

YEDITEPE UNIVERSITY
GRADUATE SCHOOL OF SOCIAL SCIENCES

**DETERMINANTS OF ENVIRONMENTAL QUALITY IN TURKEY
ON THE REGIONAL BASIS**



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REGIONAL BASIS

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DECLARATION OF ORIGINALITY

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ABSTRACT

DETERMINANTS OF ENVIRONMENTAL QUALITY IN TURKEY ON THE REGIONAL BASIS

This PhD thesis explores the intricate relationship between economic growth and environmental sustainability, emphasizing the indispensable role of the environment in sustaining economic activities in Turkey.

Central to the investigation is the Environmental Kuznets Curve (EKC) hypothesis, which posits an inverse U-shaped relationship between per capita income and environmental degradation. The study extends its focus to the Turkish context, bridging theory with empirical evidence and emphasizing the unique dynamics of the nation's international trade relations.

Empirical results highlight the phenomenon of carbon leakage, indicating that developed countries transfer pollution-intensive production to Turkey, while Turkey reciprocates in trade with certain regions. The lack of environmental policies in Turkey's economic relations raises critical implications for future research, emphasizing the need to scrutinize the impact of foreign trade on environmental degradation.

In conclusion, this research contributes to the ongoing discourse on sustainable development by providing a nuanced understanding of the interplay between economic growth and environmental stewardship. The research's novelty lies in its depth of analysis on specific variables and regional focus, offering practical insights for policymakers, scholars, and concerned citizens grappling with the challenge of balancing economic development with environmental responsibility.

Keywords: Environmental Kuznets Curve, Carbon leakage, Environmental Policies

ÖZET

TÜRKİYE'DE BÖLGESEL TEMELDE ÇEVRE KALİTESİNİN BELİRLEYİCİLERİ

Bu doktora tezi, ekonomik büyüme ile çevresel sürdürülebilirlik arasındaki karmaşık ilişkiyi keşfetmekte ve Türkiye'deki ekonomik faaliyetlerin sürdürülmesinde ile çevrenin kalitesinin vazgeçilmez rolüne vurgu yapmaktadır.

Araştırmanın merkezinde, kişi başına gelir ile çevresel bozulma arasında ters U şeklinde bir ilişki öne süren Çevresel Kuznets Eğrisi (EKC) hipotezi bulunmaktadır. Çalışma, odak noktası olarak Türkiye'yi alarak, teoriyi deneysel kanıtlarla birleştirir ve ülkenin uluslararası ticaret ilişkilerinin dinamiklerinin önemini belirtmektedir.

Deneysel sonuçlar, gelişmiş ülkelerin, kirliliği yoğun üretimi Türkiye'ye aktardığını, Türkiye'nin ise belirli bölgelerle ticaretinde benzer bir şekilde karşılık verdiğini gösteren karbon sızıntısı olgusunu vurgular. Türkiye'nin ekonomik ilişkilerinde çevresel politika eksikliği, gelecekteki araştırmalar için kritik sonuçlar doğurur ve dış ticaretin çevresel bozulmaya etkisini inceleme ihtiyacını vurgular.

Sonuç olarak, bu araştırma, ekonomik büyüme ile çevresel sorumluluk arasındaki dengeleme zorluğuyla mücadele eden politika yapıcılar, bilim insanları ve ilgili vatandaşlar için pratik içgörüler sunan, sürdürülebilir kalkınma konusundaki devam eden tartışmalara nuanslı bir anlayış sağlamaktadır. Araştırmanın literatüre katkısı, bazı ekonomik değişkenlerin derinlemesine analizi ve bölgesel ticaret ile çevre kalitesi arasındaki ilişkiye odaklanmasıdır.

Anahtar Kelimeler: Çevresel Kuznets Eğrisi, Karbon sızıntısı, Çevresel politikalar

DEDICATION

To my esteemed spiritual guide, Shams Tabrizi,

Your wisdom has illuminated my path, shaping not only my academic journey but also the essence of who I am as a scholar. Through your guidance, I have learned to embrace the pursuit of knowledge with a profound passion. This thesis is a testament to the lessons you have imparted and the inspiration you have provided. With heartfelt gratitude for your transformative influence on my academic life.

I would like to cite number 12 of your 40 rules of love, which has changed my life:

“There are more fake gurus and false teachers in this world than the number of stars in the visible universe. Do not confuse power-driven, self-centered people with true mentors. A genuine spiritual master will not direct your attention to himself or herself and will not expect absolute obedience or utter admiration from you, but instead will help you to appreciate and admire your inner self. True mentors are as transparent as glass. They let the light of God pass through them.”

In reverence,

Osman Altuğ Çakmur

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1. INTRODUCTION

In economic activities of countries, environment is unavoidably a significant part of production processes for continuously providing the needed raw materials and other inputs. At the end of production and particularly during the consumption stage however, resulting wastes often have a massive harming impact on the environment. Indeed, some wastes that cannot be recycled lead to environmental pollution, while others can be recycled and brought back for re-usage in production. Environmental degradation, in turn, negatively affects all economic activities, since the two are irreversibly intertwined. As a matter of fact, the interdependence between environment in general and economy stems from the fact that economic activities can only be sustained by producing (and selling) commodities using raw materials offered by the environment. Thus, it is undebatable that the environment is the fundamental component of economic prosperity (Ulucak and Erdem, 2014: 80).

In this context, one can clearly observe an affinitive and reciprocal relationship between the increasingly important environmental problems and the economy. The reciprocity results from the fact that rapidly increasing economic activities coming along with extensive manufacturing lead to grave environmental issues, which in turn, harm or cease economic development. In other words, while economic development increases environmental pollution, this pollution adds to both the economic and social costs of economic development (Keleş, 1997: 127).

Starting with the Industrial Revolution, mass production has brought in an ever-growing use of resources for more production. This increase in production leads to growing income levels, further contributing to consumerism — at the cost of environmental issues. Among these issues triggered by excessive production and consumption is the depletion of the ozone layer, the global climate change, erosion, diminishing fresh water resources and the overall air pollution (Bayraktutan and Uçak, 2011: 18).

The relationship between environment and economy is often marked by the development level of a country. In that, developed countries are observed to lay more

emphasis on solving environmental problems with a number of proposed solutions such as investment and technology policies with remedial actions. To cover the costs of environmental damage, public administrations in these countries can easily demand financial self-sacrifice from producers and consumers, while underdeveloped and developing countries are often observed to ignore environmental issues (Akyıldız, 2008: 35).

Defined by many as globalization taking over local control, capitalism is surely a system running on the exploitation of natural resources and trivialization of environmental rules in a way that does not interfere with the world trade. From this perspective, developing countries have accepted neoliberal economic policies in the hope of increased economic growth and welfare. Such neoliberal economic policies include removing non-tariff barriers, lowering tariff rates and reducing subsidies provided to exporters. Thanks to free trade, industrial companies can migrate to places with looser environmental legislation or prevent the imposition of stricter rules by using the threat of migration. In addition to regulations regarding the environment, manufacturers also consider labor cost, easy access to markets, as well as social and political conditions and infrastructural opportunities when deciding on the location to produce (Akboşancı, 2006: 4-5). However, free trade with such a wide range of motion has caused an increase in global environmental pollution and resource consumption.

In this vein, developing countries are seen to apply industrial activities leading to high levels of pollution in their industrialization process, and they conventionally lack any comparative advantage in their industrial production. Nevertheless, consumers in developed countries around the world have been demanding clean environment practices and environmental legislations. Such demands, in turn, have increased the costs for “dirty industries”. On the other hand, the so-called dirty industries tend to migrate from developed to developing countries today due to the relatively low environmental awareness of consumers and inadequate environmental regulations in these developing countries. Scholars explain and refer to this situation by the “Pollution Shelter Hypothesis” (Akboşancı et al., 2006: 3, Akyıldız, 2008: 156). According to the pollution shelter hypothesis, central economies transfer their industrial wastes — leading to environmental

pollution and posing a risk to nature — to peripheral economies together with the units that produce by ineffective production technologies.

Additionally, it can be observed that manufacturers in developed countries are face to face with increasing production costs due to strict environmental policies, while company owners in developing prioritize increasing profits and growth in their economic decision-making processes. At the cost of environmental damage, their goal is to sustain economic growth. In this context, manufacturers in dirty industries of developed countries have been shifting their activities to developing countries where environmental standards are relatively low, with the aim to avoid the costs resulting from high environmental standards. On the other hand, developing countries offer low environmental standards since they need all kinds of industrial activities due to the lack of high profits, as well as low environmental awareness and sensitivity and poorly defined property rights (Akyıldız, 2008: 157).

Based on these developments, economists have been studying the increasing effects of economic growth on the environment since the 1990s, when globalization gained momentum. This study will particularly dwell upon the Environmental Kuznets Curve in an attempt to explore the systematic relationship between per capita income and environmental pollution. Accordingly, scholars adopting this approach indicate that there is an “inverse U”-shaped relationship between environmental pollution and per capita income. In his study in 1955, Simon Kuznets explained the relationship between unfair distribution of income and per capita income. Due to the similarity between this relationship referred to in this study and the one between environmental pollution and per capita income, scholars attributed the name “Environmental Kuznets Curve” in an attempt to explain it (Saatçi and Dumrul, 2011: 67).

To elaborate, the Environmental Kuznets Curve (EKC) explains the hypothetical relationship between deterioration of environmental conditions and per capita income level. In this line, the theory assumes that quality of life first deteriorates due to environmental pollution, however, it later improves along with the increasing per capita income. In other words, while environmental pollution tends to aggravate at the initial stages of industrialization, improving economic development later triggers a decrease in

this degradation according to the Environmental Kuznets Curve hypothesis (Akyıldız, 2008: 142-143).

Some suggest that the increasing trend of environmental pollution drives back after a certain threshold value with the impact of increased environmental awareness coming along with economic growth. In this context, scholars accept per capita income and economic growth rates as the basic components of the Environmental Kuznets Curve. Also, as mentioned before, the relationship between per capita income and environmental pollution is explained to be in the form of an inverse U due to three fundamental effects: the scale effect, the structural effect and the technology effect. The scale effect is associated with the increasing Environmental Kuznets Curve, while the structural and technology effects are explained by the decreasing Environmental Kuznets Curve. For a deeper understanding of these three effects, it would be more than useful to refer to an example: if a country applies policies to increase its foreign and domestic trade by means of various investments in industrialization, the resulting output will tend to increase environmental degradation. This incrementing trend is explained as the scale effect. On the other hand, if that country fails to meet its energy need to sustain industrialization and growing trade volumes through efficient mechanisms, then they will face a level of environmental pollution that no longer benefits their economic growth. In this case, the resulting economic gains will only be proportional to the level of environmental pollution. Thus, they will need environmental regulations for alleviation, which corresponds to the decreasing curve, or, in other words, the structural effect on the Environmental Kuznets Curve. Finally, the technology effect on the curve refers to further improvement in the environmental conditions by the help of foreign investments in environmentally-friendly products and services (triggered by increased environmental awareness), explaining the increasing trend on the Kuznets Curve (Saraç and Yağlıkara, 2017: 256).

From a historical perspective, it can easily be assumed that industrial pollution was not an issue in pre-industrial societies, since their per capita income was low and their industrial activities were limited to agriculture only. Therefore, the economic activities of those societies were not adversely affected by environmental issues. In this context, the Environmental Kuznets Curve could only gain validity with the overarching transition to industrial societies (Yandle et al., 2004: 3). When the industrial sector gained a larger share

from the economy, environmental pollution revealed as a threat as production and economy of scale continued to grow along with the use of a plethora of natural resources to meet the increasing consumption needs. The increased production volumes, in turn, started to have a colossal negative impact on environment. As a response, though, economic structures have started to change all over the world with the impact of economic development. The world has witnessed a transition from the industrial to the services sector, where there is less use of natural resources. This has been accompanied by the tendency to use clean technologies, information processes and transition to service-oriented economic activities as part of a more advanced stage of industrialization in an attempt to reduce environmental pollution. These developments, thus, are well-associated with the technology effect explained above, in reference to the decreasing trend of the Environmental Kuznets Curve. In this regard, countries are observed to have been increasing their R&D investments in the field of environmental improvement as their welfare and technology infrastructure continue to advance (Saatçi and Dumrul, 2011: 69; Akbostancı et al., 2006: 4; Başar and Temurlenk, 2007: 3).

Merchandise trading between countries can have both positive and negative effects on carbon emissions, depending on various factors such as transportation methods, production practices, and overall supply chain management. On one hand, merchandise trading can potentially reduce carbon emissions by promoting the international trade of goods and services. This can allow countries to specialize in producing goods or services with lower carbon footprints, thus reducing emissions related to the production of those goods or services in other countries. For example, if a country with abundant renewable energy resources exports clean energy to another country that relies heavily on fossil fuels for its energy production, it could potentially reduce the overall carbon emissions of both countries. Moreover, trading can enable countries to access goods and services from other countries more efficiently, reducing the need for resource-intensive domestic production that may result in higher emissions. For instance, importing goods from a country with advanced and energy-efficient manufacturing processes may result in lower emissions compared to producing the same goods domestically in a country with less efficient production methods. On the other hand, merchandise trading can also lead to increased carbon emissions, particularly when long-distance transportation methods such as shipping

or air freight are used. The transportation of goods across long distances can contribute significantly to greenhouse gas emissions, particularly if the transportation is reliant on fossil fuels. Additionally, when countries trade goods with different environmental regulations, it can lead to a phenomenon called "carbon leakage," where production shifts to countries with less strict environmental regulations, resulting in increased emissions in those countries.

To effectively reduce carbon emissions through merchandise trading, it is important to consider and manage the various factors involved, including transportation methods, production practices, and supply chain management. Implementing measures such as promoting renewable energy in transportation, improving energy efficiency in production processes, and enforcing environmental regulations can help mitigate the negative impacts of merchandise trading on carbon emissions and contribute to more sustainable international trade practices. Additionally, incorporating carbon accounting and emissions, reduction targets into international trade agreements and policies can further incentivize countries to reduce emissions associated with merchandise trading.

Limited evidence suggests that merchandise trading can reduce carbon emissions directly. However, some studies have indicated that certain types of merchandise trading, such as e-commerce and circular economy models, could potentially reduce emissions indirectly by improving supply chain efficiency and reducing waste. For example, a report by the Ellen MacArthur Foundation suggests that circular economy principles, which prioritize the use of renewable resources and the minimization of waste, could lead to significant reductions in greenhouse gas emissions (Ellen MacArthur Foundation, 2019). Similarly, a study by the Carbon Trust found that e-commerce can be more carbon-efficient than traditional retailing, particularly in terms of last-mile delivery (Carbon Trust, 2021). However, it is important to note that the overall impact of merchandise trading on carbon emissions is complex and depends on a range of factors, including the types of goods being traded, the modes of transportation used, and the energy sources powering production and delivery. In many cases, the carbon emissions associated with merchandise trading may offset any potential benefits, particularly if transportation is a significant factor. In summary, while merchandise trading may have the potential to reduce carbon emissions indirectly through improved supply chain efficiency and circular economy

models, it is unlikely to have a significant impact on emissions reduction without broader changes in production and consumption patterns.

Carbon leakage refers to the phenomenon where a reduction in greenhouse gas (GHG) emissions in one country or region is offset by an increase in GHG emissions in another country or region, due to changes in production and consumption patterns resulting from climate policies, such as carbon taxes or emissions trading schemes. This occurs when firms in countries or regions with more stringent climate policies face higher costs of production and/or reduced demand for their products, leading them to shift production to countries or regions with weaker or no climate policies, where production costs are lower. The result is that the overall reduction in GHG emissions achieved by the climate policy is reduced or even negated, as the increased emissions from the countries or regions where production has shifted offset the emissions reductions achieved in the countries or regions where the climate policy was implemented. This is particularly likely to occur in energy-intensive, trade-exposed sectors, such as steel, cement, and aluminum production, where production costs are more sensitive to energy price changes and firms face greater international competition.

Carbon leakage can have several negative implications for climate policy effectiveness, such as reducing the incentive for countries or regions to implement ambitious climate policies and slowing down the transition to a low-carbon economy. It can also lead to unfair competition between firms and countries or regions, where firms in countries or regions with weaker climate policies gain a competitive advantage over firms in countries or regions with stronger climate policies. Various measures have been proposed to address carbon leakage, such as border carbon adjustments, which impose a carbon price on imported goods based on the carbon intensity of their production. This can help level the playing field between domestic and foreign firms, and incentivize countries or regions to implement stronger climate policies. Other measures include promoting international cooperation and harmonization of climate policies, as well as improving the energy efficiency and competitiveness of energy-intensive, trade-exposed sectors. Carbon leakage is a well-documented phenomenon in the academic literature on climate policy. It refers to the displacement of emissions from countries or regions with stricter climate policies to countries or regions with weaker or no policies, leading to a net increase in

global emissions (Böhringer & Rutherford, 2008; Fischer & Fox, 2012; Paulus & Böhringer, 2014). The phenomenon is particularly relevant for energy-intensive, trade-exposed sectors, such as steel, cement, and aluminum production, where firms face high production costs and strong international competition (Böhringer & Carbone, 2016; Jotzo & Mazouz, 2019). In these sectors, higher energy prices resulting from climate policies can lead to production shifting to countries or regions with lower energy prices and weaker climate policies, resulting in increased emissions in those countries or regions (Keller et al., 2017). Carbon leakage can have several negative implications for climate policy effectiveness, such as reducing the incentive for countries or regions to implement ambitious climate policies, and slowing down the transition to a low-carbon economy (Fischer & Fox, 2012; McGlade et al., 2018). It can also lead to unfair competition between firms and countries or regions, where firms in countries or regions with weaker climate policies gain a competitive advantage over firms in countries or regions with stronger climate policies (Jotzo & Mazouz, 2019). Various measures have been proposed to address carbon leakage, such as border carbon adjustments, which impose a carbon price on imported goods based on the carbon intensity of their production (Gersbach et al., 2017; Paulus & Böhringer, 2014). Other measures include promoting international cooperation and harmonization of climate policies, as well as improving the energy efficiency and competitiveness of energy-intensive, trade-exposed sectors (Böhringer & Carbone, 2016; Fischer & Fox, 2012).

