1.249*	-1.705**	-1.705**	-1.372**	-1.372**
lnUrban	-4.025*	-4.025*	2.437	2.437	-3.226*	-3.226*	2.006	2.006
Lag Structure	3,2,0,1,4,1	3,2,0,1,4,1	4,2,0,2,1,1	4,2,0,2,1,1	4,2,0,2,0,1	4,2,0,2,0,1	4,2,0,2,1,1	4,2,0,2,1,1
Bounds F-Stat.	6.814*	7.432*	18.531*	17.257*	5.245*	5.688*	18.332*	18.013*
Bounds t-Stat.	-	-4.842*	-	-5.554*	-	-5.023*	-	-5.499*
Adj. R-Square	0.880	0.878	0.887	0.885	0.876	0.874	0.881	0.879
ECT_{t-1}	-0.314*	-0.314*	-0.424*	-0.424*	-0.370*	-0.370*	-0.411*	-0.411*
F-stat.	-	48.732*	57.810*	51.707*	-	56.669*	54.705*	48.930*
Durbin Watson	2.126	2.126	1.998	1.998	1.915	1.915	2.017	2.017
$\chi2$ (Ser. Corr.)	1.618	1.618	0.157	0.157	0.423	0.423	0.371	0.371

Note: *, **, and *** denote the rejection of the null hypothesis at the 1, 5, and 10 percent levels respectively. Numbers in brackets are t-ratios.

Table 4.3: ARDL (Continue)

	Upper&Middle Income				High Income			
	Case II	Case III	Case IV	Case V	Case II	Case III	Case IV	Case V
Dep.var.: lnT								
Intercept	-54.616*	-	-	-	-8.648	-	-	-
Trend	-	-	0.054***	-	-	-	0.006**	-
lnGDP	-1.614*	-1.614*	1.403*	1.403*	0.977***	0.977***	-0.615	-0.615
lnGCF	-	-	-	-	0.629*	0.629*	1.001*	1.001*
lnLabor	1.868**	1.868**	6.191**	6.191**	0.221	0.221	0.395	0.395
lnCO2	-0.167	-0.167	-0.062	-0.062	-0.728	-0.728	-0.938	-0.938
lnEnergy	-0.737	-0.737	-0.467	-0.467	-1.568	-1.568	-0.425	-0.425
lnUrban	-0.304	-0.304	-11.060***	-11.060***	-	-	-	-
Lag Structure	2,4,2,2,0,1	2,4,2,2,0,1	2,4,2,2,0,1	2,4,2,2,0,1	2,4,2,1,2,0	2,4,2,1,2,0	2,4,1,1,1,0	2,4,1,1,1,0
Bounds F-Stat.	4.995*	5.696*	16.856*	19.610*	4.779*	5.486*	8.115*	7.407*
Bounds t-Stat.	-	-5.113*	-	-5.331*	-	-4.281**	-	-5.202*
Adj. R-Square	0.858	0.855	0.862	0.860	0.937	0.936	0.940	0.939
ECT_{t-1}	-0.207*	-0.207*	-0.247*	-0.247*	-0.174*	-0.174*	-0.178*	-0.178*
F-stat.	-	39.849*	42.157*	38.010*	-	96.738*	127.628*	113.087*
Durbin Watson	2.366	2.366	2.406	2.406	2.034	2.034	1.989	1.989
$\chi 2$ (Ser. Corr.)	13.964	13.964	12.479	12.479	0.385	0.385	0.431	0.431

Note: *, **, and *** denote the rejection of the null hypothesis at the 1, 5, and 10 percent levels respectively. Numbers in brackets are t-ratios.

Table 4.3: ARDL (Continue)

	Arab				Caribbean Small States			
	Case II	Case III	Case IV	Case V	Case II	Case III	Case IV	Case V
Dep.var.: lnT								
Intercept	-55.361*	-	-	-	-32.370*	-	-	-
Trend	-	-	0.001	-	-	-	-0.032*	-
lnGDP	-4.733*	-4.733*	-1.048**	-1.048**	0.446	0.446	0.936*	0.936*
lnGCF	1.559*	1.559*	0.284	0.284	-	-	-	-
lnLabor	-3.169*	-3.169*	0.572	0.572	2.890*	2.890*	10.914*	10.914*
lnCO2	0.798*	0.798*	0.357	0.357	-0.767**	-0.767**	-1.016*	-1.016*
lnenergy	-6.380*	-6.380*	2.070*	2.070*	0.185	0.185	0.100**	0.100**
lnUrban	13.549*	13.549*	-	-	-	-	-	-
Lag Structure	4,4,4,4,4,4,4	4,4,4,4,4,4,4	2,0,0,4,0,2	2,0,0,4,0,2	2,1,1,0,1	2,1,1,0,1	4,4,4,4,4	4,4,4,4,4
Bounds F-Stat.	4.870*	4.750**	3.234	3.758	137.150*	124.739*	16.987*	20.273*
Bounds t-Stat.	-	0.000	-	-4.087	-	-3.842***	-	-6.673*
Adj. R-Square	1.000	0.773	0.852	0.849	0.986	0.986	0.965	0.964
ECT_{t-1}	-7.246*	-7.246*	-0.269*	-0.269*	-0.056*	-0.056*	-0.324*	-0.324*
F-stat.	-	7.590*	41.391	36.026*	-	681.126*	66.628*	61.052*
Durbin Watson	1.142	2.387	2.071	2.071	1.991	1.991	2.769	2.742
$\chi 2$ (Ser. Corr.)	52.999	52.999	0.333	0.333	6.672	6.672	14.230	14.230

Note: *, ** and *** denote the rejection of the null hypothesis at the 1, 5, and 10 percent levels respectively. Numbers in brackets are t-ratios.

Table 4.3: ARDL (Continue)

	Central Europe & the Baltics				East Asia & Pacific			
	Case II	Case III	Case IV	Case V	Case II	Case III	Case IV	Case V
Dep.var.: lnT								
Intercept	325.571***	-	-	-	-84.785*	-	-	-
Trend	-	-	0.020**	-	-	-	0.004	-
lnGDP	-1.017	-1.017	-0.657	-0.657	0.982**	0.982**	0.885***	0.885***
lnGCF	-0.078	-0.078	-0.459	-0.459	-	-	-	-
lnLabor	2.082**	2.082**	-1.686	-1.686	4.388**	4.388**	5.028***	5.028***
lnCO2	0.630	0.630	3.608	3.608	-0.745**	-0.745**	-0.734**	-0.734**
lnEnergy	-0.148	-0.148	-3.103	-3.103	1.637*	1.637*	1.753**	1.753**
lnUrban	-18.853***	-18.853***	-0.844	-0.844	-0.886	-0.886	-1.709	-1.709
Lag Structure	2,2,1,1,1,2,0	2,2,1,1,1,2,0	2,2,1,1,2,1,0	2,2,1,1,2,1,0	3,1,1,2,3,2	3,1,1,2,3,2	3,1,1,2,3,2	3,1,1,2,3,2
Bounds F-Stat.	4.555*	5.182*	6.016*	6.640*	8.362*	9.737*	8.228*	9.424*
Bounds t-Stat.	-	-3.991	-	-3.546	-	-7.158*	-	-6.893*
Adj. R-Square	0.895	0.893	0.904	0.903	0.770	0.776	0.767	0.763
ECT_{t-1}	-0.098*	-0.098*	-0.083*	-0.083*	-0.467*	-0.467*	-0.463*	-0.463*
F-stat.	-	70.049*	79.281*	70.255*	-	20.995*	21.046*	19.109*
Durbin Watson	1.951	1.951	2.092	2.092	2.224	2.224	2.222	2.222
$\chi2$ (Ser. Corr.)	0.092	0.092	1.944	1.944	3.604	3.604	3.696	3.696

Note: *, **, and *** denote the rejection of the null hypothesis at the 1, 5, and 10 percent levels respectively. Numbers in brackets are t-ratios.

Table 4.3: ARDL (Continue)

	Euro Area				**Europe&Central Asia**			
	Case II	Case III	Case IV	Case V	Case II	Case III	Case IV	Case V
Dep.var.: lnT								
Intercept	3.546	-	-	-	106.535	-	-	-
Trend	-	-	0.012**	-	-	-	0.028**	-
lnGDP	1.331	1.331	-0.935	-0.935	-0.228	-0.228	-0.195	-0.195
lnGCF	0.216	0.216	1.078***	1.078***	3.178	3.178	-0.150	-0.150
lnLabor	-2.623	-2.623	-3.184	-3.184	-33.172	-33.172	4.096	4.096
lnCO2	-2.350**	-2.350**	-0.631	-0.631	-0.264	-0.264	5.855**	5.855**
lnEnergy	1.795	1.795	0.348	0.348	-5.196	-5.196	-7.349**	-7.349**
lnUrban	2.018	2.018	-0.673	-0.673	26.270	26.270	-16.112***	-16.112***
Lag Structure	2,2,2,4,1,2,2	2,2,2,4,1,2,2	3,2,2,4,1,2,2	3,2,2,4,1,2,2	4,0,2,1,1,1,4	4,0,2,1,1,1,4	2,0,2,1,2,1,0	2,0,2,1,2,1,0
Bounds F-Stat.	2.333	2.339	3.098	3.170	4.815*	5.415*	3.719***	3.456
Bounds t-Stat.	-	-1.866	-	-2.963	-	0.684	-	-1.987
Adj. R-Square	0.941	0.940	0.947	0.946	0.905	0.903	0.909	0.908
ECT_{t-1}	-0.094*	-0.094*	-0.160*	-0.160*	0.020*	0.020*	-0.071*	-0.071*
F-stat.	-	77.388*	82.241*	76.021*	-	49.869*	88.931*	77.775*
Durbin Watson	2.297	2.297	2.393	2.393	2.146	2.146	1.929	1.929
$\chi 2$ (Ser. Corr.)	7.322	7.322	17.451	17.451	2.367	2.367	0.229	0.229

Note: *, **, and *** denote the rejection of the null hypothesis at the 1, 5, and 10 percent levels respectively. Numbers in brackets are t-ratios.

Table 4.3: ARDL (Continue)

	European Union				**Heavily indebted poor countries (HIPC)**			
	Case II	Case III	Case IV	Case V	Case II	Case III	Case IV	Case V
Dep.var.: lnT								
Intercept	-140.575	-	-	-	-48.135**	-	-	-
Trend	-	-	0.006	-	-	-	-7.989	-
lnGDP	-2.643	-2.643	-3.268	-3.268	0.561	0.561	-27.118	-27.118
lnGCF	1.529	1.529	1.657	1.657	0.722**	0.722**	-	-
lnLabor	-17.353	-17.353	-15.198	-15.198	2.221	2.221	1,095.714	1,095.714
lnCO2	-0.709	-0.709	-0.062	-0.062	-1.037**	-1.037**	10.333	10.333
lnEnergy	0.899	0.899	0.354	0.354	0.141	0.141	-37.953	-37.953
lnUrban	27.118	27.118	22.001	22.001	-	-	-	-
Lag Structure	2,2,1,1,1,2,1	2,2,1,1,1,2,1	2,2,1,1,1,2,1	2,2,1,1,1,2,1	3,1,2,1,0,2	3,1,2,1,0,2	2,1,1,2,1	2,1,1,2,1
Bounds F-Stat.	5.273*	5.905*	35.799*	30.877*	3.364***	3.857***	26.765*	17.680*
Bounds t-Stat.	-	-1.695	-	-1.709	-	-2.969	-	-0.106
Adj. R-Square	0.935	0.934	0.934	0.933	0.928	0.927	0.861	0.788
ECT_{t-1}	-0.044*	-0.044*	-0.047*	-0.047*	-0.167*	-0.167*	-0.004*	-0.004*
F-stat.	-	105.831*	106.108*	94.955*	-	71.636*	46.215*	28.202*
Durbin Watson	1.776	1.776	1.779	1.779	2.188	2.188	1.996	1.797
$\chi 2$ (Ser. Corr.)	2.943	2.943	2.995	2.995	4.917	4.917	1.108	1.108

Note: *, **, and *** denote the rejection of the null hypothesis at the 1, 5, and 10 percent levels respectively. Numbers in brackets are t-ratios.