This study aims to answer the question of whether the merchandise trading of Turkey with various regions has an impact on the country's carbon emissions by gathering empirical evidence. The phenomenon of Carbon Leakage is tried to be observed to understand if Turkey is leaking carbon to other regions and/or is being leaked from those regions. The empirical study is based on the EKC theory and the model is designed to test the relationship between carbon emissions of Turkey and merchandise trading of Turkey on the regional basis.

2. THE ENVIRONMENTAL KUZNETS CURVE (EKC)

This chapter explores the fundamental characteristics of the Environmental Kuznets Curve — a tool designed to demonstrate the relations between economic growth, in terms of per capita income, and environmental degradation. First introducing the concept with an acknowledged definition and information on its historical background, this chapter further features the transformation of the concept over time. In that, it is important to note here why and how the concept of EKC emerged and how it has been altered by the impact of changing economic and environmental conditions.

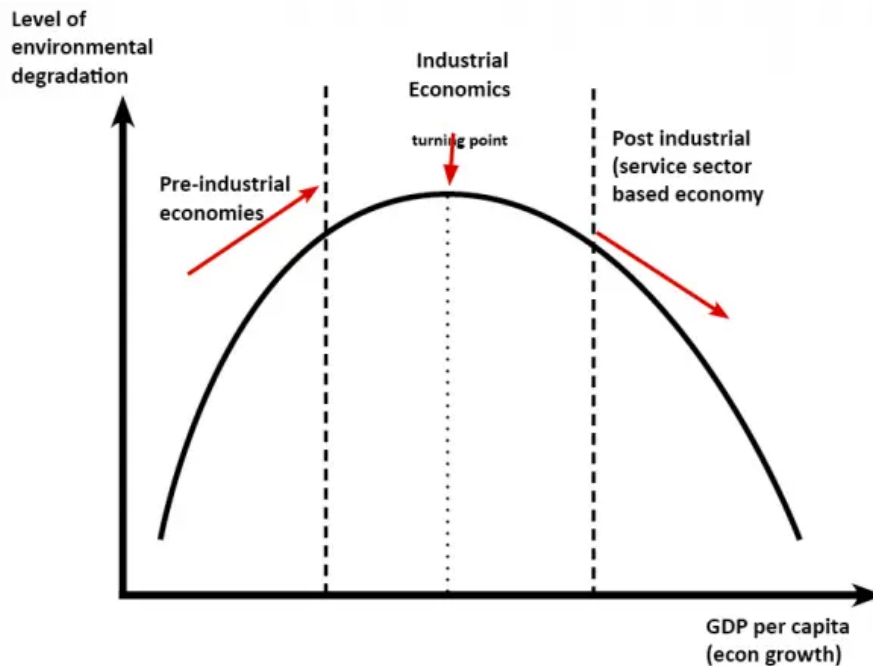
2.1 Introduction

The world has been witnessing an increased interest in the relationship between economic development and environmental quality due to the ongoing environmental deterioration seen practically everywhere. While this has become an issue of concern, societies have adopted extensive efforts to understand the causes of environmental degradation. Moreover, a growing number of economists have been dwelling upon the effects of economic growth on environment as their research topic starting from the 1990s. The common point these studies refer to is that while the pressure on environment is higher in the early stages of economic growth, it later decreases by the effect of higher income levels and greater environmental awareness. This systematic relationship between per capita income and environmental pollution is expressed by the EKC hypothesis suggesting that there is an inverse U-relationship between environmental pollution and per capita income (Suri and Chapman, 1998; Panayotou, 2000; Hill and Magnani, 2002; Raymond, 2004; Dinda, 2004; Shi, 2004; Yavapolkul, 2005; Zachariadis, 2007; Müller-Fürstenberger and Wagner, 2007; Song et al., 2008). The Kuznets curve (Kuznets, 1955) shows that the higher the per capita income, the greater the income distribution inequality. However, the income distribution inequality will decrease with the perpetual increase in per capita income (Raymond, 2004: 327; Song et al., 2008: 381; Akbostancı et al., 2009: 861).

In this context, the Environmental Kuznets Curve (EKC) can be defined as a movement pattern used to explain the relationship between changing economic conditions and environmental degradation. More specifically, scholars assume that increasing income levels also increase environmental pollution, however this situation goes into reverse over time. Thus, it can be argued that economic growth is a prerequisite for environmental improvement. In other words, growth can be expressed as a powerful way to improve the environmental quality of Economic and Monetary Unions, or EMUs. Furthermore, the view that economic growth is ultimately beneficial for environment is supported by the movement pattern in the EKC curve, and it is claimed that there is a relationship between environmental quality and economic growth (Dinda, 2004: 432).

2.2 History of the Environmental Kuznets Curve

In his elaborative analysis, Simon Kuznets (1955) pointed out to the relationship between income distribution and economic growth, reporting that economic growth first leads to increasing income per capital, while income inequality starts to reveal in the first phase of economic development. After a certain threshold, though, Kuznets suggested that income inequality begins to decline also by the effect of continued economic growth. This relationship is defined by the “Inverse U” or “Bell Curve” hypothesis and the curve demonstrating the relationship between income distribution and income level is expressed by the Kuznets Curve approach.

Figure 1*The Environmental Kuznets Curve*

Note. (Chiriluş & Costea 2022)

As seen in the figure 1 above, in the early 90's, environmental and energy affairs became of principal note in the economic growth field in international platforms due to the effects of environmental problems including global warming, air pollution, increasing use of natural resources and growing carbon dioxide emissions. Due to the effect of those environmental issues, the Kuznets Curve approach was adapted to environmental measures in the 90's and reconsidered established on the relationship between per capita income and environmental quality.

In this adaptation, economists demonstrated that during economic growth, environmental pollution first increases and then decreases, thus leading to an inverse U-shaped relationship between per capita income and pollution level (Grossman and Krueger; 1991, 1995; Shafik, 1994; Panayotou, 1993), and this relationship is referred to as the Environmental Kuznets Curve (EKC) hypothesis in the literature of economy. Since economic development initially leads to pollution and later ensures a certain level of

reduction in this environmental pollution according to the Environmental Kuznets Curve Approach (Stern, 2004), the final result of the EKC approach is that economic growth is not an environmental problem, on the contrary, economic growth positively affects environment.

A study by Grossman and Krueger (1991), a milestone in explaining the relationships in the EKC (Carson, 2010: 7), demonstrates the previously mentioned scale, structural and technological effects. In this context, it is suggested that a greater number of resources, inputs and energy are used in the early stages of economic growth in a given country as production activities grow day by day. Consequently, greater production with the consumption of vast amounts of energy and inputs will lead to more waste and pollutant emissions. This will ultimately deteriorate environmental quality (Torras and Boyce, 1998; Dinda, 2004; Prieur, 2009). Expressed as the scale effect, this situation emerges in the early stages of the economic growth process. As elaborated earlier in this study, though, the structural effect will reveal when the given country's economy undergoes a structural transformation process accompanied by a positive impact of economic growth on the environment. *Ipsa facto*, structural economic changes and increasing income levels will contribute to adding more of economic activities with less environmental harm to production chains. The final phase of this structural transformation is the transition from the energy-intensive industry to the technology-intensive service and information industries. As a matter of fact, since technology-intensive industries need less and less natural resources, their contribution to environmental pollution is also considered minimum (Tsurumi and Managi, 2010: 20). As can be remembered, the last effect on the EKC is the technology effect emerging in the economic growth process. This effect can be explained by the efforts of countries having higher incomes and profits to allocate more resources to R&D, thus replacing the old and dirty technologies with new and clean technologies and increasing their environmental quality (Copelan and Taylor, 2003).

2.3 Conceptual Background of the Environmental Kuznets Curve

In the 1950s, Simon Kuznets first propounded the Kuznets Curve hypothesis in an attempt to explore the relationship between inequality and income. When it came to 1999, Grossman and Krueger adapted this hypothesis to apply to environmental issues. According to this later version, the Environmental Kuznets Curve (EKC), economic growth initially leads to more inequality in a society, however, such a high level of inequality starts to decrease over time as economy further improves (Grossman & Krueger, 1999). In this regard, Grossman and Krueger argued that this pattern is also applicable to environmental effects (Figure 1). Thus, they suggested that environmental pollution first increases along with GDP to a certain extent. After income levels reach a certain point, though, this pollution and environmental damage are well-expected to follow a declining trend. Hence, it can be interpreted that economic growth is actually a solution to environmental degradation according to this approach. Besides, scholars assume that increasing environmental pollution in the early stage of economic growth accompanied by a higher share of GDP is not a surprise at all. Indeed, economic growth absolutely brings about greater production resulting in more and more wastes with environmental damage. Considering the later stages of economic growth, however, one can easily assume that environmental degradation will decrease over time thanks to increasing incomes and foreign trade volumes. Additionally, many countries are observed to use foreign trade to export their environmental wastes, too.

In the light of these assumptions, an increasing number of studies have recently focused on the EKC hypothesis, linking economy to environment. In the extant literature, some studies are particularly considered references for early environmental policies and among them is a research study claiming that the world's natural resources are limited and some are non-renewable (Agras & Chapman, 1999). Furthermore, it was found here that economic growth would ultimately lead to the deterioration of environmental pollution. As opposed to this idea, however, the prevailing view today is that economic growth will ultimately lead to a better environment, or at least, will not worsen environmental pollution across the world below par based on the assumption that environmental issues will be alleviated after a certain threshold of income increase (Dinda, 2004).

In line with these equations, it would be useful to first elaborate on the negative effects of economic growth on environment before lapsing into improving environmental conditions at the later stages of economic boom. From this perspective, Bilginoğlu (1989) stated that the contradiction between environmental and economic growth stems from three main reasons: first is that the economic development of developing countries is largely based on industrialization. The second reason is the dilemma regarding whether to spend already scarce resources on environmental management or on economic growth. The third reason, on the other hand, is that European Monetary Union (EMU) countries are still at the early stages of industrialization or the ones, which has these stages slowly, making it difficult for these countries to notices there is a problem with environmental degradation. Moreover, these countries seem to fail in understanding the importance of environmental protection.

Another important contradiction between economic growth and environment results from energy policies. Indeed, many significant environmental damages occur due to the excessive production, consumption and energy expenditures, while the environmental damage costs do not reflect the energy prices of the goods or the sources. Debates over the excessive use of energy are common in energy, environmental and ecological economics. While the literature on energy and environmental economics suggests that the impact of excessive use of energy on environment can be determined by a monetary value, studies on ecological economy reject the idea of measuring environmental impacts by any monetary value (Sweeney, 2000: 20).

In the same vein, it can be noted that the most important environmental impact is related to the emissions of greenhouse gases into the atmosphere resulting from the combustion of primary fossil fuels. Three major primary fossil fuels are coal, oil and natural gas. During the combustion of these fuels, carbon combines with oxygen and CO_2 , and the primary greenhouse gas is produced. CO_2 accumulates in the atmosphere and starts to build an adverse effect on the world climate, while also causing biodiversity losses, increased tropical storm intensity and hikes in ocean levels and global warming (Sweeney, 2000: 20).

In an attempt to comprehend how industrialization is associated with these serious environmental damages, it is of note to refer to the EKC. In this regard, economists generally agree on three factors that are effective in explaining the mechanisms behind the EKC hypothesis, or in other words, why the relationship between per capita income and environmental pollution follows an inverse U-shape. These factors are the scale effect, structural effect and technology effect, as elaborated previously in this study (Shi, 2004: 7; Ang, 2007: 4773). It is critical to remember that the increasing portion of the EKC is associated with the scale effect, while the structural and technology effects are used to explain the decreasing portion.

The scale effect correlates with the growth in economies supported by increased production scale, use of higher amounts of natural resources and generating more wastes and emissions. Accordingly, escalating production leads to a greater consumption of natural resources as inputs or raw materials, ending up with the destruction of environment or environmental degradation (Awesome and Temurlenk, 2007: 2). In addition, the use of inefficient technologies and neglecting the environmental dimensions of economic growth may well contribute to increasing environmental pollution (Yandle et al., 2004: 3).

Here, one turning point in the nexus between environment and economic progress is industrialization. In actual fact, it is known that economic activities were limited to farming only prior to industrialization. Therefore, environmental hazard was limited, if none at all. Hence, the EKC hypothesis became relevant along with the transition to industrial societies (Yandle et al., 2004: 3). With the continuation of economic growth, another transition took place: from industrial to the service and information sectors, requiring less of natural resources. Thus, the world has been witnessing a certain level of decrease in environmental degradation and pollution (Başar et Temurlenk, 2007: 2-3; Song et al, 2008: 383). In this context, as economic growth continues and life expectancies increase, a clean environment becomes more valuable for society in terms of improving the quality of clean water and air. Besides, individuals can choose how they spend their income in order to achieve this goal. In the advanced stage of industrialization, the use of clean technologies, the change in the information process and the shift to service-based activities are combined with the desire to improve environmental quality and increase the ability to economically grow (Yandle et al., 2004: 3).

As mentioned before, the technology effect is used to define the decreasing portion of the EKC. This effect is associated with an increase in a country's funds allocated to research and development activities, triggered by a higher level of national prosperity. As a consequence of technological developments, new and eco-friendly technologies replace old and pollution-emitting technologies, and environmental quality starts to increase (Awesome and Temurlenk, 2007: 3). Meanwhile, the structural effect emerges in a longer term, as economic development causes the economic production system to change from low-pollutive farming activities to highly-pollutive industries, and back to low-pollutive services (De Bruyn, 1997).

The extent to which these effects will prevail depends on the incentives provided by authorities of economy and policy-makers (Stern, 2004). In the fast-growing countries largely populated by individuals having middle income level, the scale effect that increases pollution prevails as such countries continue their efforts to catch up with technological developments of the world. Nevertheless, high-income economies often have low growth rates, where the technology effect is more dominant than the scale effect (Akbostancı et al., 2009: 862).

With detailed analyses of the said three effects, it can be observed that the number of studies on the validity of the Environmental Kuznets Curve Approach has increased significantly in recent years. These studies discuss the types of environmental pollution (carbon dioxide, nitrogen oxide, sulfur dioxide particulate matter, carbon, dissolved oxygen, phosphorus and nitrogen values related to water pollution, deforestation, etc.) and different models (logarithmic, log-linear, cubic, quadratic) within the framework of various periods and countries.

As mentioned before, the first pioneering study on the relationship between environmental quality and economic belongs to Grossmann and Krueger (1991). This study investigates the relationship between air quality and economic growth for 42 NAFTA countries by cross-sectional analysis between the years of 1977 and 1988. Sulfur dioxide (SO₂) and particulate matter (PM) values were used as indicators of air quality. "The study further found an inverse U-shaped relationship between environment and income levels. In addition, Grossman and Krueger (1995) examined the relationship

between water quality and per capita income as well as air quality by expanding the scope of their first study.” They used 14 different variables (arsenic, cadmium, nitrate, lead, coliform, etc.) as indicators of pollution in the study covering different country groups and different time periods. As a result of the study, the inverse U shape was found to be valid for 5 variables, while an N shape was obtained for 6 of the 14 variables, some as part of the Macroinvertebrate Community Index (MCI) — the indices used for measuring water quality.

In another study examining the Environmental Kuznets Curve Approach within the framework of air pollution, Selden and Song (1994) elaborated on the relationship between economic development and air pollution, applying the panel data method for 30 countries categorized as low, middle, and high income countries. The periods covered in this study were the years between 1973-1975, 1979-1981 and 1982-1984, respectively. SO₂, PM, NOX (nitrous oxide) and CO (carbon monoxide) values were taken into consideration as pollutants, and the EKC relationship was evaluated for all indicators. Similarly, Panayotou (1997) used SO₂ as an indicator of pollution in his study covering 30 countries between the years of 1982 and 1994. In parallel to former analyses, an inverse U-shaped EKC relationship was found as an empirical result of this study as well.

Apart from the pollutant gases causing air pollution, there are also other studies in the literature taking CO₂ (carbon dioxide) emission values as an indicator of pollution. In fact, this gas is a global pollutant and a major source of global warming and climate change. According to Denhez (2007), the share of CO₂ in the greenhouse gases causing global warming is around 60%. For this reason, numerous studies analyzed the Environmental Kuznets Approach within the framework of the CO₂ gas. For instance, Moomaw and Unruh (1997) considered CO₂ as an indicator of pollution in their studies analyzing 16 countries for the period between 1950 and 1992. By using the panel data method, they explored the relationship between CO₂ and per capita income and found an N-shaped relationship. In another study, Dijkgraaf and Vollebergh (2005) examined the relationship between CO₂ and per capita income in OECD countries for the period between 1960 and 1997. They also benefited from the panel data method in practice. Consequently, the results of the study supported the existence of the EKC relationship for CO₂ emission in the sample countries. In another important study, Ang (2007) examined the EKC

relationship within the framework of income, energy use, and CO₂ emissions in France for a term, which is between 1960 and 2000. The findings of this study supported the existence of the EKC relationship as well. Furthermore, the author suggested that the addition of energy data in the analysis would be even more satisfactory in understanding the resulting EKC. “In a similar manner, Shahbaz et al. (2012) tested the relationship between CO₂, per capita income, energy consumption and openness in Pakistan for the years between 1971-2009.” In this study, they benefited from the boundary test approach (ARDL) and causality analysis as the preferred methodology. They concluded that there was a long-term relationship between those variables and supported the EKC relationship.