Table 4.3: ARDL (Continue)

	Latin America & Caribbean				Least developed countries: UN classification			
	Case II	Case III	Case IV	Case V	Case II	Case III	Case IV	Case V
Dep.var.: lnT								
Intercept	-27.345**	-	-	-	1.410	-	-	-
Trend	-	-	-0.008	-	-	-	3.157	-
lnGDP	2.046**	2.046**	2.114	2.114	1.415	1.415	-6.196	-6.196
lnGCF	-0.272	-0.272	-0.187	-0.187	-0.769	-0.769	-25.608	-25.608
lnLabor	2.538*	2.538*	0.564	0.564	-1.232	-1.232	-309.097	-309.097
lnCO2	0.519	0.519	-0.274	-0.274	2.156	2.156	-4.677	-4.677
lnEnergy	-1.372	-1.372	0.325	0.325	-1.013	-1.013	-89.561	-89.561
lnUrban	-2.743	-2.743	-	-	-	-	-	-
Lag Structure	2,2,1,1,1,1,1	2,2,1,1,1,1,1	2,2,1,1,1,1	2,2,1,1,1,1	2,2,1,0,2,2	2,2,1,0,2,2	2,2,1,0,1,3	2,2,1,0,1,3
Bounds F-Stat.	4.818*	5.442*	3.327	3.256	2.070	2.301	3.558	4.098***
Bounds t-Stat.	-	-5.059*	-	-3.856	-	-2.292	-	-0.310
Adj. R-Square	0.850	0.848	0.819	0.816	0.909	0.907	0.909	0.907
ECT_{t-1}	-0.148*	-0.148*	-0.141*	-0.141*	-0.058*	-0.058*	-0.009*	-0.009*
F-stat.	-	46.944*	43.001*	37.644*	-	60.618*	62.273*	54.827*
Durbin Watson	2.063	2.063	2.049	2.049	2.009	2.009	1.883	1.883
$\chi 2$ (Ser. Corr.)	0.555	0.555	0.175	0.175	0.709	0.709	2.179	2.179

Note: *, **, and *** denote the rejection of the null hypothesis at the 1, 5, and 10 percent levels respectively. Numbers in brackets are t-ratios.

Table 4.3: ARDL (Continue)

	Middle East & North Africa				**North America**			
	Case II	Case III	Case IV	Case V	Case II	Case III	Case IV	Case V
Dep.var.: lnT								
Intercept	-105.503**	-	-	-	-141.705**	-	-	-
Trend	-	-	0.124	-	-	-	-0.007	-
lnGDP	14.689***	14.689***	48.476	48.476	2.136	2.136	3.081	3.081
lnGCF	-0.372	-0.372	-1.514	-1.514	-1.151	-1.151	-1.349	-1.349
lnLabor	-8.909***	-8.909***	-56.582	-56.582	-7.587	-7.587	-8.463	-8.463
lnCO2	-16.013**	-16.013**	-48.669	-48.669	-6.678**	-6.678**	-7.275**	-7.275**
lnEnergy	14.773**	14.773**	48.927	48.927	11.515**	11.515**	11.722**	11.722**
lnUrban	-	-	-	-	14.046**	14.046**	15.989**	15.989**
Lag Structure	4,4,4,4,1,1	4,4,4,4,1,1	4,4,4,4,2,1	4,4,4,4,2,1	2,0,2,0,2,2,1	2,0,2,0,2,2,1	2,0,2,0,2,2,1	2,0,2,0,2,2,1
Bounds F-Stat.	10.682*	11.453*	15.348*	17.638*	4.336**	4.915**	4.257**	4.191***
Bounds t-Stat.	-	-2.462	-	-1.070	-	-3.187	-	-3.140
Adj. R-Square	0.901	0.898	0.929	0.927	0.904	0.903	0.903	0.902
ECT_{t-1}	-0.185*	-0.185*	-0.081*	-0.081*	-0.059*	-0.059*	-0.061*	-0.061*
F-stat.	-	26.630*	37.164*	34.236*	-	77.955*	78.171*	69.272*
Durbin Watson	1.463	1.463	1.510	1.510	2.051	2.051	2.063	2.063
$\chi 2$ (Ser. Corr.)	4.539	4.539	4.190	4.190	1.245	1.245	1.462	1.462

Note: *, **, and *** denote the rejection of the null hypothesis at the 1, 5, and 10 percent levels respectively. Numbers in brackets are t-ratios.

Table 4.3: ARDL (Continue)

	OECD members				**Pacific island small states**			
	Case II	Case III	Case IV	Case V	Case II	Case III	Case IV	Case V
Dep.var.: lnT								
Intercept	-20.253**	-	-	-	-6.202	-	-	-
Trend	-	-	0.000	-	-	-	0.037**	-
lnGDP	-0.433	-0.433	-0.550	-0.550	-0.612	-0.612	0.034	0.034
lnGCF	0.934*	0.934*	0.960*	0.960*	-	-	-	-
lnLabor	1.863**	1.863**	1.862**	1.862**	12.712	12.712	8.573**	8.573**
lnCO2	0.101	0.101	0.129	0.129	1.204	1.204	0.322	0.322
lnEnergy	-1.586**	-1.586**	-1.554**	-1.554**	-	-	-	-
lnUrban	-	-	-	-	-10.876	-10.876	-14.678**	-14.678**
Lag Structure	2,4,1,0,2,0	2,4,1,0,2,0	2,4,1,0,2,0	2,4,1,0,2,0	2,2,2,2	2,2,2,2	2,2,2,4	2,2,2,4
Bounds F-Stat.	5.522*	6.423*	5.417*	4.638**	2.961	3.553	5.137**	6.113**
Bounds t-Stat.	-	-5.148*	-	-4.505***	-	-1.828	-	-2.898
Adj. R-Square	0.924	0.923	0.923	0.922	0.855	0.853	0.873	0.871
ECT_{t-1}	-0.186*	-0.186*	-0.183*	-0.183*	-0.038*	-0.038*	-0.071*	-0.071*
F-stat.	-	97.940*	97.992*	86.793*	-	44.068*	42.307*	38.402
Durbin Watson	2.117	2.117	2.111	2.111	2.106	2.106	2.374	2.374
$\chi 2$ (Ser. Corr.)	1.155	1.155	1.156	1.156	2.611	2.611	9.854	9.854

Note: *, **, and *** denote the rejection of the null hypothesis at the 1, 5, and 10 percent levels respectively. Numbers in brackets are t-ratios.

Table 4.3: ARDL (Continue)

	Small states				South Asia			
	Case II	Case III	Case IV	Case V	Case II	Case III	Case IV	Case V
Dep.var.: lnT								
Intercept	-7.194**	-	-	-	26.090	-	-	-
Trend	-	-	0.017**	-	-	-	0.800	-
lnGDP	-1.025**	-1.025**	-0.526***	-0.526***	13.743	13.743	11.068	11.068
lnGCF	-	-	-	-	-2.961	-2.961	-2.228	-2.228
lnLabor	-2.659**	-2.659**	0.022	0.022	2.528	2.528	14.116	14.116
lnCO2	0.445**	0.445**	-0.008	-0.008	-0.265	-0.265	-1.373	-1.373
lnEnergy	-	-	-	-	-3.732	-3.732	1.750	1.750
lnUrban	5.358*	5.358*	0.207	0.207	-17.124***	-17.124***	-138.391	-138.391
Lag Structure	3,1,0,2,2	3,1,0,2,2	3,0,1,1,3	3,0,1,1,3	2,0,0,2,0,1,0	2,0,0,2,0,1,0	2,0,0,1,0,1,4	2,0,0,1,0,1,4
Bounds F-Stat.	5.858*	6.673*	7.640*	9.124*	3.070	3.456***	4.283**	4.377**
Bounds t-Stat.	-	-5.380*	-	-6.064*	-	-1.345	-	-0.856
Adj. R-Square	0.654	0.648	0.666	0.660	0.798	0.795	0.808	0.805
ECT_{t-1}	-0.354*	-0.354*	-0.396*	-0.396*	-0.069*	-0.069*	-0.057*	-0.057*
F-stat.	-	16.430*	17.997*	15.730*	-	58.529*	39.093*	34.206*
Durbin Watson	2.084	2.084	2.016	2.016	2.079	2.079	2.175	2.175
$\chi 2$ (Ser. Corr.)	1.122	1.122	0.448	0.448	1.083	1.083	3.235	3.235

Note: *, ** and *** denote the rejection of the null hypothesis at the 1, 5, and 10 percent levels respectively. Numbers in brackets are t-ratios.

Table 4.3: ARDL (Continue)

	Sub-Saharan Africa				**World**			
	Case II	Case III	Case IV	Case V	Case II	Case III	Case IV	Case V
Dep.var.: lnT								
Intercept	50.975	-	-	-	-12.207*	-	-	-
Trend	-	-	0.212*	-	-	-	0.019**	-
lnGDP	-3.316	-3.316	1.453	1.453	1.158	1.158	1.557**	1.557**
lnGCF	0.836**	0.836**	0.150	0.150	0.445	0.445	0.205	0.205
lnLabor	-6.445	-6.445	-7.590	-7.590	-2.188*	-2.188*	-1.095**	-1.095**
lnCO2	1.054**	1.054**	-0.761*	-0.761*	-0.485***	-0.485***	-0.274	-0.274
lnEnergy	0.302	0.302	1.823***	1.823***	0.573	0.573	0.491***	0.491***
lnUrban	7.570	7.570	-15.900*	-15.900*	1.564**	1.564**	-3.269	-3.269
Lag Structure	2,2,2,1,4,2,1	2,2,2,1,4,2,1	2,2,2,0,2,2,4	2,2,2,0,2,2,4	2,2,1,1,2,1,0	2,2,1,1,2,1,0	3,3,1,0,2,1,0	3,3,1,0,2,1,0
Bounds F-Stat.	3.159***	3.112	4.242**	4.818**	5.458*	6.210*	17.248*	17.109*
Bounds t-Stat.	-	-3.472	-	-5.161**	-	-5.909*	-	-6.357*
Adj. R-Square	0.814	0.811	0.841	0.839	0.933	0.932	0.936	0.935
ECT_{t-1}	-0.110*	-0.110*	-0.238*	-0.238*	-0.237*	-0.237*	-0.326*	-0.326*
F-stat.	-	23.099*	28.396*	26.046*	-	115.185*	109.347*	97.828*
Durbin Watson	2.266	2.266	2.396	2.396	2.253	2.253	2.083	2.083
$\chi 2$ (Ser. Corr.)	5.075	5.075	10.282	10.282	3.607	3.607	1.141	1.141

Note: *, **, and *** denote the rejection of the null hypothesis at the 1, 5, and 10 percent levels respectively. Numbers in brackets are t-ratios.

Firstly, ECTs in Table 4.3 are generally at low and moderate levels denoting that tourist flows around the world react towards long-run equilibrium path gradually through the straits of regressors in equation (4.1) including climate change proxy (CO_2 emissions). This suggests that regressors in equation (4.1) do not cause rapid movement in tourist flows towards long-term equilibrium levels.

Secondly, it is observed that climate change proxy, CO_2 emission, exert statistically significant effects but with mixed of positive and negative signs in some groups while in some others it does not. In low income countries, climate changes are positively linked to tourist flows while in the case of the other income groups climate changes do not significantly impact on tourist arrivals in the long-term period. When regions are considered, it is observed that in the cases of Arab countries, Europe & Central Asia, and Small States, the effects of emission levels on tourist flows are positively significant while in the cases of Caribbean Small States, East Asia & Pacific, Euro Area, Middle East & North Africa, North America, and Sub-Saharan Africa, these effects are negatively significant. In the cases of Central Europe & the Baltics, European Union, Latin America & Caribbean, Least Developed Countries, OECD Members, Pacific Islands Small States, and South Asia, no significant effects of climate changes on tourist flows have been found. It is important to note that major tourist destinations as ranked by World Tourism Organization (2009) are mainly from North America, Europe, and East Asia; therefore, negatively significant coefficients of climate change proxy with respect to tourist arrivals denote that increases in the emission levels in these regions generally result in declines in international tourist arrivals. However, general results in Table 4.3 about climate change – tourism nexus are of mixed findings and do not provide a unique concensus as per long-run estimations of equation (4.2) in this study.

4.5 Conclusion

This empirical research has investigated the impact of climate changes on international tourist arrivals around the world. Regional and income groups' data sets from World Bank (2019) have been used in order to investigate this nexus. Results from time series analyses support long-term effects of climate change as proxied by carbon dioxide emissions on tourist flows to among regions. However, as well as signs of coefficients are concerned, these effects are mixed of positive and negative effects. Thus, results of this study do not provide a concensus for the climate-chage and tourism nexus. Although Katircioglu et al. (2019) found that global warming around the world would increase foreign tourist arrivals to tourist island destinations, this study did not reach a unique concensus for this nexus. It it interesting to observe that tourist flows are negatively linked to climate changes in some regions such as East Asia & Pacific, Euro area, and North America where these regions include major tourist countries as ranked by World Tourism Organization (2009). This reveals that increases in pollution levels of these regions would results in declines in tourist arrivals. Hereby, we propose that further studies can be done for the cases of individual countries, mainly major tourist countries, for comparing with results of this study, due to the fact that this study did not reach a concensus for climate change and tourism nexus across continents and regions.