Nonetheless, other studies analyzing the Environmental Kuznets Approach within the framework of CO₂ gas are observed to have failed in supporting the said EKC relationship. A study by He and Richard (2010), for instance, could not support the EKC relationship in the analyses of CO₂ emission data between 1948 and 2004 for Canada. In another study, Agras and Chapman (1999) used the panel data method to analyze 34 countries between 1971 and 1989, and found no support for the EKC relationship, either. Similarly, Fodha and Zaghoud (2010) tested the validity of the EKC approach in Tunisia for the period between 1961 and 2004, using the methods of cointegration and causality analysis. Here, they found no EKC relationship, while discovering a linear relationship between per capita income and CO₂.

From this perspective, the results of the empirical model applied in the present study, as briefly manifested in this chapter, can be observed to show similarities with the results of some previous studies referenced here. Indeed, the conclusion reached regarding the shape of the Environmental Kuznets Curve within the scope of the empirical model is similar to that of Grossman and Krueger (1991), Torras and Boyce (1998), Barrett and Graddy (2000), and Arı and Zeren (2011), despite the differences between the country groups considered. In addition, the threshold value (approximately \$3,600) that Arı and Zeren calculated for Mediterranean countries is close to the threshold value obtained in our study. As emphasized before, the results obtained in various studies differ according to the time period and the country group chosen for analysis as part of both the EKC and MCI indices. Some studies, in the literature, for instance, analyzed specifically the “BRICS Countries” or, in other words, Brazil, Russia, India, China, and South Africa —

categorized as first emerging market economies — based on different parametric bonds, while this current study will particularly ponder the Turkish case within the framework of the Environmental Kuznets Curve theory.

For the sake of brevity, this chapter of the study first introduced the concept of the Kuznets Curve, further detailed the concept as the Environmental Kuznets Curve, and then elaborated on how this concept emerged and changed over time. Followed by these analyses, this chapter featured a deep discussion on the effects of the EKC on environment based on the variables of the given model. In this respect, it was suggested that the interdependence between environment and economy stems from the fact that environment and nature are the sources of raw materials for production cycles across industries, as well as directly being one of the basic elements of economic prosperity. In this context, globalization has brought about mass production requiring a greater use of raw materials. By nature of economic development, income and consumption levels increase significantly, while leading to the rise of environmental problems.

Thus, the Environmental Kuznets Curve approach was taken as basis in this chapter to explicate the hypothetical relationship between per capita income and environmental degradation, where the quality of life initially worsens on account of environmental degradation and then improves.

After putting forward those theoretical analyses, the literature review in this chapter also consolidated the idea that increasing per capita income first leads to augmenting environmental pollution, yet the level of pollution later starts to abate in parallel with the development level of a given country. As set forth in the literature review part of this chapter, some studies demonstrated that the EKC takes the “N” shape based on the long-term regression coefficients estimated within the scope of the panel data analysis. Moreover, it was seen that studies on the validity of the Environmental Kuznets Curve reveal distinct results depending on the type of pollutant emissions analyzed. Besides, some used different empirical models in analyzing various time frames and countries, and these differences affected both the shape and the turning points of the Environmental Kuznets Curve. However, the common denominator found in most studies is that environmental pollution tends to expand in an economic structure where the industrial sector has a greater share, since flourishing economies of scale and the unremitting production and consumption trends negatively affect the environment. Over time, on the

other hand, it is claimed that economic structure transforms by the effect of economic development, and peaks with the transition from the industrial to the services sector, where there is less use of natural resources compared to the industrial sector. Thus, in the developed stages of industrialization, environmental pollution decreases thanks to the use of environment friendly technologies, changing information processes, the transition to service-oriented economic activities and policies to improve environment. Based on these assumptions, the following chapter of the study will provide an in-depth analysis of foreign trade relations for the case of Turkey in an effort to provide a holistic background before delving into the application of the Environmental Kuznets Curve to Turkey.



3. INTERNATIONAL TRADE OF TURKEY

Mainly focusing on Turkey's trade relations with foreign countries, this chapter starts with an overview of the concept of foreign trade followed by an inquiry on the country's position in the international trade market. The postliminary analysis is a summary of the historical evolution of Turkey's trade relations in two different periods (before and after 1923) with a glimpse of its macroeconomic dynamics. In that, this chapter is essential for providing a holistic view of Turkey's trade relations before evaluating the trade variables to the EKC model.

3.1 Introduction

Foreign capital investments often arise from the acquisition of a company by a foreigner in a country, providing the founding capital for a newly established company or the purchase of the assets of an existing company in the financial market of a foreign country. Consequently, foreign capital appears as direct foreign investment in real markets and indirect foreign investment in financial markets. This chapter first defines the phenomenon and various types of foreign capital investments, and then analyzes the historical development of foreign capital (as direct and indirect foreign capital) from the Ottoman Empire Era to the present day by using secondary data and statistical figures.

In this regard, definitions of foreign capital investments have evolved into different dimensions over time. However, the commonly-accepted definition is that foreign capital investments are made by foreign investors through acquiring a company or part of its shares, providing founding capital for a new company to be set up in a country different than that of the investor or increasing the capital rate of an existing company in the destination country. Foreign investors, thus, bring technology, know-how on corporate management as well as their control authority via their business transactions to the receiving country. In the same vein, some categorize foreign capital as private, official and

direct foreign capital (Profit and Land, 2003: 47–48). Private foreign capital includes investments made by private foreign entrepreneurs in a country to generate more profit, interest and income. On the other hand, official capital investments include capital which is generally directed by developed countries or by the World Bank, IMF (International Monetary Fund), and European Investment Bank to the economies of less developed countries. Finally, direct foreign capital is more in line with our definition of foreign capital, meaning the straightforward flow of capital among countries through business.

Today, it seems that most scholars agree on the distinction between direct and indirect foreign capital: indirect investments are mostly portfolio investments. In other words, foreign investors buy deposits, stocks or bonds in the financial market of another country with their financial assets, while direct investments refer to the purchase of a plant, company, business, etc., i.e. a physical property, in a country away from the investors' home country.

For their advantages, foreign capital investments compose the most preferred method to use in financial markets, and developed countries see foreign capital investments as a way of using their savings. On the other hand, developing countries expect benefits from these investments to accelerate their technological development and to ensure additional capital flow. From this perspective, it can be observed when analyzing the international distribution of foreign capital investments in 2006 that developed countries have a larger weight in terms of both investors and host countries (Undersecretariat of Treasury, 2007).

For the case of Turkey, it may well be purported that the country has strong trade relations with both the European Union (EU) — even though it is not a part of the EU — and the WTO (World Trade Organization). For that matter, Turkey is the 6th ranking partner for EU imports and also the 6th largest partner for EU exports according to Eurostat data (EUROSTAT, 2023). Among Turkey's major exporting partners are the USA, United Arab Emirates, Russia, Iraq, and Iran. Machinery and transport equipment are among the primary Turkish exports. On the other hand, the main imports of Turkey usually come from the EU countries as well as China, Russia, the USA, South Korea, and Iran, while the major imports are chemical products, machinery and transport materials (OEC, 2023).

3.2 Historical Evolution of International Trade in Turkey before 1923

The year 1923 is critical in the evaluation of Turkey's history of foreign trade, since it marks the foundation of the Republic of Turkey, bringing along many different policies to manage international trade. From this perspective, it is essential to first have a glimpse of foreign trade activities prior to the Republic, namely the Ottoman Era, in order to fully understand the long course of international trade in Turkish lands. In that regard, foreign capital first entered our country during the Ottoman Empire by the impact of economic policies and the Ottoman pursuit of financial assets. Indeed, this entry of foreign capital to the Ottoman lands came late, while accumulation of wealth was the dominant policy in the West well before the 1840s (Geyikdağı & Geyikdağı, 2011: 375-376). Ottomans could only open up to the outer world for foreign investments by the effect of more and more international treaties.

Although some might argue that foreign capital flows in Turkish economy have a short history of 50 years, when the experiences of the Ottoman Empire are taken into consideration, one can easily associate the history of Turkish foreign capital flows with a 167-year time frame (Olgu, 2013: 75). Indeed, the beginning of foreign capital inflow to the Ottoman Empire dates back to the 1838 Trade Agreement, and British companies took the first initiatives to construct railways in the Ottoman lands as early as 1856 (Ağır & Artunç, 2021: 714). In this context, it would be meaningful to first refer to the historical developments of foreign capital in the final period of the Ottoman Empire in this chapter, and then to synthesize them with the latest developments in modern Turkey, explained in the next chapter.

Until the 19th century, the Ottoman Empire had been fond of solving its financial problems through domestic assets. More specifically, Ottoman rulers preferred to make changes in their taxation system — by increasing taxes — to address the lack of financial assets. Taxes were first collected based on prison records. With the new counts (dividend counts) made after 1839 (especially 1844), authorities started to collect increasing taxes from a wider segment of the society. In the 19th century and especially from 1840 onwards,

the Ottoman Empire opened its doors to foreign capital, a method today referred to as outsourcing (İnalçık, 1996: 9; Güran, 1997: 9–10). As a matter of fact, the Ottoman Empire was under heavy pressure from the European states in the fields of military, politics and economy throughout the 19th century. The Western pressure on the Ottomans grew day by day due to the geostrategic location of the Ottoman lands as a bridge between the West and the East, as well as market opportunities on a vast land. Furthermore, the Ottomans were unable to process their potential raw materials for production chains (Karluk, 1996: 535). That poor financial position, therefore, prevented the Ottomans from resisting the Western pressure.

From the 1840's ahead, European plutocrats and various statesmen began to put pressure on the central Ottoman bureaucracy to applying policies for accepting foreign debt as a solution to the financial turmoil of the Empire. Subsequently, the Ottoman Empire obtained its first foreign capital through the sale of short-term bonds to French banks by Galata Bankers in the 1840s in order to create additional assets (Pamuk, 1997: 187–188).

Besides the purchase of bonds in the Ottoman Empire, European capital started to be influential in the fields of investment in the 1850s. European investors wishing to invest in the Ottoman Empire demanded concessions from the Ottoman government, and upon attaining the concessions, they began to organize by establishing joint-stock companies (Pamuk, 1997: 192). As a result of that organization, or mobilization (more accurately), some British companies made the first attempts to construct railways in both Anatolia and Rumelia in 1856. The first concessions to England were granted with the Constanta-Chernova (66 km) line and Izmir-Aydin (131 km) line (Kütükoğlu, 1992: 124). In fact, 68% of the foreign capital investments in the Ottoman Empire were invested in the construction of those railways, excluding foreign debts. On the other hand, banking, insurance and ports, water and gas companies were shifted to municipal services (Kepenek and Yenturk, 2001: 11). The remaining 10% of the foreign capital from foreign debt was invested in production sites such as mining, agriculture and industry. As it can be understood, the foreign capital in the Ottoman Empire included not only investments to increase production capacity but also to conduct infrastructural works aimed at paying off foreign debts and expanding foreign trade (Pamuk, 1997: 193).

Yet, the Ottoman Public Debt Administration referred to as the “*Düyun-u Umumiye Osmaniye*” was established by the Muharrem Decree in 1881 due to the difficulties in paying off foreign debts. This agreement reduced the amounts of foreign debts through increased interest rates and rearranged the payment terms. After the foundation of the public debt administration, it can be said that foreigners completed their mobilization in the 1850s and started to operate in the Ottoman territory in today’s sense. The administration took over the management of a salt production plant, and a multicultural administration funded by the Ottoman Bank, Credit Anstalt (Austria) and S. Bleichröder (Germany) took the monopoly of the tobacco business. Over time, the Ottoman Bank dominated the operation of Eregli Coal mines, Damascus-Hama, Izmir-Kasaba, Thessaloniki-Istanbul railways, Istanbul and Beirut port operations, and Istanbul electricity, water and tramway operations thanks to the British and French capital. In 1888, Germany entered the Baghdad railway project through Deutsche Bank and in 1889, the company founded the Anatolian Ottoman Company named Turkish Company. The United States requested the right to operate oil and mineral resources within 40 km of lanes on both sides of the line in order to bring the railway to Eastern Anatolia by means of the Chester Project (Karluk, 1996: 535–536).

In terms of return, on the other hand, bank and insurance investments ranked first in foreign capital investments with 10.8%; government borrowing ranked second with 8.7% and investments in industry ranked third with 8.6%. It is noteworthy here that public borrowings as a source of foreign capital reached a significant level during those times. In other words, government debts and foreign capital investments were the most attractive and most profitable businesses for the Ottoman Empire given the conditions of the period. That openness and foreign capital policies continued until the Republican period (Grigoriadis & Kamaras, 2008: 54).

3.3 Historical Evolution of International Trade in Turkey after 1923

In the aftermath of the analyses of the history of foreign trade in Ottoman lands before 1923, this chapter particularly addresses the developments after 1923 — the

founding year of the Republic of Turkey. To draw a general frame, the analyses will start with elaborating on the first attempts of the young Republic to attract foreign capital due to the insufficient domestic capital, and later provide an insight as to why Turkey could not ensure any significant amount of capital flow from the outer world during the period from the early days of the Republic to the 1950's. Nevertheless, the country achieved a rapid progress in foreign capital compared to the past thanks to the new laws were introduced after 1954 and the effect of the Marshall Plan. In the modern sense, foreign capital started to increment after the 1980s, and the efforts for admission to the European Union have brought foreign capital in Turkey to an important level since 2003 (Ormanoğlu, 2004).

To elaborate on the details of these milestones in the history of international trade of Turkey, it is first essential to note that in the first years after the foundation of the Republic of Turkey, the foreign capital remaining from the Ottomans to the new Republic amounted to £643 million or £500 million. This amount was owed to 94 companies and consisted of seven railway partnerships, 23 banks, six mining rights, 12 industrial corporations, 35 trade-related consortiums and 11 co-partnerships, which served the local governments (204: 29; Görgün, 2004: 31). On top of this initiative, the Izmir Economy Congress convened in 1923 to insert a positive attitude to attract greater amounts of foreign capital to Turkey. In parallel to this positive attitude, foreign capital inflows increased by 1930, further enhanced by the 1927 Law for Incentives for the Industry (Kasalak, 2012: 65-66).

The founder of the Republic of Turkey, Mustafa Kemal, rendered the first formal opinion of the new Turkish government regarding foreign capital at Turkey's Economic Congress in Izmir on February 17, 1923 as follows (cited by İnan, 1989: 47; OKC's, 1923: 14):

“Masters, while thinking and talking in the field of economics, do not assume that we are hostile to foreign capital. No, our country is wide. We need a lot of labor and capital. We are always ready to provide the necessary collateral to foreign capitals provided that we obey and respect our laws and the desire is that the foreign capital join our labor and wealth. Let us give useful results for them; but not like before!”

Hence, efforts were made to attract private capital to contribute to economic growth in support of Atatürk's above thoughts, throughout the first years of the Republic. For example, deposits of private individuals in banks reached 13 million Turkish Liras in 1924 and 117 million Turkish Liras in 1929 (Karpaz, 1996: 93). As it can be understood from the promises of the Great Leader, liberal decisions were taken at the Izmir Economic Congress to attract foreign capital in all fields provided that investors complied with the interests and laws of the newly established Turkish State.

From the pronouncement of the Republic of Turkey until the Great Depression of 1929, which had a profound impact on the whole world, there had been an increasing trend in foreign direct investment in Turkey. A law enacted in January 1924 facilitated the acquisition of property by foreigners. In 1929, many foreign companies joined several companies such as Consolidated Borax, Istanbul Tramway and Coal Gas and Electricity. Due to the liberal policies adopted at the Izmir Economic Congress, state representatives allocated two thirds of foreign capital to the manufacturing and mining sectors and one third to the service sector, i.e. to banks, trade companies, foreign trade and insurance companies during the period between 1923 and 1929 (Parasız, 2004: 29).

By the year 1929, the Great Depression started to affect the United States, emerging and developed capitalist countries, as well as the whole world. This situation caused the abandonment of liberal economic policies in the first years of the Republic. With the effect of the economic contraction experienced with the depression, countries began to shift their capital surpluses to their own countries rather than to other states. Due to the crisis, Turkey, as well as other nations of the world, began to implement statist policies within its borders.

Concordantly, although the proclamation of the Republic brought institutional-legal arrangements, those could not be completed in the first decade of the Republic due to the economic regression. Therefore, the aims of "economic independence" and "rapid development" stated by Atatürk at the Economic Congress were not achieved at that time (Kepenek and Yenturk, 2001: 61). In fact, the following years witnessed the abandonment of the liberal economic approach that young republicans initially adopted due to several reasons: the inadequate success of liberal policies, the effects of the Great Depression in

1929, the ongoing turmoil in the country, such as the dry spell between the years 1927 and 1928, the successful liberal policies executed in the Soviet Union and the relative success of “statist” tendencies in some Western countries. In the 1930s, a similar “statist” approach came to the forefront in Western countries, while Turkey also followed this policy in an attempt to overcome the negativities in the Republican economy. Hence, the Turkish state commenced its active role in the field of economy in order not to leave private enterprises alone in economic life.