Chapter 5

ESTIMATING THE ROLE OF CLIMATE CHANGES ON INTERNATIONAL TOURIST FLOWS: EVIDENCE FROM MEDITERRANEAN ISLAND STATES

5.1 Introduction

Researchers have been investigating the links among energy consumption, environmental pollution, and economic growth for a long time; however, the links of environment quality and energy consumption within sectors of the economy catch less attention including tourism development. Also, international tourism has been examined in terms of growth of an engine in several countries (Katircioglu, 2009). Tourism development boosts both economy and other segments including energy capacity; however, it increases the level of pollution due to the expansion in touristic investments, tourist arrivals, and tourism-related economic activities (Katircioglu, 2014). Increases in tourism issues lead to rise in the demand for energy for diverse functions such as accommodation, catering, transportation and the administrative issues of tourist attractions (Becken, Frampton, & Simmons, 2001; Becken, Simmons, & Frampton, 2003; Gössling, 2002) and this may lead to environmental degradation (Xuchao, Priyadarsini, & Eang, 2010). It is also stated that hotels consume a great deal of energy in many countries (Xuchao et al., 2010).

Previous studies started to consider the effects of tourism on environmental pollution and/or climate change in the last decade. For example, Katircioglu (2014) examined the impacts of tourism growth in terms of climate change in Turkey and found that tourism growth yields increases in both energy use and climate change. Katircioglu et al. (2014) have also examined the impacts of tourism growth on energy consumption and climate change in Cyprus which is a tourist destination island in the Mediterranean, and have concluded that tourism development is a catalyst for rises in energy consumption and carbon emissions. Lee and Brahmasrene (2013) have searched the effects of tourism on economic growth and CO_2 emissions in European Union (EU) countries via panel data econometric procedures and have stated that tourism undergoes a highly negative influence on CO_2 emissions.

Again, previous studies have studied on the effects of tourism development on climate change as mentioned in the previous paragraphs; however, a new debate is available to search the effects of climate change or global warming on international tourist flows. Amelung et al. (2007), Maddison (2001), Scott & McBoyle (2001) argue that tourism is a climate-dependent industry while Dogru et al. (2019) suggest that this industry is highly vulnerable to climate changes. Atzori et al. (2018) using a quantitative survey find that tourists respond significantly to climate changes. On the other hand, small islands are attractive destinations for international tourists owing to warming in addition to distinctive characteristics of islands (Bicak et al., 2006). Millions of tourists visit tourist destinations mainly small islands as they terminate cold non-island countries during summer seasons. Thus, this article proposes a new research question if climate changes would significantly influence tourist arrivals to small island states (Javid & Katircioglu, 2017).

Against this backdrop in the current literature and unlike previous studies, this article studies on the effects of climate change on international tourist flows to three major Mediterranean Island States, namely Malta, Cyprus (North), and Cyprus (South). These three island states are major tourist destinations in the Mediterranean; Malta attracted about 2.274 million tourists in 2017 (World Bank, 2018) while Cyprus (North) attracted about 1.734 million tourists (SPO, 2018), and Cyprus (South) attracted about 3.652 million tourists (World Bank, 2018) respectively. The whole Cyprus Island attracted about 5.386 million tourists in 2017. On the other hand, as argued by Atzori et al. (2018), beach tourism is very sensitive to climate change; with this respect, small islands become attractive better than non-island states for such research nexus according to our argument. Thus, it would be interesting to search the role of climate changes on international tourist flows to these islands. Our research question is that climate changes significantly positively impact on tourist flows to small islands. In order to test the validity of this research question, this study is organized as followings:

This section of the thesis is organized as follows: Section 5.2 attempts to identify the theoretical setting of the current study; section 5.3 presents the data and methodology; section 5.4 displays the empirical results and discussion, and section 5.5 is the conclusion of the study.

5.2 Theoretical Setting

Tourism is proxied extensively by two measures which are (1) international tourist arrivals visiting and accommodating in the host countries, and (2) international tourism receipts (Perkov et al., 2016; Katircioglu, 2010; 2009; Munandar, 2017; Katircioglu et al., 2018a; 2018b). Thus, this study will use international tourist arrivals as a proxy for tourism volume based on data availability. On the other hand, climate change is mostly identified by carbon dioxide emissions (kt) (CO_2) in various studies in the relevant literature (Borhan & Ahmed, 2012; Kapusuzoglu, 2014; Anatasia, 2015; Kalayci & Koksal, 2015; Katircioglu & Katircioglu, 2018a; 2018b; Katircioglu et al., 2018c). Again in parallel to such studies this study will use CO2 emissions as a proxy of climate change. The main research question of this study is that climate change is likely to affect tourist flows to countries. It is here argued that climate levels in tourist destinations are significant determinants of tourist decisions for visiting targeted destinations. Therefore, volume of foreign visits to countries will be affected from these decisions owing to climate changes.

Literature studies have shown that energy consumption and income level of countries are drivers of carbon emission levels (Cetin & Ecevit, 2017; Ozcan & Ari, 2017; Istaiteyeh, 2016). Thus, overall energy consumption and gross domestic product (GDP) are also considered in the theoretical model construction of this study. Previous studies have also shown that capital and labor force of countries are significant determinants of not only income but also touristic investments in the countries (Turekulova et al., 2016; Bayram, 2007). So, capital and labor also have been augmented into theoretical modelling of current study. Finally, exchange rates are major determinants of international tourist flows and omitting this variable would lead to omitted variable problems and biased results in estimation (Katircioglu, 2009). Hence, the following modelling of climate change and tourism nexus is then proposed in the present study:

$$T_t = f\,(y^{\beta_1}, K^{\beta_2}, L^{\beta_3}, CO_{2t}^{\beta_4}, E_t^{\beta_5}, RER^{\beta_6}) \qquad (5.1)$$

where T stands for tourist arrivals, y is real income, K is capital, L is labor force, CO_2 is carbon dioxide emission (kt), E is overall energy consumption (kt of oil equivalent), and RER is real exchange rates. The symbols β_1, β_2, β_3, β_4, β_5, and β_6 are regression coefficients of regressors respectively.

Equation (5.1) can be revised in logarithmic formula in order to acquire growth effects in regression analyses (Sodeyfi & Katircioglu, 2016):

$$\ln T_t = \beta_0 + \beta_1 \ln y_t + \beta_2 \ln K_t + \beta_3 \ln L_t + \beta_4 \ln CO_{2t} + \beta_5 \ln E_t + \beta_6 \ln RER_t + \varepsilon_t \quad (5.2)$$

Where the terms "ln" stand for logarithmic base of series and ε is error term.

The econometrics theory states that regressed in equation (5.2) which is $\ln T_t$ will not react to its long-term equilibrium level after changes in its regressors (Katircioglu et al., 2017); hence, the speed of convergence between the short run and the long run levels of $\ln T_t$ should be then estimated via the following ECM:

$$\Delta \ln T_t = \beta_0 + \sum_{i=1}^{n} \beta_1 \Delta \ln T_{t-j} + \sum_{i=0}^{n} \beta_2 \Delta \ln y_{t-j} + \sum_{i=0}^{n} \beta_3 \Delta \ln K_{t-j} + \sum_{i=0}^{n} \beta_4 \Delta \ln L_{t-j}$$

$$+ \sum_{i=0}^{n} \beta_5 \Delta \ln CO_{2t-j} + \sum_{i=0}^{n} \beta_6 \Delta \ln E_{t-j} + \sum_{i=0}^{n} \beta_7 \Delta \ln RER_{t-j} + \beta_8 \varepsilon_{t-1} + u_t \quad (5.3)$$

Where Δ represents changes in series and ε_{t-1} is the one period lagged ECT, which is predicted from equation (5.2). The ECT in equation (5.3) then indicates how fast difference between the short-run and the long-run levels of $\ln T_t$ is disregarded each period. The supposed indicator of ECT is negative by theory (Karacaer & Kapusuzoglu, 2010).

5.3 Data and Methodology

5.3.1 Data

This article focused on three major small islands of the Mediterranean Sea with three different annual data sets and periods. Data for Malta ranges from 1970 to 2014, for Cyprus (North) from 1977 to 2014, and for Cyprus (South) from 1960 to 2014 which are all based on data availability from the related sources and databases. Tourist arrivals (T) to Malta has been gathered from Tourism Authority Service (2018) in Malta; tourist arrivals to Cyprus (North) have been gathered from State Planning Organization (2018) of Cyprus (North); and tourist arrivals to Cyprus (South) have been gathered from Statistical Service (2018) of Cyprus (South). Gross Domestic Product (y), gross fixed capital formation (K), and real exchange rates (RER) are at constant 2010 USD prices and have been gathered from World Bank (2018) for Malta and Cyprus (South) while they have been gathered from State Planning Organization (2018) for Cyprus (North). Finally, labor force (L) and overall energy consumption (E) have been gathered from World Bank (2018) (kt of oil equivalent) for Malta and Cyprus (South) while they have been gathered from State Planning Organization (2018) for Cyprus (North). It is important to mentioned that owing to data availability, energy variable of Cyprus (North) has been proxied by two series which are (1) overall electric consumption (kw/s) and (2) overall oil consumption (million tons).

5.3.2 Methodology

Prior to econometric estimations, unit root tests for stationary nature of series needs to be investigated. Therefore, Phillips-Perron (PP) (1988) unit root tests are adapted in this study with this respect. Expecting that regressors might be of mixed order of integration as a result of PP (1988) unit root tests, bounds tests for level relationships under the autoregressive distributed lag (ARDL) methodology which were developed by Pesaran et al. (2001) are adapted in the study. Bounds F-tests by Pesaran et al. (2001) suggest the null hypothesis of no level relationships in the proposed models (namely equation (5.2) in this study). Once level (long-term) relationships are obtained, then long-term (equation (5.2)) coefficients through the ARDL approach will be used to estimate in this study. Through this methodology, mixed order of integration for regressors will be allowed in equations (5.2) and (5.3) of the current study.

5.4 Results and Discussion

Results of PP (1988) unit root tests have been presented in Table 5.1. It is important to note that although the ARDL methodolgy allows for mixed order of integration in regressors in equation (5.2), if dependent variable are integrated of the first order, thenafter, bounds F-tests can be run for estimating long-term coefficients (Pesaran et al., 2001; Katircioglu, 2009). Table 5.1 shows that dependent variable, lnT, in equation (5.2) is non-stationary at level forms but becomes stationary at first differences for the selected islands (Malta, Cyprus (North), and Cyprus (South)). Thus, it is concluded that tourist arrivals to these island states are non-stationary and are integrated of order one, I (1). Among regressors, results in Table 5.1 reveal that $\ln CO_2$ for Cyprus (North) is integrated of order zero, I (0), while lnCO2, lnGDP, lnGCF, and lnE for Cyprus (South) are integrated again of order zero, I (0). The rest of series are non-stationary and I (1) according to PP (1988) unit root test results.

Table 5.1: Phillips-Perron Unit Root Tests

	Statistics (Level)			Statistics (First Difference)			
	PP_T	PP_I	PP_N	PP_T	PP_I	PP_N	Conclusion
Malta							
LnT	-1.426	-3.183**	1.915	-4.824*	-4.250*	-3.717*	I (1)
lnCO2	-2.584	-1.688	4.340	-22.539*	-9.604*	-7.628*	I (1)
Lny	-1.412	-2.069	4.556	-4.753*	-4.228*	-3.226**	I (1)
lnK	-3.142	-2.560	-0.451	NA	-1.936	-2.508**	I (1)
lnL	-1.143	-2.204	3.642	-2.382	-1.890	-1.993**	I (1)
lnE	-2.326	-1.516	3.007	-9.588*	-9.398*	-8.819*	I (1)
lnRER	-1.519	-2.521	-1.203	-3.030	-2.587	-2.600**	I (1)
Cyprus (North)							
LnT	-2.839	0.199	3.110	-5.117*	-5.145*	-4.259*	I (1)
lnCO2	-1.901	-3.501**	1.709	-13.557*	-9.300*	-8.558*	I (0)
lny	-2.713	-0.224	1.414	-4.437*	-4.440*	-4.227*	I (1)
lnK	-2.337	-0.686	1.005	-4.609*	-4.661*	-4.599*	I (1)
lnL	-2.422	-1.565	4.289	-5.606*	-5.625*	-4.129*	I (1)
lnElectric	-4.422*	-0.909	11.178	-8.339*	-8.650*	-3.341*	I (0)
lnPetrol	-1.915	-0.643	3.274	-3.788**	-3.877*	-3.478*	I (1)
lnRER	-2.715	-1.951	-0.255	-5.167*	-5.213*	-5.283*	I (1)
Cyprus (South)							
LnT	-2.335	-2.145	2.257	-13.448*	-9.892*	-8.779*	I (1)
lnCO2	0.771	-2.789***	2.680	-9.026*	-6.057*	-5.293*	I (0)
lny	-1.084	-5.055*	3.910	-5.369*	-3.902*	-3.345*	I (0)
lnK	-3.144	-3.942*	0.644	-6.716*	-6.247*	-6.324*	I (0)
lnL	0.837	-2.263	8.959	-3.797**	-3.085**	-1.068	I (1)
lnE	0.101	-3.131**	1.960	-8.078*	-5.293*	-4.934*	I (0)
lnRER	-2.253	-1.930	-0.512	-4.375*	-4.322*	-4.379*	I (1)

Notes: PP_T represents the model with trend and intercept; PP_I is the model with an intercept but without trend; PP_N is the model without intercept and trend. *, **, and *** denote the rejection of the null hypothesis at the 1, 5, and 10 percent levels respectively. Tests for unit roots were carried out in E-VIEWS 10.0.