Within this framework, the World Depression of 1929 negatively affected foreign capital investments in Turkey. After all those years with capital outflows to cover the Ottoman debts, Turkey had been engaged in activities to attract foreign investments after the transition to the republic era, however, the economic depression led to nationalization and statist approaches in economy. Certain railways, ports, municipal services and mines had formerly been sold to foreigners by virtue of the etatism policy, and Turkey reintroduced them to the national economy during this period as part of its “nationalization” policies. Hence, the nationalization movements limited the inflow of foreign capital in this period (Avcıoğlu, 1968: 216-218; Karluk, 1996: 538). The said nationalization activities implemented under the goal of the etatism policy to reduce the volume of foreign capital continued only until World II. Thus, in the years following World War II, both Turkey and the world witnessed an upward trend in foreign capital, particularly triggered by American aid.

Although Turkey was not a party to the Second World War, the country had suffered from the war economy bringing along adverse conditions. As a result of those unfavorable conditions, the indicators of economic development entered into a period of decline between 1940 and 1946. Nevertheless, Turkey made a number of legislative arrangements to regulate foreign capital inflows in the years of 1947, 1950, 1951, 1954, 1980, 1986, 1992, 1995 and 2003, respectively. However, foreign direct investment in Turkey could not reach the desired level despite enforcing quite liberal arrangements. As a matter of fact, the Law on the Encouragement of Foreign Capital, which came into force in 1954, was the most liberal law of the period, yet it failed to achieve the expected returns. Inadequate economic conditions, bureaucratic obstacles and unwillingness to act on this issue were among the major problems in attracting foreign capital (Deichmann, 2021: 72).

Due to the declining economy in the postwar period, Turkey adopted a new economic policy, where particularly external factors played a decisive role. In that, the deterioration of relations with the USSR led Turkey's rapprochement with the British Empire, while the United States of America became the most dominant power in the world. This convergence turned into a determinant factor of the economic policies that Turkey followed in the new period (Görgün, 2004: 34). This determination was established under the leadership of the World Bank and IMF. In that regard, Turkey joined the United States side and began to feel more powerful, benefitting from the Marshall Aid.

In this context, Turkey initiated new legal regulations particularly after the 1946 elections. The Marshall Aid was launched in 1948. As part of the Marshall Plan, Turkey received an aid of US \$50 million as foreign capital between 1948 and 1949 (Tekeli, 1950: 4).

The first of the legal regulations mentioned above was the Decision on the Protection of the Value of the Turkish Currency No. 13 dated April 22, 1947, which was enacted on the basis of the Law on the Protection of the Value of the Turkish Currency No. 1567 dated February 25, 1930 (Görgün, 2004: 37). In addition, the first law on the promotion of foreign investment in Turkey was issued on March 1, 1950. The Law No. 5583 on "the Private Enterprise Yank in the Treasury not to Bail Currency Commitment" was another legal initiative taken during this period (Karluk, 1996: 539). With this law in particular, many privileges were offered to attract foreign capital, and many obstacles blocking the inflow of foreign investment were removed.

One of the most critical steps taken during this period to attract foreign capital was the Law No. 5821 on the Encouragement of Foreign Capital Investments, dated August 9, 1951. With this enacted law, certain rights and conveniences were provided for investors who would bring foreign capital to the fields of domestic industry, energy, mining, public works, transportation and tourism without constituting concessions. In 1954, the Law No. 6224 replaced the Law No. 5821 for encouraging foreign capital, bringing further liberal policies to attract foreign investments to Turkey. One privilege was to enable foreign capital investors benefit from similar rights, exemptions and facilities granted to domestic capital owners and enterprises operating in the same field (Ormanoğlu, 2004: 15). Thus,

Turkey endeavored to set the necessary ground to benefit greatly from foreign enterprises, capital and techniques, since foreign capital and enterprises were considered as an important driving force in the development of the national economy.

After 1950, Turkey took a systematic initiative allowing foreign aid and loans through private enterprises and the promotion of private foreign capital. Implementing a new economic policy, Turkey accelerated its capital movements and particularly the attraction of foreign investors. During this period, Turkey also performed significant liberalization initiatives in relation to foreign investment in the oil industry. The most important of those liberalization moves was the Petroleum Law No. 6326, which was passed on January 18, 1954 (Yasa, 1980: 94), regulating the liquidation of foreign companies operating in Turkey for oil exploration, drilling, production, and distribution activities. With this Petroleum Law, foreigners were allowed to carry out oil exploration activities and drilling oil wells, which had been under the monopoly of the state until then. One of the important legal texts regulating foreign capital after the Law No. 6224 became the Eregli Iron and Steel Factories Law No. 7462, entering into force on February 28, 1960 and enabling the implementation of more liberal policies.

By the effect of these initiatives, as one can easily estimate, a significant amount of foreign capital entered Turkey after World War II, especially between the years 1950 and 1954. Starting initially with the Marshall Aid, foreign capital from the USA continued to increase after 1954. After the end of World War II and during the 1950s, Turkey further contributed to build a favorable environment for economic growth through foreign investments. During this period, almost all economic, political and military organizations in Turkey received significant amounts of funds from foreign resources granted to the country.

However, the Turkish Lira was overvalued due to such moves in the foreign trade volume after the mid-1950s and the growing gap between domestic and foreign prices. Nonetheless, the government refused to devalue and take the stabilization measures proposed by international financial institutions. Thereupon, foreign organizations cut their donations and credits to force the Turkish government to take stabilization measures. This led to significant reductions in foreign capital inflows. Particularly after 1956, Turkey had

to face a significant increase in the general level of commodity prices. With the support of the IMF and OECD countries, devaluation took place and Turkey started to implement certain stability measures on August 4, 1958. Those stabilization measures helped the elimination of the congestions in foreign economic relations, albeit relatively (Şahin, 2000: 114–116). In the 1960s, the planned economic development period started in Turkey.

Within this framework, the word planning came up with Shakir Kesebir Plan in Turkey in 1929. However, the idea of modern and large-scale planning could begin only after the mid-1950s. With the establishment of the State Planning Organization on September 30, 1960, the objectives and strategies of the Economic Development Plan were determined for the first time in July 1961 (Kuyucuklu, 1993: 199–200). During the period of implementing development plans, important substitution policies aimed at reducing the dependence of the economy on foreign resources. Those plans formed a massive impact on foreign capital investments.

Within this scope, the country achieved relatively higher growth rates for a while thanks to self-enclosed import substitution policies (Balassa, 1986: 163). Yet, Turkey gradually started to feel an increasing need for outsourcing in a more advanced and severe manner due to the excessive import substitution policies and the application of three consecutive development plans.

Although the need for external resources increased during the period of planned development, Turkey managed to achieve significant developments in its relations with Europe. An important development was to sign the Ankara Agreement for a joint market with Europe on September 10, 1963 (Çamoğlu, 1963: 644). Therefore, the European Economic Community (EEC) took the place of the United States in both foreign investments and borrowing after this joint market entry. The changing foreign actor was observed in all areas of foreign capital investment, including infrastructure investments. During the Development Plan periods II and III, NATO provided Turkey with infrastructure investments, despite slight decreases at times. Aid organizations in Turkey also benefited from USA-supports (Görgün, 2004: 42).

Pursuant to these insights, it is significant to note that in the first three development plan periods, foreign capital was \$115,183 million and \$362 million, respectively. Despite

the import substitution policies, this increase in foreign capital stems from the fact that arbiter economists of the time found foreign capital more attractive and profitable. Accordingly, the profitability of foreign capital investments increased to \$64,168 million and \$346 million, respectively (Çelik, 2019: 126-128). Hence, the ratio of foreign capital transferred to Turkey increased from 55.7 to 91.8 and later to 95.6 from the initial times to the Development Plan Period II, following an increasing trend. However, there later emerged a gap between profits and foreign capital inflow, indicating that the net numerical contribution of foreign capital to the capital stock of the country gradually decreased. This led to an increased need for foreign capital in Turkey, triggering the search for new methods of attracting foreign capital.

When it came to 1973, oil prices in the world economy increased by 400%, and by 100% in 1979. Under those circumstances, Turkey did not particularly go to any adjustment for preventing the adverse effects of that first oil shock — which would be the highest current account deficit ever seen until then. Yet, the country tried to control the movement of reserves and financial transactions. This still caused a crisis period until 1978. Constituting a major recession in Turkey, this led to significant decreases in the GNP and GDP rates while inflation rates hiked (Parasız, 2004: 277).

Nevertheless, the promotion of foreign capital continued as rapidly as in the previous period during the Planned Development Period. Unlike previous years, this period was marked by most foreign capital being invested in the manufacturing industry. However, the legal regulations after that fed the idea that foreign capital caused problems in both mining and oil production and manufacturing industries. As a result, the “Oil Reform Law No. 1702” was enacted in 1973, giving priority to the public sector and prohibiting foreign private oil companies from installing new refinery facilities and expanding their existing facilities. In the following periods, further restrictions were imposed on the foreign capital in the manufacturing industry. All these regulations interrupted foreign capital inflows and foreign capital undertakings (Akalın & Tüfekçi, 2014: 57).

During the Planned Development Period, foreign capital investments continued routinely, but fell to negative levels due to the oil crisis of the 1970's and the Cyprus

Operation. In 1979, economic and political instability reduced foreign investments down to negative figures. By the year 1979, the total foreign investment in Turkey was over \$228 million. To alleviate the negativities of 1979, Turkey endeavored to decrease inflation rates, close the current account deficit, eliminate the disadvantages experienced in GNP and GDP growth and thus started to apply export-containing development strategies by the January 24, 1980 decisions. Those decisions aimed at improving Turkey's relations with the outside world by containing more liberal policies (Öztürk, Nas, & İçöz, 2008: 15-17).

Within the scope of the liberal policies given in the Stabilization Decisions of January 24, 1980, Turkey took important steps towards lifting of restrictions on foreign capital movements (Kar and Kara, 2003: 53). On January 25, 1980, the "Foreign Investment Framework Directive No. 8/16" was used to establish the Prime Ministry Foreign Capital Department, while it was linked to the then State Planning Organization. In addition, as a result of the establishment of the Undersecretariat of Treasury and Foreign Trade with the Law No. 4059 on December 9, 1994, the General Directorate of Foreign Investment continued its activities within the body of the Undersecretariat of Treasury. Finally, the "Decree No. 32 on the Protection of the Value of Turkish Currency" removed the restrictions on foreign capital and foreigners so that they could make purchases from the securities markets in Turkey. This decree also enabled foreigners the right to domestic use or transfer of incomes from real estates and real rights obtained in Turkey without cash exchange (Ormanoğlu, 2004: 16).

Although such legal arrangements had been made to attract foreign capital before 1980, the liberal practices had remained limited and there had been a conservative attitude towards foreign capital back then. Later, however, legislative amendments were made after 1980, disseminating the liberal media's effect and ensuring significant advantages of foreign capital for inputs and outputs of production chains in Turkey.

However, the liberalization of the exchange regime changed the types of capital inflows, size and results in Turkey. Capital movements significantly enlarged. With the changing nature of capital movements and the relevant maturity regime, external imbalances related to foreign capital inflow weakened, and reserve accumulations increased.

As it can be predicted based on these insights, international capital movements increased gradually after 1980. The revival in foreign capital investments especially after 1989 increased considerably with financial freedom. On the other hand, the decline in 1994 occurred as a result of the crisis that erupted that year. Looking at the sectoral distribution of the foreign capital in this period, it can be seen that the share of agriculture and mining sectors had been very low since the beginning of 1990, while the shares of the most permissible manufacturing and services sectors started to change after the 1990s. In this period, while there was a proportional decrease in the foreign capital investments in the manufacturing sector, the share of foreign capital investments increased in the services sector (Güngör, 2001: 70–71).

In 1980, an increase was observed in foreign capital inflows of Turkey. One of the most important reasons, along with the Economic Stabilization Decisions in 1980, was that Turkey started to implement a policy of international expansion. Thus, foreign capital inflows gradually increased after 1980. The manufacturing industry and especially the tourism sector (which is a sub-sector of the services sector) became the main sectors obtaining the largest share from this increase. However, Turkey's foreign capital inflows remained insufficient in comparison to other countries during that period. On top of that, there was the inability to come up with long-term plans on foreign capital due to economic and political instability, failure in fully implementing economic decisions and frequent changes in those decisions. Another factor preventing foreign capital inflows was the difficulties in employing foreigners accompanied by bureaucratic barriers in practice.

Although the later sectoral changes in foreign capital investments contributed to the solution of the internal problems ramifying after 1989 in the Turkish economy in 1994, they failed to bring about a long-term sustainable growth process. As a matter of fact, the uncontrollable capital movements caused a great crisis in 1994. As a result of the crisis, public deficits increased to a large extent and consequently, increasing domestic interest rates accelerated the inflow of hot money, which caused the Turkish Lira to overvalue. Those developments led to the rapid loss of competitiveness of the Turkish economy, increasing labor costs and decreasing export incentives (Görgün, 2004: 45–47).

Correspondingly, the internally imbalanced economy led to high public deficits and deterioration of the foreign trade balance, as imports increased rapidly, slowed down and foreign trade deficit reached a significant level. Ultimately, the rapidly deteriorating internal and external balances created a crisis that brought along a major decrease in foreign capital inflows. Therefore, in the new period, some stabilization policies had to be adopted in order to re-stabilize the new unstable environment and ensure confidence for foreign capital.

In parallel to that need, the decisions taken after 1980 to promote foreign capital yielded fruitful results. However, Turkey lost about \$958 million in capital investment. Likewise, with the Gulf Crisis of 1991, approximately \$2 billion and 397 million of capital was lost before the 1994 crisis, due to which \$4 billion and 257 million in capital investment left Turkey. Until 1986, foreign capital in the form of portfolio investment as well as direct foreign capital investments started to follow a major upward trend, leading to a rapidly increasing amount of hot money and risk in Turkey (Hale, 1992: 683-692).

Especially after 1986, though, economic indicators of portfolio investments, i.e. the share of direct investments, started to considerably decrease. From 1990 to 1995, foreign direct investments amounted to \$4.2 billion, while portfolio investments actualized as \$10.3 billion (Aydoğan, 2017: 89). Nevertheless, foreign direct capital increased in the second half of the 1980s, since a more liberal foreign capital policy started to be followed in 1986 via new legislative regulations. Due to the fear of a possible increasing competition due to the Single European objective, many companies with large amounts of capital sought foreign joint support. Besides, privatizations during this period contributed to the increase in foreign direct investment (Dumludag, 2006: 227).

After 1980, the decisions to liberalize the economy by means of growing portfolio investments in corporation contributed greatly to Turkey. The development of the capital market, the liberalization of the foreign exchange regime and rising interest rate were particularly effective in this contribution.

While 87% of foreign capital was allocated to the manufacturing industry in 1980, that share came down to 63% in 1989, whereas the share of the services sector increased from 12% to 36%. Trade, financial services and tourism activities had a major share in the

development of the services sector. Also, foreign banks offered various brokerage services to foreign investors in Turkey in that period, accompanied by liberalization of foreign firms and marketing firms (Saplins, 1993: 134-135).

In spite of those developments, the increasing foreign investments observed in the 1980s came to a stagnation in the 1990s. The reason for this is that Turkey's foreign capital policy did not include the benefits of foreign capital such as bringing technology and adapting it to the national economy, technical training, promoting R&D activities, establishing links with the domestic industry and the foreign market. Therefore, in the 1990s, foreign direct investors mostly took advantage of low wages, geographical proximity and short-term profit expectations (Ülgen, 2005: 38–39). Foreign companies owning investment permits in Turkey brought a small portion of their capital while keeping the larger portion at the company. Furthermore, when a foreign partner wished to add the accumulated profits to the capital, there might not have been any capital inflow at all.

In the second half of 1980, Turkey's balance of payments started to change with its capital account. In that, Turkey benefited from foreign capital inflows up to 1986 by portfolio investments. Indeed, the amount of foreign capital inflow in 1986 was registered as \$146 million, while reaching the highest level in 1993 with \$3917 million. Also in 1993, foreign investors began to purchase treasury bills and bonds. Portfolio investments (with \$8293 million) in 1992-1996 were \$2360 million higher than foreign direct investments in the previous decade. Between 1994 and 1995, however, there was a huge contraction in portfolio investments. The fluctuations in the financial and stock markets in 1994 reduced the inflow of portfolio investment by 70.4% compared to the previous year. Also affecting Turkey after 1998, the South Asian crisis led to foreign capital flight (Thesis-live et al, 1994: 99-100; SPO, Economic Indicators).

In this regard, the country faced high inflation rates and economic instability as the reasons for plummeting foreign direct investment rather than achieving the desired level. Turkey witnessed a serious economic crisis in the 1990s due to the failure in reducing the inflation, as well as high public deficits, growing domestic and foreign debt accumulation (1994, 1999 and 2000). Soaring real interest rates and overvaluation of the national

currency caused the domestic savings of the country to flee abroad, while only some portion of them later returned Turkey. Besides, the attempts to encourage foreign investors by various methods such as tax cuts did not yield effective results due to the presence of a chronic instability.

Nevertheless, Turkey had and still has significant advantages pertaining to attracting foreign capital. First and foremost is Turkey's geographical location. Yet another characteristic of Turkey is that it has a high growth potential with increasing purchasing power as well as increasing power, constituting an attractive market for foreign capitalists. At the same time, in 1996, Turkey signed the Customs Union Agreement with the EU, gaining the opportunity of rapprochement with these countries. Besides, a new legislation was enacted in 2003 to attract foreign capital, later followed by the action to begin the accession negotiations with the EU on October 3, 2005. That development brought the country several significant advantages for foreign capital, while globalization movements in association with the world's major capital also affected Turkey as a natural consequence. In other words, the increasing interaction of foreign capital proceeded in favor of Turkey. And Turkey provided the necessary regulations to direct foreign capital flow according to its interests.

In this context, there are opposing views concerning the effects of commercial liberalization policies on the development of a country. While some claim that commercial liberalization policies are a must for the growth of a country, others assert that they will eventually have a negative impact especially in developing countries. However, today there is a general acceptance that commercial liberalization policies positively affect economic growth in the long run. Pursuant to this assumption, as noted previously in this chapter, Turkey adopted an outstandingly open approach towards foreign trade between the years of 1923-1929. On the other hand, the arrangements in 1929 reduced the level of imports, and in the aftermath of this period, Turkey gave a continuous trade surplus until 1940, except 1938. Considering the general course of foreign trade after 1940, the increase in imports was higher than the increase in exports. Although various measures were taken to reduce imports and increase exports, the desired result could not be achieved, though. As a result of the use of imported goods in the production chains of the domestic market, the prices of imported goods and energy suddenly rose in 1973, leading to a significant

foreign exchange shortage. After 1980, on the other hand, economy of Turkey underwent a structural transformation with growing economic initiatives to encourage exports and facilitate imports. During the same years, the government offered vast opportunities to agricultural and industrial exporters by several innovative economic policies. However, the issue of depending on imported goods for producing the necessary export goods remained as a major issue for Turkey.

In line with the current developments in global economy, it is of note to point out to the prevailing economic trends of countries. In this sense, while some countries have various regulations to control or restrict foreign trade, the afore-mentioned commercial liberalization movement requires the removal of such controls or restrictions in the international trade of goods and services by means of various regulations (Yaprakli 2007: 68).

In this regard, Sachs et al. refer to five main criteria for determining whether a country implements a trade liberalization policy. The authors suggest that any country which meets even one of the criteria does not apply a commercial liberalization policy. “The said criteria are listed below (Sachs et al. 1995: 22):

- Non-tariff barriers cover 40% or more of foreign trade.
- Average tariff rates are 40% or higher.
- Black market foreign exchange prices are 20% or higher.
- There is a socialist economic system as defined by Kornai (1992).
- A significant part of exports is in public monopoly.”

“On the other hand, Rose lists the necessary practices for foreign trade in seven groups (Rose 2004: 212):

- Trade openness encouraging the growth of total foreign trade or the contribution of imports to GDP,
- Trade flows adjusted according to the characteristics of the country,
- Tariffs,
- Non-tariff barriers,
- Informal or qualitative measures,
- Combined indices,
- Price-based measures.”

To elaborate on this list, one can easily assume that countries need openness for prolific international trade relations. When imports contribute to the GDP of a given country, this will further grow bilateral relations between that country and its trading partner. While doing so, however, there is always a need to adjust trade flows between two countries in a way that will benefit both in terms of economic gains. As a follow-up to this assumption, tariffs must also benefit the trading countries, while non-tariff barriers should not impose any significant obstacle to the trade relations. Qualitative measures and combined indices may be used between two countries to boost their bilateral trade, and similarly, price-related measures may well benefit the trading parties through favorable terms and conditions.

In the same vein, Edwards (1993) proposes the idea that exchange rates form a rather useful index to measure whether a country applies trade policies encouraging or restricting foreign trade (Edwards 1993: 1364). Meanwhile, Lewer (2002) suggests that along with favorable foreign exchange rates, commercial liberalization is an important opportunity for developing countries to catch up with developed countries through comparative advantage attained by cheap labor (Lewer 2002: 313). Thus, many believe that the economic levels of trading countries will converge thanks to the promotion of competition and knowledge transfer as a result of commercial liberalization moves allowing foreigners to trade without bureaucratic restrictions such as quotas and tariffs (Caminis 2007: 181). Arguing that bilateral economic growth depends on the market widths of countries, Ales and Glaeser further add to this idea by suggesting that commercial liberalization will lead to the design of new products and an increase in the countries' market shares (Ales and Glaeser 1999: 1025). Some other economists advocate the notion of increasing the efficiency of production as well as economic power through economic policies based on import substitution especially for underdeveloped countries (Oskooee and Niroomand 1999: 557). The common view today is that free foreign trade is more beneficial for economic growth in the long run compared to closed economies (Winters et al. 2004: 72; Panagariya 2004: 1170; Guttman and Richards 2006: 188). And in the light of these assumptions, Turkey seems to have understood the importance of international trade for a long period of time stretching from 1923 to today, since the country has often applied various methods to increase its foreign trade volume. Turkey has been striving to increase both its bilateral and multilateral trade relations by the help of

several international economic initiatives. Concordantly, a great number of scholars have recently studied Turkey's international trade relations over the course of many years with specific interest in solid economic indicators. The next chapter will provide a concise overview of Turkey's international trade during the years of World War II accompanied by regulative initiatives in line with the country's development goals.

3.4 Developments in Foreign Trade Relations of Turkey during the War Years

In the first years of the Turkish Republic, the country deeply felt the negative economic effects of the First World War and the Turkish Independence War. Due to lack of supplies, foreign capital and entrepreneurial power were quite low in the overall Turkish economy. However, Turkey adopted a clear economic outlook with extensive openness to foreign-dependent economic structure (Şahin 2009: 43-44). The reason for the enactment of an economic policy open to foreign trade was due to the economic provisions of the Lausanne Peace Treaty. In accordance with the provisions of this treaty, the Ottoman Customs Tariffs, signed in 1916, remained valid for five years. In other words, there was no increase in customs tariffs until 1929 (Uludağ and Arıcan 2003: 5). Considering Turkey's economy between the years of 1923 and 1929, it can be seen that the rate of imports to the Gross National Product (GNP) was 14.6%, while the rate of exports to the GNP was 10.6%. Turkey failed to reach those rates in the next 50 years due to extensive trade openness (Boratav 2006: 49-50).

In this regard, Turkey issued the Law for the Encouragement of Industry in 1927, introducing customs duty exemption for industrial machinery in an attempt to promote the country's industrialization activities. In 1929, when the Lausanne Treaty ended, a new customs tariff came into effect, exempting all agricultural machinery, tools and equipment from customs duty. Furthermore, this new tariff reduced the tax rates on transportation vehicles as well as industrial products that Turkey had not been able to domestically produce (those tax rates went below the rates before 1929). On the other hand, import taxes were increased for yarn, fabric, sugar, flour and other foodstuffs, leather and wood products, as well as cement in order to support domestic production in those industries of Turkey (Tezel 1994: 162). On the same line, the government pursued policies to increase local production despite adopting a relatively liberal economic policy during the

foundation years of the Republic. More specifically, the Turkish government applied tax exemptions and provided inputs with reasonable prices to the private sector in order to boost domestic production during those years (Özkale and Kayalıca 2008: 356). Nevertheless, it can be observed that the liberal policies pursued during the first years of the Republic failed to meet the expectations. This led the government to seek new and fresh economic policies. They ultimately leaned towards statist policies after 1930 due to the lack of an entrepreneurial class and sufficient infrastructure as well as the fluctuations in international markets (Palamut and Giray 2001: 23).

In consequence of the statist understanding, the government did not take any substantial measure regarding the domestic economy, while they applied strict control over foreign trade between 1930 and 1931 (Boratav 2006: 67). As much as other countries, the World Economic Crisis in 1929 also negatively affected Turkey, thus took the first protectionist steps in its economic policies by enacting a law on imposing quotas on imports and controlling exports. In actual fact, the first traces of the state in the economic life could be found looking at the years between 1933 and 1938 when the government applied the First Five-Year Industrial Plan. Yet, many believe that this First Five-Year Development Plan was not a full-fledged development plan, but rather an industrial investment program drafted by the then-government (Buluş 2003: 46). After the end of this first plan, a second one was drafted although the government failed to implement it due to the outbreak of World War II. Thus, they altogether abandoned the plan and replaced it with an “Economic Defense Plan” (Uludağ and Arıcan 2003: 7-15).

From this point of view, one can assume that the period between 1940 and 1946 in the Republic of Turkey was marked by statist economic policies. Combined with the war economy and the subsequent act of mobilizing over a million people in the army, it was only natural that a significant contraction occurred in production and consumption rates (Uludağ and Arıcan 2003). Ultimately, the war economy led to a massive block in front of foreign trade due to international turmoil (World War II) rather than domestic issues in Turkey. Therefore, Turkey endeavored to create foreign trade surplus during this period by limiting imports to a certain extent. Indeed, the level of imports went down from \$119 million in 1938 to \$53 million in 1940. Despite efforts to increase exports, the Turkish Lira was overvalued and the government imposed taxes on exports, too, which ended up in shrinking exports in terms of volume and value (Bulut 2006: 178). Nevertheless, Turkey

witnessed a balanced trade rate during that time since the decrease in imports was higher than the decrease in exports (Parasız 1998:65). As a matter of fact, Turkey achieved a surplus in its foreign trade in 1940 despite the deficit in its balance in 1939, and although the surplus diminished in 1942 compared to the previous year, it then started to show an increasing trend until the year 1946.

As underlined before in this chapter, Turkey did not save itself from suffering from the negative economic effects of World War II despite not being a warring party. Indeed, one effect of the war was an extreme devaluation on September 7, 1946 (Alkin, 2004: 120). Although this devaluation took place with the aim of increasing export rates, it was also triggered by Turkey's involvement with the newly-established IMF (International Monetary Fund) and WB (World Bank) and the restriction of their competence in devaluation (Kepenek and Yentürk 2005: 118). Yet, the devaluation in 1946 eased the restrictions on imports, and the increase in imports exceeded that of exports (Tezel 1994: 184). While there was an increase of over 100% in imports in 1947 compared to the previous year, there was no significant change in export rates (Özkale and Kayalica 2008: 359).

3.5 Foreign Trade after the War of Independence and Ahead

In the aftermath of the War of Independence, there were nearly 65,000 enterprises operating in Turkey. Approximately 44% of those enterprises operated in the field of agriculture, while 24% run businesses in the weaving sector and the rest in the mining, industrial sector and machinery construction/repair area (Kepenek and Yentürk, 2009). In other words, economic activities were largely concentrated on labor-intensive areas. As for foreign trade, the government of the newly-established Republic found it easier to implement new customs duty policies thanks to the abolishment of the capitulations with World War I. However, due to the Turkish side's commitment to implement the customs tariffs dated September 1, 1916 for 5 years, it can be understood why the Republic of Turkey did not have the ability to implement a free customs policy until 1929. The Great Depression that followed, on the other hand, caused a rapid decline in the prices of agricultural products. Although production was increased to compensate for this loss, the continuation of the downward trend prevented any growth. There was a decrease in the

prices of the products Turkey exported, however the prices of imported products did not decrease at all, leading to a foreign trade deficit (Zarakolu, 1988: 113-117). The ratio of exports to imports increased to 80% in 1923 and to over 90% in 1929. With the impact of the crisis after 1929, the rates reversed, though, and in 1934, this rate dropped to the lowest level of 30.6% (Zarakolu, 1988: 113-117).

In the period from 1923 to 1929, state intervention in the market was at a minimum level due to the terms of the Lausanne Peace Treaty, since the government had to adopt a liberal development model in order to achieve economic independence and accelerate economic growth (Eroğlu, 2007: 63-73). After 1929, there was an excessive demand for imported goods leading to a further increase in the trade deficit. During the aforementioned period, Turkish economy was also affected by the facts that they started to pay the debts remaining from the Ottoman Empire and Turkish Lira depreciated rapidly. Until 1945, however, Turkey followed a statist economic policy in an attempt to ensure rapid growth.

During the term of the Democratic Party between 1950 and 1960, the government prioritized providing initiatives to private enterprises rather than building balance between private and public entrepreneurship (Oktar and Varlı, 2010: 6). However, the government's intervention in the economy did not shrink, while a new State Economic Enterprise was founded. Also during the Democratic Party government, favorable domestic conjuncture increased the demands for trading domestic products along with the growing agricultural production, further contributing to the country's economic development. In this period, agricultural production contributed to the economy in several ways: firstly, some of the state lands and pastures were distributed to villagers ensuring that idle lands were put into use by turning them into cultivation fields. Secondly, Ziraat Bank of Turkey met the loan needs of farmers, and more cash inflows were provided to producers by increasing the prices of agricultural products (Eroğul, 2003:142).

In the light of these developments, it can be said that agricultural policies of Turkey also impacted the industrial policies. Indeed, the expansion of the domestic market resulting from the changes in agriculture caused the industry to grow at a high rate (Şahin, 2007: 114). The Democratic Party's rulers promoted the growth of especially iron and copper production, mining, sugar, cement and textile sectors in the industrial field by

means of considerable investments (Eroğul, 2003: 143). While the foreign trade regime implemented in this period contributed to private capital accumulation, it caused the transformation of commercial capital into industrial capital (Ercan et al., 2008: 231-232).

When the effects of agricultural and industrial policies on monetary and fiscal policies are examined, it can be seen that Turkey started to search for new resources in order to cover for its growing expenditures. This search resulted in an increase in on the taxes imposed on imported goods, while issuing a new tax on agricultural products. When those resources proved to be not enough, the government resorted to domestic borrowing. They managed to keep the money supply stable between 1945 and 1950 thanks to balancing inflation and ensuring that public expenditures did not exceed budget revenues. In actual fact, the main objective of the fiscal policies during the same years was to implement a balanced budget policy. In 1951, prices started to increase again and after 1954 this increase started to cause a permanent inflation trend. In August 1958, Turkey decided to impose a stabilization program due to the deterioration in economic activity with inflation, aiming to end the deficits, reduce the money supply and to ensure balance in foreign investments (Şahin, 2007: 126). According to this program, the government would abolish the internal price controls that had been implemented since 1956, and a ceiling system would be introduced for bank loans. Within this framework, the aim was to fairly distribute loans to the public sector and banks. In this context, a condition was imposed on the Turkish Central Bank to repay the loans received by the Turkish Grain Board until the first half of 1959. This contraction in loans was followed by an increase in interest rates (Kazgan, 2005: 116). Expansion in the money supply during the 1950-1954 period did not pose a problem as long as production increased, but in the following periods, the inability to reduce the money supply when production fell became one of the main reasons for inflation. A prominent activity of the Democratic Party in its economic policy, increasing the money supply led to a growth in economic activity in this period. However, the lack of increase in production capacity in response to monetary expansion caused higher inflation rates (Eroğul: 2003: 147-206).

In the early years of the Democratic Party's rule, the large investment costs and increasing public expenditures were largely met by inflation. On the other hand, there was a favorable foreign trade environment and increase in real income, in addition to the effort

to compensate the decrease in the domestic value of money through price control. However, the fact that public enterprises made sales below their costs increased the budget deficits and further increased the deficit financing. In this period, when the Central Bank could not follow an independent monetary policy, the rising inflation rates created pressure to increase imports and the foreign trade deficit increased continuously until 1955, as there was no devaluation. Although the Central Bank was responsible for paying the debts in foreign currency, the short-term foreign currency debts of the Central Bank increased gradually by imports that did not contribute to the growth of the country, since this authority was not able to check the purpose for which foreign loans were received. Hence, Turkey's commercial foreign debts became unpayable due to credit imports (Stone, 2004). Due to this situation, the State Planning Organization was established in 1960 to organize investments. From this perspective, the fiscal policies consisting of public revenues, expenditures and borrowings had special importance for Turkey due to adopting planned economic development. The segments of society that public revenues were received as well as the sources they were used for posed an important pillar in this planned development policy. In this regard, economic development was measured by the indicators in the public sector, going beyond the rate of fulfilling the classical functions of the state, but also reaching the planned goals (Kepenek and Yentürk, 2009: 164-165). As for the regulations on Turkey's fiscal policies during the planned development period, it can be said that they prioritized increasing the savings amounts, ensuring efficient asset distribution and justice in income levels by the redistribution of incomes (Parasız, 1998: 136).

During the implementation of Turkey's five-year development plans up until the early 1980's, budget deficits were financed using resources from the Central Bank. Consequently, monetary policy was subordinate to fiscal policy. Under these conditions, the continuously growing public deficits hindered the Central Bank's ability to implement effective policies for price stability. The Central Bank's resources were used to finance public deficits, leading to the dominance of fiscal policies over monetary policies. After the 1980 Stabilization Program, on the other hand, the government's use of the Turkish Central Bank resources was significantly limited, while they often resorted to domestic

borrowing as a source of alternative financing to meet the public's funding needs (Saçkan, 2006:22).

After the experiences of the stabilization measures in 1958 and 1970, it gradually became inevitable to take long-term measures due to several reasons: the oil shocks starting in the 1970s, the insufficient exports, increasing foreign trade deficit, inflation hiking up over 100%, growing domestic political tension and the intensification of public demonstrations. Indeed, the society fundamentally demanded urgent measures. Thus, the groundwork for the stabilization measures had already been laid on January 24, 1980 (Gerni, 1992: 2). More specifically, Turkey started a transition period with a new program via the January 24, 1980 Decisions with the purpose of to be included in the international economic system.

The afore-mentioned stabilization program put into practice on January 24, 1980 can be considered orthodox, just like the other stability programs implemented in Turkey and Latin American countries, since it was aimed to eliminate public expenditures and domestic demands causing macro and price instability (Payless, 1998: 198). Aiming to prevent inflation, achieve external balance through export growth and provide free market conditions in the economy, the decisions of January 24 were based on the regulations to open Turkey to foreign competition with its industrial production (Ataç, 1999: 304). Within the scope of the said program, interest rates were increased, while reducing the private sector subsidies, Central Bank advances and the volume of emissions. Moreover, the Turkish Lira was devalued by 48.6% against foreign currency and export earnings were excluded from taxation, while also abolishing taxes on export loans. Thanks to those measures, foreign trade volumes undertook an upward trend in the 1980s, and the composition of exports changed in favor of industrial products. In the balance of payments, transactions increased significantly, regulating the prices for goods and services in the formal market and preventing the formation of a black market. In addition, there were efforts to mobilize foreign capital inflows and to increase the usage rates of the manufacturing industry capacity.