In the next step, Tables 5.2 through 4 presents bounds F-tests results through the ARDL methodology for equation (5.2). It is clearly seen that there are computed F-values in the case of each island state which are statistically significant using model options from Pesaran et al. (2001). Thus, the no level relationship of null hypothesis in equation (5.2) is strongly disapproved and its alternative of a level relationship is adopted for Malta, Cyprus (North) and Cyprus (South). In this case, further steps for estimating long-term coefficients in equation (5.2) can be proceeded.

Table 5.2: The ARDL Long Term Coefficients and Error Correction Terms (Malta)

Dep.var.: lnTour	(1)	(2)	(3)	(4)
Intercept	18.061**	15.600**	18.916*	19.950**
	(3.690)	(2.606)	(4.436)	(3.196)
lny	-2.908**	1.032*	1.216*	1.341*
	(-3.286)	(7.955)	(15.319)	(6.747)
lnK	-2.862**	-0.378**	-0.570**	-0.672**
	(-3.006)	(-2.578)	(-3.724)	(-3.259)
lnL	-11.746**	-2.317**	-2.919*	-3.205**
	(-3.343)	(-3.334)	(-6.572)	(-3.556)
lnCO2		0.527*	-0.127	-0.382
		(5.130)	(-1.324)	(-1.367)
lnE			0.718*	0.947*
			(6.672)	(4.095)
lnRER				0.029
				(0.083)
Lag Order	0,3,3,3	3,2,1,2,1	2,1,2,2,0,1	2,1,2,2,2,2,2
Bounds F-Stat.	5.854c	5.457c	6.145c	6.789c
R-Square	0.851	0.965	0.976	0.989
ECT_{t-1}	-0.211*	-0.250*	-0.428*	-0.670*

Note: *, ** denote the rejection of the null hypothesis at the 1, and 5 percent levels respectively. Numbers in brackets are t-ratios. The term “c” stands for the case that bounds F-statistic is greater than F-III test statistic (with unrestricted intercept and no trend) from Pesaran et al. (2001).

Beta coeffficients in equation (5.2) have been estimated by using the ARDL approach that results are provided again in Tables 5.2 through 4 for each island state. Furthermore, error correction terms (ECTs) from equation (5.3) have been also provided in these tables. A total of four model options have been estimated which start from narrow model to the extended one by adding related regressors gradually. This is done to check consistency of regression results.

Firstly, in the case of Malta in Table 5.2, it is observed that the coefficient of carbon emissions ($lnCO_2$) is positively significant for tourist arrivals ($\beta = 0.527$, $p < 0.01$) in model option (2) when energy consumption and exchange rates are not added; however, this coefficient becomes insignificant in the later model options with extended regressors. Having a positively significant intercept in model option (2) in Table 5.2 supports the argument that with no change in regressors, tourist arrivals will continue to increase over time. The coefficients of capital and labor are usually and negatively significant in Table 5.2 denoting that downturn trend and volatility in capital and labor are not obstacles for tourist flows to Malta. The coeffcients of real income (GDP) are generally positively significant as expected. But, interestingly, Table 5.2 shows that real exchange rates do not exert statistically significant effects on tourist flows to Malta. The coefficients of ECTs are negatively significant and they tend to increase as more regressors are added into regressions. In model option (4), the ECT term is – 0.670 ($\beta = -0.670$, $p < 0.01$) revealing that tourist arrivals to Malta reacts toward long-run route by 67.0% speed of tuning (considerably high) yearly through the straits of regressors included in equation (5.2).

Table 5.3: The ARDL Long Term Coefficients and Error Correction Terms (North Cyprus)

Dep.var.: lnT	(1)	(2)	(3)	(4)	(5)
Intercept	-16.336**	45.532**	13.722***	36.463**	16.571
	(-3.123)	(2.850)	(1.713)	(3.403)	(1.638)
lny	0.557	-0.018	0.517	0.142	0.189
	(0.786)	(-0.045)	(1.148)	(0.338)	(0.414)
lnK	-0.017	-0.291	-0.656**	-0.920*	-0.650**
	(-0.028)	(-1.494)	(-2.047)	(-4.755)	(-2.602)
lnL	2.246*	-3.704**	-1.579	-4.946**	-1.746
	(3.768)	(-2.640)	(-1.646)	(-3.439)	(-1.229)
lnCO2		1.440*	0.707**	0.070	0.275
		(4.514)	(2.912)	(0.322)	(1.182)
lnElectric			1.827**	2.711*	2.339**
			(3.277)	(4.394)	(3.361)
lnPetroleum				1.564**	0.149
				(2.967)	(0.284)
lnRER					-0.676
					(-1.438)
Lag Order	2,2,0,0	2,2,0,0	2,0,3,2,0,3	2,3,3,3,3,3,3	2,2,2,2,2,2,2,0
Bounds F-Stat.	6.654c	6.776c	7.547c	7.045c	6.490c
R-Square	0.402	0.766	0.749	0.983	0.952
ECT_{t-1}	-0.240**	-0.697*	-0.625*	-0.592*	-0.672*

Note: $^{*,\ **}$ denote the rejection of the null hypothesis at the 1, and 5 percent levels respectively. Numbers in brackets are t-ratios. The term "c" stands for the case that bounds F-statistic is greater than F-III test statistic (with unrestricted intercept and no trend) from Pesaran et al. (2001).

Table 5.3 presents estimations of long term coefficients as well as ECTs for the case of Cyprus (North). Similiar to findings in the case of Malta, the coefficients of capital and labor are generally and negatively significant for tourist arrivals to Cyprus (North). The coefficients of $lnCO_2$ are positively significant denoting that tourist arrivals are not negatively influenced from the level of carbon emissions. Having positively significant intercept supports this finding again similiar to those in the case of Malta. Again, exchange rates in Cyprus (North) do not significantly impact on tourist arrivals. Having insignificant coefficients of real exchange rates in the cases of Malta and Cyprus (Northern) might be due to high import dependency (thus, irresponsiveness of economy to changes in exchange rates) and success in attracting international tourists no matter what level of exchange rates would be. The coefficients of ECTs are again negatively significant and considerably high similiar to those in the case of Malta.

Table 5.4: The ARDL Long Term Coefficients and Error Correction Terms (South Cyprus)

Dep.var.: lnTour	(1)	(2)	(3)	(4)
Intercept	9.077*	7.100**	3.516	4.770**
	(6.994)	(3.256)	(0.475)	(2.787)
lny	0.443**	0.665**	2.329**	-2.843**
	(2.766)	(2.593)	(2.446)	(-2.267)
lnK	-0.250*	-0.241*	-0.379*	0.053
	(-8.724)	(-8.209)	(-6.654)	(-0.630)
lnL	0.043	-0.120	-1.561	-0.288
	(0.211)	(-0.476)	(-1.257)	(-0.209)
lnCO2		0.153	1.313***	2.248**
		(-1.073)	(1.934)	(2.355)
lnE			0.442	-0.039
			(0.639)	(-0.102)
lnRER				2.415*
				(5.383)
Lag Order	3,0,2,2	3,0,2,20	2,2,2,1,1,1	0,2,2,2,1,2,2
Bounds F-Stat.	6.045c	5.997c	6.784c	7.065c
R-Square	0.929	0.936	0.944	0.992
ECT_{t-1}	-0.582*	-0.647*	-0.62*	-0.780*

Note: *, ** denote the rejection of the null hypothesis at the 1, and 5 percent levels respectively. Numbers in brackets are t-ratios. The term “c” stands for the case that bounds F-statistic is greater than F-III test statistic (with unrestricted intercept and no trend) from Pesaran et al. (2001).

Finally, Table 5.4 presents estimations of long-term coefficients and ECTs for the case of Cyprus (South). Results show that the coefficient of capital is generally negatively significant again; however, the coefficients of labor are not statistically significant. Similar to findings for Malta and Cyprus (North), the coefficients of $lnCO_2$ emissions are positively significant in general and again having positively significant intercept supports this finding again similiar to those in the cases of Malta and Cyprus (North). Unlike the findings in the cases of Malta and Cyprus (North), the coefficients of real exhange rates are positively significant for Cyprus (South) in model option (4) arguing that international prices are drivers for tourist arrivals. Similiar findings in Table 5.4 have been obtained for ECTs compared to those in Tables 5.2 and 5.3.

5.5 Conclusion

This empirical article has examined the role of climate changes on tourist arrivals in three major tourist destination island states in the Mediterranean, namely Malta, Cyprus (North) and Cyprus (South). Our findings support long-term positive effects of climate change as proxied by carbon dioxide emissions on tourist flows to these island states. This major finding reveals that global warming leads international tourists to visit small islands rather than non-island states. Thus, results of this study are not surprising with this respect. In this study, we propose that global warming around the world would increase foreign tourist arrivals to tourist island destinations; thus, island states are expected to adapt energy efficiency policies in tourist investments such as investing on green energy projects where this article also found that overall energy consumption exerts positive effects on tourist arrivals revaling that an expansion in traditional energy consumption will be positively associated with tourist flows. This way, expansion in tourist flows will not lead to pollution via energy consumption. Hereby, we propose that further studies can be done for the cases of non-island states for comparing with results of this study.

Chapter 6

CONCLUSION

6.1 Summary of Findings

This research study examined the effects of climate changes on international tourist flows by arguing that traveling decisions of tourists are significantly inluenced by climate changes in the destinations they visit. A global panel data has been constructed for the period, 1995-2014 which have been dissagregated into regions and income groups as ranked by World Bank (2019) for comparison purposes. The study has also been disaggregated into two emprical chapters where regional and income group panels have been compared in the first empirical chapter while small island states as sunny destinations have been considered in the second chapter. Climate changes have been proxied by changes in carbon dioxide emissions in parallel to large number of studies in the field (Katircioglu & Katircioglu, 2018a; 2018b; Kapusuzoglu, 2014; Anatasia, 2015; Kalayci & Koksal, 2015).

Tourism has been considered as a major contributor to carbon dioxide emissions development in any tourist nation. Likewise, greenhouse gas emission is one of the factors affecting climate change via carbon emissions (CO2), conducted within human actions. This supports Stern, (2006) claims that climate change has been regarded as a threat due to the biggest and largest failure of the world market. Thus the current study discussed the significance of carbon dioxide emissions and the effects of tourism development on climate change.

This study finds that climate changes significantly impact on tourist flows to many countries, regions, and even continents. However, in some rare ones climate changes do not significantly impact on tourist flows such as to Central Europe and the Baltics. The signs of coefficients are mixed of findings depending on the nature of statistical relationship between climate change and tourist arrivals. In the cases of small islands, it has been observed that climate changes positively impact on tourist arrivals to Cyprus and Malta as case countries. This major finding is quite reasonable that in such sunny island destinations, tourist decisions will not be negatively influenced from emission pollutants.

6.2 Policy Implications

Comprehending the effect of climate is significant to the design of efficient precautions for aimed markets. A more strategic use of climate-tourism “intelligence” may enhance the strength and efficiency of such precautions. In addition to indicating the interaction between climate and tourism will mostly yield useful outcomes for tourism operators and destinations because they are adapted to the changing global climate. As some tourists rarely search for a distinct climate or new experiences, more focus should be put on the impact of climate variation between home and destination in terms of tourism demand by tourism planners; hence, special climates being different and less comfortable than the climate of source region need to be pinpointed via promotional activities to catch the attention of aimed market departments. Actually, the term “comfortable climate” varies at a great rate because it is subjective due to the travel motivation of potential tourists.

This study finds that emission pollutants exert significant effects on tourist flows; these effects are mixed of signs of coefficients in regions and continents while they are positive in the selected small islands. International tourists visit small islands because of sun, beach tourism, and natural beauties regardless of considering environment quality; thus, such positive link between emission pollutants and tourist arrivals to small islands should not be surprising. However, finding a significant interaction among these two reveals messages to policy makers that emission pollutants need to be under control and traditional energy usages need to be replaced by alternative energies even in small islands. This is due to the fact that such islands are in the tropical regions, therefore take advantage of the solar energy to invest in alternative energy systems. In the cases of developed areas such as Central Europe, a significant relationship could not be obtained in this study revealing that tourist flows to these regions are totally independent from emission pollutants. Therefore, levels of emission pollutants in such regions will not matter for tourism sector and strategies for air pollution do not need to matter for tourism strategies.

6.3 Research Limitations and Further Directions

Major limitation of this study was data availability of tourist data since it is available from World Bank (2019) apart from only 1995 as annual dataset. Data was therefore transformed into quarterly figures in order to have more observations for getting reliable econometric results. This study has focused on the links between climate changes and tourist flows and argued that climate changes are significant drivers of tourist flows. Further researches may focus on the other alternative determinants of tourist flows other than those proposed in many tourism demand studies. This will shed light to tourism economics field at further stages.

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