Despite the positive results of the January 24, 1980 stabilization measures stated above, the desired results could not be achieved in the institutional field. As a matter of

fact, the country failed to fulfil the aim to reduce the weight of the state in the economy (the basic philosophy of the program) despite the efforts to adopt the market economy model that. On top of that, the authorities back then failed to establish balance between public incomes and expenditures. The desired level in the privatization of State Economic Enterprises was not reached, unavoidably leading to a significant increase in public expenditures. That increase further exacerbated the domestic and foreign debt stock. Under those circumstances, the only way out was to resort to the sources of the Central Bank. This period was marked by “maneuvering the apostles”, as an old saw. To put it in a different way, the government was running into further debts to be able to pay off its existing debts, thus leading to a deep economic crisis and adverse effect on the optimal distribution of resources (Gündüz, 1999: 280).

In 1985, the abundance of foreign exchange transactions ongoing up to the second half of 1984 stopped along with the real depreciation of Turkish Lira. Consequently, banks were given the authority to freely determine exchange rates in June 1985. In the same year, domestic borrowing rates increased by the auction method in selling treasury bonds (Önder et al., 1993: 189). Macro-economic data of the year 1988 manifest that the Turkish state reached the economic and social limits of export-oriented growth policies. On August 11, 1989, thus, the Decision No. 32 on the Protection of the Value of Turkish Currency” was adopted to support the country by means of foreign exchange savings and to complete the second phase of the liberalization process. “In parallel to this development, the obstacles to capital movements were removed, taking an important step towards convertibility. In the early 1990s, however, the positive developments in the current account balance and the growth rate started to slow down. Inflation rates as well as unfair distribution of income increased, while the domestic and foreign debt burden reached a significant level as well (Ataç, 1999: 314).

At the beginning of the 1990s, thus, the Turkish economy became fragile under the influence of short-term foreign capital flows despite the endeavors of liberalization starting with the January 24 Decisions. In fact, the developments of that period prepared the infrastructure of consecutive economic crises. After the second half of 1989, the hikes in wage earners increased consumption expenditures and stimulated industrial production, resulting in the highest growth figure in 1990. After the Gulf Crisis in 1990 and the

uncertainty created by the early elections in 1991, the timely intervention of the Central Bank of the Republic of Turkey in the markets prevented a currency crisis (Parasız, 1995: 174).

In this context, the economic policies of Turkey in the early 1990s accompanied by the appreciation of the national currency contributed to an increasing trend in both exports and imports (Barışık and Çetintaş 2006: 6). However, with the high-rate devaluation in 1994, imports contracted and exports increased (Tokgöz 2001: 37).

On the other hand, the increasing public expenditures and the downscaling domestic savings in 1993 were the footsteps of an economic crisis in 1994 (Özgüven 2001: 59). In that year, Turkey announced the economic stability program referred to as the “April 5 Decisions”. Thereby, the exchange rate increased from 14.458 TL/\$ at the end of December 1993 to 39.853 TL/\$ on April 7, 1994. After the second half of 1994, the foreign exchange market was stabilized again, while at the end of 1994, the exchange rate was 34.418 TL/\$ (Özkale and Kayalica 2008: 365). Between June 1994 and September 1995, both bank loans and government domestic borrowing rates declined. Furthermore, the inflation rate tended to decline, as well. Buluş suggests that the increase in production and imports constituted the largest share in the 7% growth in 1995 by the effect of growing private consumption rates. The author also argues that due to the expectation of forming a Customs Union (CU), the largest increase in investments realized in the textile industry in 1995. This development was predominantly achieved in the private sector (Buluş 2003: 74-75). As a matter of fact, Turkey signed the Customs Union Agreement with the EU in 1995. Coming into force in 1996, this Customs Union Agreement formed an crucial step in the trade liberalization process of Turkey initiated by the January 24, 1980 Decisions (Tonus 2007: 193).

While agriculture had a major place in Turkey’s exports before 1980, the country’s foreign trade regime started to transform by the impact of the 1980 Economic Decisions. Indeed, the share of agriculture in exports diminished after the 1980s, while the share of industry incremented expeditiously. “Accordingly, foreign trade products started to change for Turkey, too. In this regard, the share of agriculture in total exports was 18.4% in 1990, and it regressed to 7.8% in 2000. While the share of the industrial sector in our total

exports was 79.0% in 1990, this rate increased to 91.2% in 2000 (Serin 2001: 311-312; TÜİK 2009: 695).” It is also substantial to recognize that the major exporter industries of Turkey were also the major importer industries of the time. Therefore, this a clear indicator of the fact that exports were dependent on imports. For instance, the rates of exports in the industries of motor vehicles, tractors, bicycles and motorcycles, which ranked first in exports, reached the level of \$9.6 billion in 2005, while the imports in those sectors in the same year amounted to \$10.6 billion (Eşiyok 2008: 140). From this perspective, since there was a growing need for importing intermediate goods, it can be said that exports depended on imports during that period (Hepaktan 2007: 79). Between 1994 and 2004, Turkey’s exports grew over the world average with 12.5%. Thereby, Turkey increased its share in world’s exports from 0.42% in 1994 to 0.70% in 2004. During the same year, Turkey’s imports grew faster than its imports. More specifically, while import rates increased by 7.6% in that year, Turkey’s imports grew by 14.3% (Aktan, 2006: 80). As Lewer and Vandenberg argue, countries that import capital goods and export consumer goods grow faster compared to those that export capital goods (Lewer and Vandenberg 2006: 39). In the context of Turkey, it can be said that the country grew according to this principle in the early 1990s. However, as it can be remembered, Turkey followed liberal policies during the foundation of the Republic, while the government tended to follow protectionist trade policies after 1930. Yet, imported substitution policies implemented until 1980 did not yield the expected results, and the foreign trade deficit constantly increased. Especially after 1973, importing became more expensive. Also, products manufactured by imported goods were not used for exports. Thus, Turkey had to face a foreign currency shortage over time.

Taking important steps towards trade liberalization in 1980, Turkey also strived to liberalize imports and increase exports. As underlined before, the larger proportion of Turkish exports depends on imports. The use of imported inputs in the production of export commodities still increases Turkey’s foreign trade deficit. In this regard, the increase in Turkey’s imports is greater than the increase in exports. Therefore, it is essential for Turkey to shift its exports to research and development activities and products with high added value.

In conclusion, this chapter provided an overview to Turkey's role in international trade, first explaining the concept of international trade and then summarizing Turkey's position in this field. In this context, foreign trade relations were examined before and after the year 1923, since that year constituted significant shifts in the economic understanding of the state accompanied by the regime change. This analysis was followed by a comprehensive look at the 1990s in terms of fiscal policies and practices to grasp the evolution of Turkish foreign trade from the perspective of historical developments in order to lay the foundations for understanding Turkey's position regarding economic developments and environmental issues through the Kuznets Curve. Prior to dwelling upon the analysis of the Environmental Kuznets Curve, the next chapter will first provide information about renewable energy and the policies that Turkey implements in this field with the aim to understand the grand scheme of the developments.

4. RENEWABLE ENERGY IN TURKEY

This chapter explores the concept of renewable energy, and Turkey's position regarding the use of renewable energy from past to present, and it is particularly important in relating the EKC model to the renewable energy use, since this type of energy is a significant part of the model.

4.1 Introduction

Renewable energy is most often defined as generation of energy by renewable resources including rain, waves, wind, sunlight, or geothermal heat. Renewable energy resources are mostly available on the earth and in nature without the need for any process

(production), and they are not fossil-based fuels (coal, petroleum and carbon derivative). They cause a low CO_2 emission and environmental damage, while generating electrical energy compared to traditional energy resources. Such energy sources are geothermal, biomass, hydraulic, wind, solar, biogas, wave, current energy and tides, hydrogen, which are renewed with a continuous movement in nature and ready to be used. In short, renewable energy denotes to energy sources that exist in nature and constantly renew by themselves. Resources such as solar energy, wind energy, hydroelectric energy, geothermal energy, biomass energy, and tidal energy are renewable energy resources that cannot be diminished by usage.

4.2 An Overview of Renewable Energy

The silver linings of renewable energy sources are that they are clean, they reduce greenhouse effect, water pollution, air pollution, nuclear pollution and soil erosion, and they also protect fauna and flora. They are indigenous, economical, and they cause low external (social), fuel, security and operating costs as well as low disposal of waste. Furthermore, the cost of dismantling at the end of its economic life is also low. They offer employment opportunities contributing to the given country in becoming independent in the energy sector and supporting internal and external peace as well as being modern (contemporary). Moreover, it can be said that the use of renewable energy sources means respecting the rights of present and future generations, being ecological, supporting social and economic development, breaking fuel monopolies and curbing proliferation risk of nuclear weapons (Twidell & Weir, 2015).

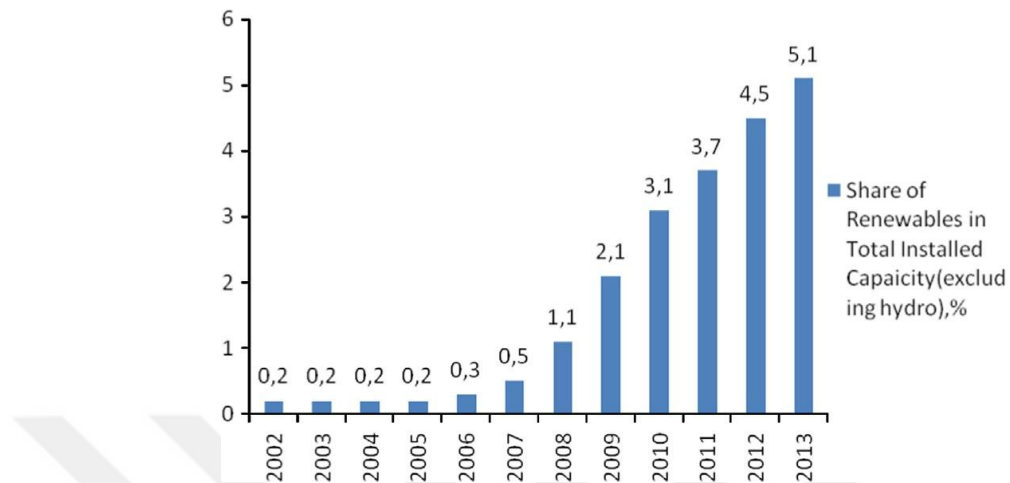
However, the use of renewable energy is currently limited across the world despite all their positive features, especially their environmental advantages (Bull, 2001). Several factors contribute to this limitation: these sources are deemed economically expensive because external costs are often overlooked, there are inadequate credit and financing mechanisms, high initial investment costs, and a lack of sufficient loans and financing mechanisms to offset these expenses. Thus, they are not taken into account in national energy plans and policies and not given priority. Rather, traditional (fossil) fuels are

accepted due to the existence of direct and indirect mechanisms that support these resources. Besides, renewable energy sources are not extensively used due to the insufficient legal and administrative regulations, lack of knowledge about their technologies, and about their economic and social benefits, and not supporting technology development properly. There are no standards developed and there is no infrastructure for production of renewable energy sources in most countries (Quaschnig, 2016).

4.3 Introducing Renewable Energy and its Use in Turkey

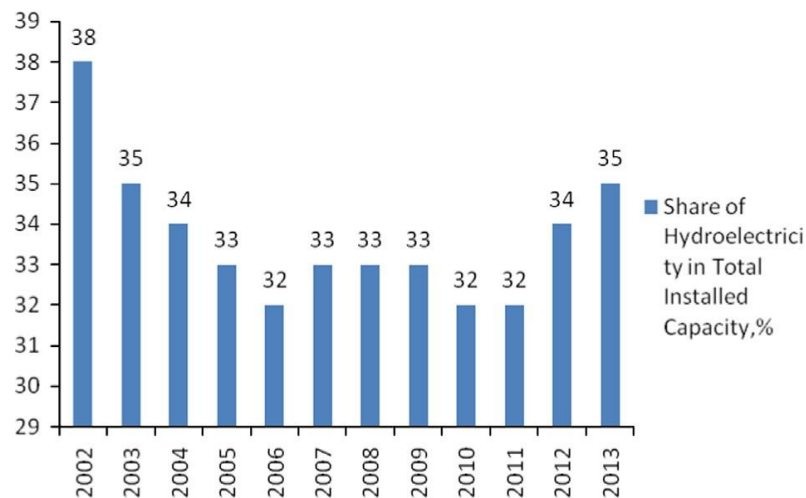
Currently, the energy demand originated from the growing population and industrialization across the world cannot be compensated with the limited resources of the world, and the gap between energy production and consumption is growing promptly. Conversely, traditional energy production methods are a major contributor to current environmental pollution. Furthermore, it is indisputable that fossil fuel reserves will be depleted in the near future. Industrial activities annually release about 20 billion tons of carbon dioxide, 100 million tons of sulfur compounds, 2 million tons of lead, and various other toxic chemical compounds into the atmosphere.

Meeting the majority of the needs for energy, fossil fuels have been decreasing by amount day by day. Starting particularly in the 20th century, fossil fuels such as oil, coal and natural gas has affected the world to a great extent due to ozone layer perforation, acid rains and global warming, etc. Those effects perhaps make it hard to improve environmental health. On the other hand, since there are not infinite reserves, it is a well-known fact that fossil fuels is likely to be completely consumed in the upcoming years. Thus, it is essential to opt for renewable resources. From this perspective, worldwide electricity consumption per capita is averagely 3,081kWh/year, while it is 3,013 kWh/year in Turkey with leakage and losses (EIA, 2019). In this respect, the following charts demonstrate the share of renewables and hydroelectric power consumption in particular. As can be observed, the use of renewables in total capacity has increased over the years, and hydroelectricity has been used in relatively greater amounts despite some fluctuations in some years.

Figure 2*Share of Renewables**Note.* (EIA, 2019)

As seen in figure 2, In determining energy policies, energy and the environment factor must be considered together. In recent years, all developed countries have been attributing remarkable significance on utilizing ecologically friendly, renewable energy sources. In this respect, it seems that the next century will be marked by efforts to make progress in the use of the sun and its derivatives as well as other inexhaustible and clean energy resources.

Figure 3



Share of Hydroelectricity

Note. (EIA, 2019)

As illustrated in Figure 3, an analysis of global energy production reveals that fossil fuels account for the largest share at 60%. The combustion of fossil fuels releases various byproducts into the atmosphere, including gases such as CO₂, NO_x, and SO₂, which are emitted as flue gas. Flue gases also contain fly ash and hydrocarbons, while toxic metals such as nickel, cadmium, lead, and arsenic are also discharged into the atmosphere during fossil fuel combustion. CO₂ significantly contributes to the greenhouse effect, with rising CO₂ levels causing an increase in Earth's temperature and disrupting climate stability. Additionally, SO₂ and NO_x combine with atmospheric water vapor to form acid rain, which further exacerbates ecological imbalances. All fossil fuel residues cause air pollution with massive effects on numerous cities especially during the winter months. Of course, the environmental effects of fossil fuels are not limited to those mentioned above. They also bring health risks and even death due to methane gas explosions, which is not uncommon in our country. Another issue arises in the transportation of fossil fuels. Oil tanker accidents have been known to release hundreds of thousands of tons of oil into the sea.

The cleanest of the known fossil fuels, natural gas, on the other hand, is used as raw material in the electricity generation industry as it is found in nature. The natural gas

reserves in Turkey, however, are rather limited with 17.5 billion m³. Nowadays, its usage is steadily increasing.

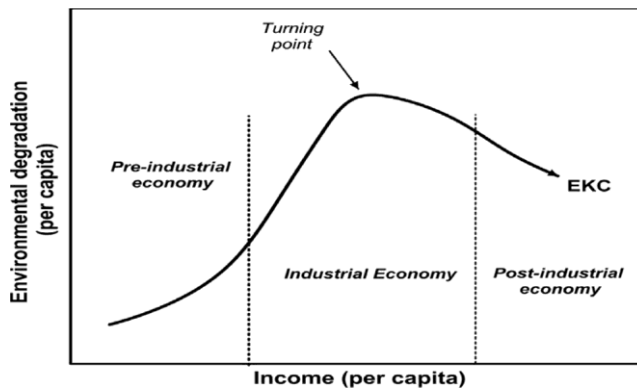
As for oil, 45% of the world's energy need is met by oil. It also constitutes 44% of the total energy consumption of Turkey. Thus, it is critical to sustain oil resources.

Compared to other fossil fuels, though, coal is widely available around the world and it is found in diverse industries, mostly used for power generation.

Nuclear energy differs from the previously mentioned fossil fuels. Unlike conventional power plants, nuclear power plants do not involve combustion reactions. These facilities are maintained under low pressure to prevent the release of radioactive elements into the environment in case of potential leaks in the primary or secondary cycle, particularly within the reactor building. In other words, the air in these buildings is absorbed, since the internal pressure will be low compared to the outside. An air flow is created not from the leaks outwards but inwards. The absorbed air is continuously measured and filtered, and then released to the environment in a controlled manner through the chimney. Likewise, liquid wastes are collected by similar methods and released into the environment in a confined way. Nuclear reactors that meet 17% of the world's electricity needs are shown as an alternative to rapidly depleting oil resources. As of 1996, 437 nuclear power plants have been actively operating in various countries. In terms of environmental impact, the anticipated waste from nuclear energy over 40-50 years is estimated to be around 200 m³. Due to the controlled storage of radioactive waste from nuclear energy, there is no environmental risk associated with it. Also, nuclear waste storage technology has been improving every passing day. In that manner, the nuclear energy use is likely to play an important role in preventing SO₂ and NO_x emissions as well as reducing CO₂ emissions. Fuel transportation, however, is quite risky due to possible accidents, which may turn into environmental pollution. Additionally, fuels are dependent on foreign sources to generate energy by raw materials. On top of that, fossil fuels with increased use during the industrial and post-industrial economy have caused significant environmental damage, despite a certain level of decrease in the post-industrial term, as demonstrated in the below chart.

Figure 4

Environmental Degradation



Note. (Bölük & Mert, 2014)

As seen in figure 4, using fossil fuels as a source of energy leads to important negativities including but not limited to foreign-source dependency, high import costs and environmental problems. Furthermore, the significance of renewable energy sources is increasing daily as global fossil fuel reserves rapidly diminish. These sources are not only sustainable but also universally available. Additionally, their environmental impact is considerably lower compared to non-renewable energy sources. With the resolution of current technical and economic challenges, renewable energy sources are expected to become the primary energy source in the 21st century.

To elaborate on hydro energy, on the other hand, one can understand this type of energy as one that is obtained through converting the potential energy of water into kinetic energy. By using 1/3 of the hydro power's economically operable potential, 17% of the world's electricity production is met. Hydroelectric power plants account for 23% of global electricity production. However, favorable geographical conditions are required for the establishment of hydroelectric power plants for energy generation. Provided that these conditions are met, hydro projects have the advantage of no greenhouse gases, SO₂ and no particle emissions, as can be understood from an analysis of the interaction of hydroelectric power plants with the environment. However, certain changes in dams, flora, fauna, settlements and worsening water quality cause negative consequences. The creation of large water reservoirs can potentially disrupt natural and geological balance by causing soil erosion. Additionally, the marshes formed in these reservoirs provide a conducive environment for methane gas formation.

On top of that, annual precipitation in our country ranges between 200-2500 mm and the average precipitation (arithmetic) is 642.6 mm. This comes into line with an annual average of 501 billion m^3 of precipitation, and nearly 186 billion m^3 of this amount of water, which falls on the surface of our country annually, becomes flow.

Many dams and hydroelectric power plants have been built to date to control the regimes of our streams, thus preventing floods and providing drinking water, irrigation benefits and energy from stored water. More dams are planned to be built to irrigate 7,254,454 ha of land. Moreover, 704,868 ha of land will be protected from flood, while 130,326 ha will be prevented from drying. 9,856,3 hm^3 water will be provided to cities and towns as drinking water. 485 hydroelectric power plants with a total power of 34,728.7 MW will generate 123,040 GWh of energy. According to the studies conducted so far, this plan seems feasible.

Conversely, solar energy, a renewable source derived from the sun, maintains a consistent intensity beyond Earth's atmosphere, ranging from 1370 W/m^2 to $0-0-1100 \text{ W/m}^2$ on the planet's surface. It can be harnessed for controlled heating, cooling, and electricity generation. Our country experiences an average of 2640 hours of sunshine annually, with the highest exposure in July at 362 hours and the lowest in December at 98 hours. Electricity generation from solar energy is achieved through direct and indirect conversion methods. Presently, solar energy finds applications in residential and commercial settings, agricultural technology, industrial processes, transportation, communication devices, signalization, automation, and electricity production.

Turkey possesses abundant solar energy potential. The annual average solar energy is 1315 kWh/m^2 . The amount of energy on the entire surface of Turkey is 1025.1012 kWh. This amount of the total electrical energy produced in 1996 is equivalent to approximately 11,000 times. The total installed solar cell power in our country was 250 kWp in 2000. Besides, there have been more efforts to lean towards the use of renewable energy sources in accordance with the world trends in an attempt to fight global warming and achieve the sustainable development goals. Many private companies in Turkey have recently been focusing on their production processes with the aim to ameliorate the environment in Turkey.

In sum, this chapter first summarized the renewable energy concept, and then elaborated on the advantages and disadvantages of renewable energy in the global perspective. The final part of the chapter provided a glimpse of renewable energy trends in Turkey. The next chapter will tackle the theoretical assumptions on the EKC model, in addition to several other test approaches.



5.MODEL & METHODOLGY

This chapter introduces the formula and theoretical foundation of the EKC and the Autoregressive Distributed Lag (ARDL) model. In parallel to the EKC, ARDL is often

used to understand the relations of causality between various variables in both the long- and short-terms. (Leybourne, 2003). Based on these models, the methodology used in the present study is explained, together with the modes, independent and dependent variables. It is essential to note that the models used in the study are expanded based on different regions of the world. In addition, the ARDL approach is investigated together with the EKC here, since the model features supplementary components to the Kuznets Curve Model, offering better comprehension. Besides these two theoretical models, several other test approaches will be scrutinized: the ADF, the PP, the KPSS and the DF-GLS.

The ADF (Augmented Dickey-Fuller Test) is developed to test a unit root in a given time series to refute the null hypothesis that there is a unit root at some point against the equation of stationary alternative (Cheung and Lai, 1995). On the other hand, the DF-GLS test is also a unit root analysis, yet a modified version of the ADF statistic. This modification was performed by a generalized least squares (GLS) logic with greater performance in particularly small size sample groups. This method was developed by Elliott, Rothenberg and Stock in 1996, and the authors attributed significance to this approach arguing that it was more comprehensive than the ADF especially in the presence of an unknown mean or trend (Elliott et.al, 1996). The PP test, or the Phillips–Perron test, is also a unit root test applied on time series. It is used to test the null hypothesis that a time series has cointegration (Davidson et. al, 2004). Finally, the KPSS (or the Kwiatkowski, Phillips, Schmidt and Shin tests) analyzes if a time series is stationary or not based on a mean or linear trend. Otherwise, it tests to see if that time series is non-stationary because of a unit root. By this means, a stationary time series can be found with constant statistical characteristics (Kwiatkowski et. al, 1992).

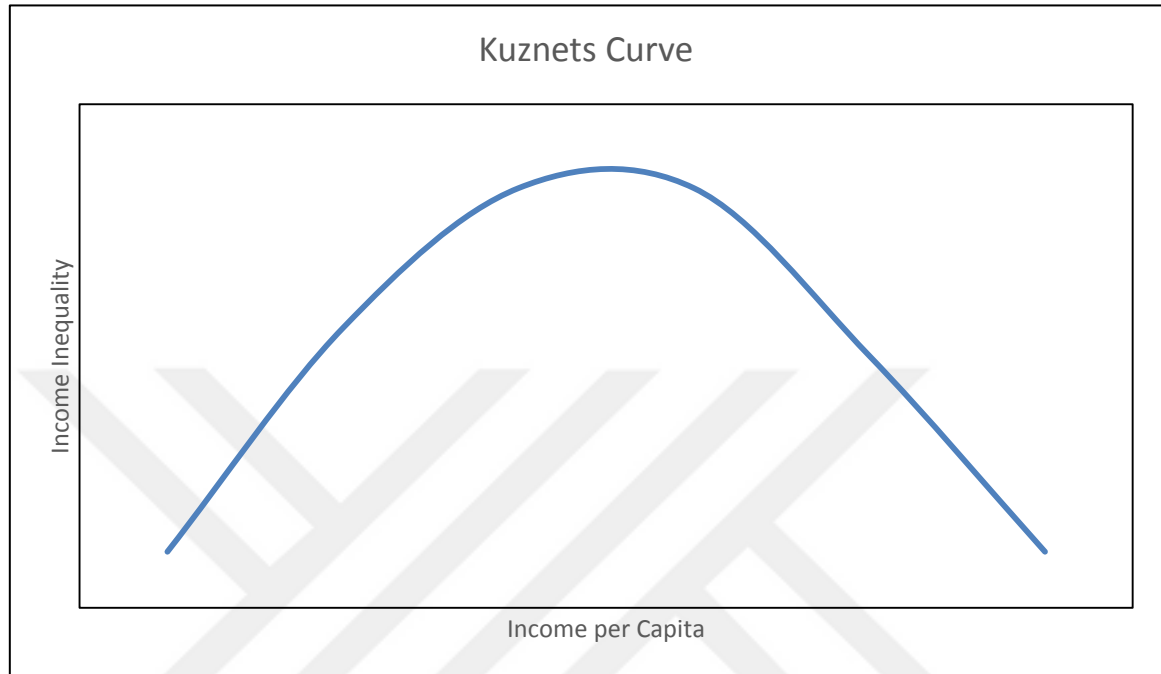
Before elaborating on the formulations of these tests, the following sub-chapter will first elaborate on the EKC model to be followed by an analysis of the ARDL model in the subsequent chapter.

5.1. The EKC Model and Related Literature

As stated in the beginning of this study, Simon Kuznets introduced the concept of the Kuznets Curve during the 1950s. The correlation between inequality in terms of

economic growth and personal income is used to explain various factors on this curve to determine the trends of income inequalities (Kuznets, 1955). Considering the period explained in the study, the major issue was the scarcity of data. There was especially a lack of specific data indicating the income distributions of the various classes in society. The first aim here was to identify the different social classes and observe their different income levels, however the empirical background of the Kuznets hypothesis was not solid. Therefore, the outcomes of the study were highly debated. Even Kuznets accepted the fact that empirical information had only 5% of accuracy while the 95% relied on wishful thinking. However, the Kuznets Curve found a significant place in the Economic literature.

The Kuznets Curve suggests a U-shaped relationship between income inequality and income per capita. As a country's economy welcomes growth, income inequality first increases, then reaches a peak point, and thereafter declines. Briefly, economic growth initially creates inequality, which is followed by the elimination of this particular inequality as long as the growth is continuous.

Figure 5*Kuznets Curve*

Note. (Chen et al. 2018)

At the beginning of the 1990's, environmental and energy issues became of crucial importance in the field of economic growth on international platforms with the effects of environmental problems such as global warming, air pollution, increasing natural resource use, and carbon dioxide emission. Along with these developments, the Kuznets Curve approach describing the “Inverse U” or “Bell Curve” relationship between income distribution and income level was adapted to the environment in the 1990's and reinterpreted based on the relationship between per capita income and environmental quality. This curve can be seen in figure 5.

Economists have shown that the environmental pollution level increases first and then decreases during the economic growth process and therefore, there is an inverse U-shaped relationship between per capita income and pollution level (Grossman and Krueger; 1991, 1995; Shafik, 1994; Panayotou, 1993). This relationship is called the Environmental Kuznets Curve (EKC) hypothesis in the literature of economy. According to the Environmental Kuznets Curve Approach, the environmental pollution level increases first

and then decreases during the economic development process (Stern, 2004). Therefore, the final result of the EKC approach is that economic growth is not an environmental problem, on the contrary, it has positive impacts on environment.

Grossman and Krueger (1991)'s research is accepted as the core study explaining how the relationship of EKC will be realized (Carson, 2010: 7). Here, the researchers stated that the impact of economic growth on environmental quality should be explained in terms of scale, structural and technological effects. According to these effects, while technology means data in the early stages of economic growth, as production increases, more resources and energy will be used as input used in the production process. Therefore, more production, more resources and greater energy use will result in more wastes and pollutant emissions, which will ultimately lead to the deterioration of environmental quality (Torras and Boyce, 1998; Dinda, 2004; Prieur, 2009). This effect, expressed as the scale effect, emerges in the early stages of economic growth. On the other hand, the structural impact implies that the economy will undergo a structural transformation through the ongoing growth process and that the economic growth will have a positive impact on environment. As the income level increases, the structure of the economy will start to alter and the share of economic activities that pollute the environment will diminish with gradually increasing production. In addition, the transition from the energy-intensive industry to the technology-intensive service and information sector takes place in the final phase of the structural transformation. Since technology intensive sectors use less natural resources, these sectors will have less impact on environmental pollution (Tsurumi and Managi, 2010: 20). The last effect in the growth process, as mentioned, is the technology effect. New technological processes will emerge as the country with higher income levels can allocate more resources to R&D activities. Thus, the country will replace the old and dirty technologies with new and clean technologies and increase its environmental quality (Copelan and Taylor, 2003).

The number of studies on the validity of the Environmental Kuznets Curve Approach has increased significantly in recent years. These studies point out to pollution types, (sulfur dioxide, nitrogen oxide, carbon dioxide, carbon, dissolved oxygen, particulate matter, phosphorus and nitrogen values related to water pollution, deforestation,

etc.), differences in established models (logarithmic, log-linear, cubic, quadratic) depending on the periods and countries discussed.

As it has already been underlined, the first study examining the relationship between environmental quality and economic growth was made by Grossmann and Krueger (1991). This study examined the relationship between air quality and economic growth for 42 NAFTA countries by cross-sectional analysis. Sulfur dioxide (SO₂) and particulate matter (PM) values were used as indicators of air quality. In this study, an inverse U-shaped relationship was found between environmental quality and income. Grossman and Krueger (1995) analyzed the relationship between water quality and per capita income as well as air quality by expanding their first study. 14 different variables (arsenic, cadmium, nitrate, lead, coliform, etc.) were used as indicators of pollution in the study, which included different country groups and different periods.

The methodology of Grossman and Krueger (1995) aimed to estimate several reduced-form equations, which revealed the relationship between the degree of pollution, whether it was water or air, and the function of the current and lagged income per capita in countries as well as other covariates. The model includes the variables of environmental regulations, technology, and industrialization as shown below.

$$Y_{it} = G_{it}\beta_1 + G_{it}^2\beta_2 + G_{it}^3\beta_3 + \bar{G}_{it-}\beta_4 + \bar{G}_{it-}^2\beta_5 + \bar{G}_{it-}^3\beta_6 + X'_{it}\beta_7 + \varepsilon_{it} \quad (5.1.1)$$

Y_{it} measures pollution level in terms of air or water in station i in year t , whereas G_{it} is GDP per capita in year t , $\bar{G}_{it-}$ is the average GDP per capita of the previous period of three years, X'_{it} is a vector of other covariates and ε_{it} is the error term.

As a result of the study, the inverse U shaped relationship was found for five variables and the N shape was found for six of the 14 variables.

In this regard, throughout years, various econometric methods have been applied to test whether the Kuznets' Curve was U-shaped. The paper of Laszlo M, Laszlo K and Lachlan M (1998) shows a model which does not support Galleoti and Lanza (1999), where the U-shaped Environmental Kuznets Curve could not be gathered. The model is as below:

$$INQ_i = \alpha + \beta_1 Y_i + \beta_2 Y_i^2 + u_i \quad i=1, \dots, N \quad (5.1.2)$$

Where INQ_i is the income inequality for a given country i in the sample, Y_i is used as a proxy in terms of the level of development, indicating the log of the GDP per capita, while u_i is the disturbance term. The model focuses on gathering opposite signs of β values, which can prove the U-shape of the EKC (Environmental Kuznets Curve).

In the analysis, unbalanced panel data sets of 47 and 62 countries are used for the time period from 1970 to 1993. Here, two-way fixed and random effect models are used. The results indicate that there is no significant evidence for a U-shaped Kuznets Curve. The authors, however, conclude the study by stating that income inequalities can be explained by other complex factors rather than the development level. It must be underlined that, apart from the previous studies, there is no variable indicating the environmental quality in this model.

On the other hand, Shafik (1994) specifies an empirical model by using four determinants in an econometric study. In this model, endowment indicates environmental quality; income per capita and technology represent the exogenous factor of technology in form of a time trend; and policy is used to estimate the environmental policies such as pollution taxations. Shafik specifies three models: log-linear, quadratic, and cubic:

$$E_{it} = \alpha_0 + \alpha_1 \ln Y_{it} + \alpha_2 T_t + \alpha_3 F_i + e_{it} \quad (5.1.3)$$

$$E_{it} = \beta_0 + \beta_1 \ln Y_{it} + \beta_2 (\ln Y_{it})^2 + \beta_3 T_t + \beta_4 F_i + e_{it} \quad (5.1.4)$$

$$E_{it} = \varphi_0 + \varphi_1 \ln Y_{it} + \varphi_2 (\ln Y_{it})^2 + \varphi_3 (\ln Y_{it})^3 + \varphi_4 T_t + \varphi_5 F_i + e_{it} \quad (5.1.5)$$

E indicates the environmental capital quality for a given country i , at the time of t . Y is the income per capita while T is the time trend. F represents the fixed effect factors and e is the error term.

The model is tested by the panel regression method. The results proved that environmental quality variables such as urban sanitation and access to clean water improve with higher per capita income. Moreover, environmental problems, especially air pollution, emerge when countries reach the middle-income level. Additionally, technology as a time trend has a positive effect on environment since it allows countries to produce with less

polluting methods. Shafik also underlines the importance of economic development since countries create environmental policies in proportion to their development levels.

Galleoti and Lanza (1999) focused on CO₂ emissions as the best evidence and tried to empirically characterize the reduced-form correlation between the pollutants — carbon dioxide emission in this study — and economic growth. In the article, two different models are used with the same variables: carbon dioxide emissions (CO₂) and real GDP (GDP). $i=1,\dots,N$ is the index of the countries whereas $t=1,\dots,T$ shows time indexes. The terms α_i and β_i represent country-fixed effects, α_t and β_t stand for year-fixed effects, and u_{it} and v_{it} are white noise disturbances. The linear and log models are as follows:

$$CO_{2it} = \alpha_i + \alpha_t + \alpha_1 GDP_{it} + \alpha_2 GDP_{it}^2 + \alpha_3 GDP_{it}^3 + u_{it} \quad (5.1.6)$$

$$\log CO_{2it} = \beta_i + \beta_t + \beta_1 \log GDP_{it} + \beta_2 (\log GDP_{it})^2 + \beta_3 (\log GDP_{it})^3 + v_{it} \quad (5.1.7)$$

Galleoti and Lanza underline the importance of distinguishing between variables, which can affect the GDP, and the ones that can be classified as endogenous or exogenous. In the model, dummy variables are: significant differences in fossil fuel demands, shares of various fossil fuels, output mixes, regulations, taxes, and subsidiaries. Technology changes and environmental policies are added to the model as fixed effects. Additionally, time dummies are included in the model, considering domestic price differences in countries. The countries are grouped as OECD and non-OECD to be able to observe the groups' patterns of economic growth.

Results of the model support the magnitude of the Environmental Kuznets Curve, where it is obvious that as the countries become richer, carbon dioxide emissions have the tendency to naturally reduce. Hence, it can be argued that emissions drop via economic growth. In other words, there is a turning point where the emissions start to decline with the effect of economic growth. However, Galleoti and Lanza mention that instead of an Inverted-U Shaped EKC, a problematic N-shaped curve is found as a result of applying the model. The main outcome of this study is the model specification. It is expressed that new functional forms have the potential to gather the bell-shaped EKC.

In another study examining the EKC Approach within the framework of air pollution, Selden and Song (1994) tried to explore the relationship between air pollution

and economic development with the panel data method for 30 countries categorized as high, middle and low income countries. The periods covered were 1973-1975, 1979-1981 and 1982-1984, respectively. The authors evaluated PM, *nitrous oxide (NOX)*, SO₂, and *carbon monoxide (CO)* values as pollutants. In this study, the EKC relationship was obtained for all indicators. Similarly, Panayotou (1997) used SO₂ as an indicator of pollution in his study covering 30 countries during the period between 1982 and 1994. According to the empirical results, they found an inverse U-shaped EKC relationship.

Apart from the pollutant gases causing air pollution, the literature has many other studies where carbon dioxide (CO₂) emission values are used as an indicator of pollution. This gas is a global pollutant and a major source of global warming and climate change. According to Denhez (2007), the share of CO₂ in the greenhouse gases causing global warming is around 60%. For this reason, numerous studies have examined the Environmental Kuznets Approach within the framework of the CO₂ gas. Moomaw and Unhruh (1997), for instance, considered CO₂ as an indicator of pollution in their studies covering 16 countries for the period between 1950 and 1992. By using the panel data method, they examined the relationship between CO₂ and per capita income, and consequently found an N-shaped relationship. "In another study, Dijkgraaf and Vollebergh (2005) analyzed the relationship between CO₂ and per capita income in OECD countries during the period between 1960 and 1997, using the panel data method." As a result of the study, they concluded that there was an EKC relationship for CO₂ emission in sample countries. In another important study, Ang (2007) examined the EKC relationship within the framework of energy use, income, and CO₂ emissions in France, for the period between 1960 and 2000. In this study, they reached findings supporting the EKC relationship, as well. In addition to this, the author suggested that the resulting EKC is expected to be more satisfactory with the addition of energy data in the analysis. Similarly, Shahbaz et al. (2012) tested the relationship between CO₂, per capita income, energy consumption and openness in Pakistan for the years between 1971 and 2009, using the methods of the boundary test approach (ARDL) and causality analysis. In the study, they concluded that there was a long-term relationship between these variables, supporting the EKC relationship.

Nevertheless, some studies examining the Environmental Kuznets Approach within the framework of CO₂ gas were unable to support any EKC relationship. He and Richard (2010) examined any possible EKC relationship for Canada using CO₂ emission data between 1948 and 2004, and the findings did not manifest any relationship. In another study, Agras and Chapman (1999) used the panel data method in their evaluation of 34 countries between 1971 and 1989, and found no support for any EKC relationship. Similarly, Fodha and Zaghdoud (2010) tested the validity of the EKC approach in Tunisia for 1961-2004 by benefiting from the methods of cointegration and causality analysis. Here, no EKC relationship was found, while a linear correlation was discovered between per capita income and CO₂.

In the context of Turkey, it can be observed that studies on the validity of the EKC relationships are quite limited. Among these studies, Başar and Temurlenk (2007) tested the period between 1950 and 2000 to validate the EKC relationship for Turkey using the least squares method. They used CO₂ emission as an indicator of pollution and considered three different models in their effort to explain the reason of the emissions. In this vein, the authors used the regression method to analyze the correlation between solid fuel and fuel oil based CO₂ in the first model, CO₂ per capita in the second model, and the relationship between fossil fuel based CO₂ and GDP per capita in the third model. In the study, a significant result was not obtained for the first model, while an inverse N-shaped relationship was obtained for the second and third models. On the other hand, Atıcı and Wolf (2007) examined the relationship between CO₂, income and foreign trade for the period between 1968 and 2000 in Turkey, using time series data by the least squares approach. Based on the study results, they found EKC evidence in Turkey, for the relationship between income and CO₂. “In another study, Akbostancı et al. (2009) tested the validity of the EKC approach for CO₂, SO₂ and PM in Turkey. In the first model, they investigated the relationship between CO₂ and per capita income for 1968-2003 by applying the Johansen – Juselius cointegration method.” In the second model, they analyzed the correlation between per capita income and SO₂ and PM and per capita income for 1992-2001, using the panel data method for 58 provinces. On the basis of the study, a linear and long-term relationship was found between CO₂ and per capita income, while an N-related relationship was obtained between SO₂ and PM. Furthermore, Halıcıoğlu (2009)

investigated the relationship between CO₂, income and foreign trade in Turkey during the years between 1960 and 2005, using the causality and the ARDL bounds testing method. In the study, the author concluded that it was found a long-term correlation among those variables. In addition, income was the main factor affecting CO₂ emissions, followed by energy consumption and foreign trade. Ozturk and Acaravcı (2010), on the other hand, tried to explore the CO₂ emissions, economic growth, the employment rate, and energy consumption in Turkey for the period between 1968 and 2005 within the scope of cointegration and causality, using the ARDL bounds testing and Granger causality test methods. As a consequence, they found a cointegration relationship between the given variables. They also reached the conclusion of CO₂ emission decreases revenues, and energy consumption increases revenues. In addition, they tested the EKC relationship in the context of causality by a log-linear model and could obtain no findings supporting any relationship.

5.2. The ARDL Model

The Autoregressive Distributed Lag Bound Test, or briefly the ARDL Boundary Test, developed by Pesaran and Shin (2001), is used to test the concept of cointegration of at least two non-stationary series in a given context of variables. In other words, the ARDL is a model used to find long- and short-term causality relationships between any chosen variables. In this cointegration test, as in other cointegration tests, there is no need for the cointegration relationship between the series to be equally stable.

Consequently, the ARDL model offers several significant advantages. Firstly, it allows for the application of the boundary test regardless of whether the variables in the model are stationary at level I (0) or stationary at first difference I (1). As a result, there is no need to determine the variables' degree of integration before performing the boundary test. Therefore, it is not required to determine the degree of the variables before the execution of the boundary test. However, since the critical values are tabulated according to whether their variables are I (0) or I (1), the variables should be tested against the possibility of being stationary I (2) in the second difference. In the second difference, the ARDL model cannot be used for the stationary variables, since the ARDL approach uses an unrestricted error correction model. This provides better statistical properties than the

Engle Granger test, which assumes that all variables are stationary when trying to find the long-term relationship between them. Similarly, the Johansen test only assumes non-stationary data, while the ARDL differentiates between both stationary and non-stationary sets (Österholm and Hjalmarsson, 2007). The ARDL yields more feasible outcomes in small samples than Johansen and Engle-Granger tests, since it would be harder to distinguish stationary and non-stationary figures. Additionally, other tests for cointegration analysis can only give good results over a long period of time, while the ARDL offers short-term analysis, as well. Statistical analyses demonstrate that the ARDL model significantly lowers the likelihood of spurious regression when dealing with non-stationary series by incorporating the necessary lags. This indicates that spurious regression often arises from the omission of relevant variables, which can be mitigated by including the appropriate lags. Different from the other models, the ARDL method also provides short-run and long-run coefficients.

Bento and Moutinho (2016) made a major comparison between the panel method and the ARDL model. Here, Bento and Moutinho (2016) stated that they preferred the ARDL model instead of the panel method as it shows a superior performance in smaller sample sizes, despite it may also be applied to time series as well as to panel data. As it is stated in their work, another reason for Bento and Moutinho (2016) to prefer the ARDL model is that it has superiority over the long-run Granger causality test, as they defended that the ARDL model works better in longer term analyses. In the extant literature, the majority of the research has been based on panel methods, instead of using time series models. Stated otherwise, renewable energy research has usually been neglected in the past literature. Here, the ARDL model appears as a highly attractive alternative with regard to investigating long term relationships.

Narayan (2005) stated that the ARDL method has lots of advantages over other single cointegration procedures. Some advantages include: the prevention of endogeneity problems and problems in testing the hypotheses in the long-run by the Engle-Granger method, the availability to simultaneously estimate long-run and short-run parameters of the model, the applicability of long-run analysis between the variables regardless of whether the underlying regressors are purely $I(0)$, purely $I(1)$, or fractionally integrated,

and the superiority of the small sample property of the model over the multivariate cointegration.

From the beginning of 1960's to the end of 1970's, distributed lag (DL(q) or ARDL(0,q)) models had often been used and in these models, it was common to restrict the distribution of the values that the α coefficients might take to decrease the number of parameters, with the aim of preventing the harmful effects of multicollinearity associated with including many lags of "x" as regressors. Koyck (1954), for example, used lots of restrictions for the estimation of the DL (∞) model. These restrictions caused α coefficients to decay at a polynomial rate, leading to the model to transform into an autoregressive model, referred to as the ARMAX model by adding an error term that comes after the average process. To achieve consistent estimations using the model's parameters, Instrumental Variables estimation is usually applied here.

The ARDL method is also used in the present study, as the majority of the studies in the literature indicate that the ARDL method gives better and more consistent results in Kuznets curve analysis.

Economic time series generally have non-stationary processes (Johansen and Juselius, 1990: 170). False regression problems may arise as a result of analyses using non-stationary time series (Granger and Newbold, 1974). Differences are carried out to ensure stability. "However, while causing loss of information in the series, this process can eliminate the existing relationship between the series (Tari and Yildirim, 2009: 100)." Therefore, cointegration analysis is applied, which states that the series determined to be non-stationary may have a static composition and that this may be determined econometrically (Eriçok and Yılancı, 2013: 95).

In an attempt to see how the ARDL model has progressed over time, one can observe a significant change in 2004. Here, a different approach was brought to the Koyck model by Frances and van Oest (2004), 50 years after the model's introduction into the literature. In the past, Almon (1965) also offered certain restrictions to the coefficients in a DL(q) model. The base of Almon's model was associated with Weierstrass' Approximation Theorem, claiming that every continuous function might be approximated, arbitrarily closely, by a polynomial of some order. The point here is to determine the order.

The Almon estimator might also be interpreted as a restricted least squares estimator (Giles, 1975; Schmidt and Waud, 1973).

A change in any economic variable may also cause changes in other economic variables beyond the time, and the effects of this change might not be felt immediately, but the effects are usually seen in a longer time frame. Thus, it is really important to investigate the long-run dynamics of the variables. Here, the ARDL models are especially useful models in presenting long-term relationships.

$$y_t = \beta_0 + \beta_1 y_{t-1} + \dots + \beta_p y_{t-p} + \alpha_0 x_t + \alpha_1 x_{t-1} + \alpha_2 x_{t-2} + \dots + \alpha_q x_{t-q} + \varepsilon_t \quad (5.2.1)$$

In this equation, y_t is the value at time period t of the dependent variable y , and in the model, y_t is partly explained by lagged values of itself. The model features a distributed lag component that includes successive lags of the x explanatory variable. Sometimes, the current value of x_t itself is left out from the distributed lag part of the model. The term ε_t is referred to as the random disturbance term, and the model is assumed as autoregressive by its nature, as the outcome variable of the ARDL model is partly explained by its lagged values. The successive lags of the explanatory variable x constitute the distributed lag part of the model.

In the ARDL model, the lagged values of the dependent variable exist as regressors, therefore, the OLS (Ordinary Least Squares) estimation of the ARDL model is expected to generate biased coefficient estimates. In the cases where the disturbance term ε_t is autocorrelated, the OLS also turns out to be an inconsistent estimator. In such cases, Pesaran and Shin (2001) applied the Instrumental Variables Estimation when using the model.

The ARDL model can be applied if the variables are stationary in a relatively longer term. If the variables are stationary at the base level, this situation is described as $I(0)$. If the variables are stationary at the first difference, this is described as $I(1)$ and if the variables are stationary at the second difference, this case is referred to as $I(2)$. If the error-correction coefficient is negative and significant, this indicates a long-run relationship between independent and dependent variables. While applying the ARDL model, unit root tests are used to determine whether the variables are $I(0)$ or $I(1)$. The aim here is to test

that the data are not I (2), as the ARDL model is applied only for the variables that are stationary at the base level or at the first difference, but not applied for the variables that become stationary at the second difference. Suitable lags are determined using the statistical criteria of Akaike (AIC), Schwarz (SIC) and LM. According to this statistical test, if the p-value is greater than 0.05, this means that there is no auto-correlation, which is important in determining the suitable delay.

Hence, based on the ARDL model, cointegration exists if there are at least two sets of data that are not stationary but become stationary over time (i.e., at the base level or at the first difference) when they are together. Here, hypothesis tests are applied to test the cointegration. In that manner, the null hypothesis states that there is no cointegration, while the alternative hypothesis demonstrates that there exists cointegration. When the F statistic is greater than F table upper limit, this means that null hypothesis is rejected and there is cointegration. On the other hand, if F statistic is lower than F lower limit, null hypothesis may not be rejected, thus no integration can be found. Meanwhile, if the F lower limit is lower than F statistic, or lower than F upper limit, it indicates that there is an unstable region.

$H_0: \theta_1 = \theta_2 = 0$ (No cointegration hypothesis)

$H_a: \theta_1 \neq \theta_2 \neq 0$ (Cointegration has an alternative hypothesis)

If the F statistic > F table upper limit; $H_0: \theta_1 = \theta_2 = 0$ is rejected and cointegration exists.

If the F statistic < F table lower limit; $H_0: \theta_1 = \theta_2 = 0$ is considered and no cointegration is found.

If the H_0 hypothesis is rejected and it is concluded that there is cointegration, the ARDL Short-Term and Long-Term interpretations are made at the last stage. However, for the model to work, the Error Correction Model (also shown as EC (-1) or CointEq (-1)) must be negative and statistically significant. That is, the p-value should be less than 0.05. The EC (-1) parameter shows a period delay value of the residues obtained from the long-term relationship between the dependent variable and the independent variables.

In this regard, the ARDL boundary testing approach consists of three stages. In the first step, it is tested whether there is a long-term relationship between the variables included in the analysis. If there is a cointegration relationship between these variables, long- and short-term elasticities are obtained respectively in the following stages (Narayan and Smyth, 2006: 337). Here, the p-value in the model corresponds to the relevant delay length. Information criteria are used to decide the p value. After determining the lag length in the ARDL boundary test, the basic hypothesis $H_0: \theta_1 = \theta_2 = 0$ is tested using the F test (Narayan, 2005: 1981) to investigate the existence of the cointegration relationship between the variables included in the analysis (Narayan, 2005: 1981). However, the standard F test used to test the basic hypothesis has a non-standard distribution for a few cases (Narayan and Narayan, 2005: 431). Narayan and Narayan's (2005) study defines these cases as follows: (i) when the variables in the ARDL model are I (0) or I (1), (ii) the number of variables and (iii) when the ARDL model contains fixed terms and/or trends. Therefore, the critical values that should be compared with the test statistics, as done by Pesaran et al. (2001). These critical values consist of two parts: According to the variables I (0) and I (1), critical values were determined for upper and lower limits. If the calculated F statistical value is greater than the upper limit of the critical value, the basic hypothesis that there is no long-term relationship between the variables is rejected. However, this basic hypothesis cannot be rejected if the calculated F statistical value is lower than the lower limit of the critical value. If the calculated F statistic value is between the upper and lower limits, no decision can be made, and other cointegration tests that take into account the stationarity of the variables are recommended (Yılancı, 2012: 70). In the ARDL boundary test approach, the next step is to reject the basic hypothesis as a result of the F test. This stage consists of two parts: first, the suitable lag length is found by considering Schwartz Bayesian Criterion (SBC) for the long-term ARDL model in Equation 2. In the following section, the model is estimated by the least squares technique (Narayan and Narayan, 2005: 431). The variable HDT_{t-1} , expressed as the error correction term in the short-term model, is the value of the residual series obtained from the long-term ARDL model one period earlier. The coefficient of this variable indicates how much of the imbalance in the short term can be corrected in the long term.

The next chapter will focus on several other models as a follow-up to the ARDL to provide background for several theoretical analyses.

5.3. Theoretical Analysis of the ADF, the DF-GLS, the PP and the KPSS

The Kwiatkowski, Phillips, Schmidt and Shin (KPSS) test analyzes stationarity like other unit root tests. However, according to this test, the classical unit root tests cannot accept the null hypothesis as unit rooted and provide a strong proof. Thus, the founders of the test state that the null hypothesis is not unit rooted, that is, it is stationary, and they prefer the opposite hypothesis over the DF (Degrees of Freedom) and ADF (Augmented Dickey Fuller Test) hypotheses. The KPSS tests the stationary zero hypothesis against the unit rooted alternative hypothesis. A test is proposed for the null hypothesis that an observable series is stationary around a deterministic trend. This test is based on a non-parametric estimator of the long-run variance of residuals. The equation for the test is as follows:

$$y_t = x_t' \delta + u_t \quad (5.3.1)$$

The x in the equation is the deterministic component that expresses the “constant” or “the constant and the trend”. The residuals obtained with the help of this equation are used for the test statistic estimation. The test statistic will be:

$$LM = T^{-2} \sum_{t=1}^T S_t^2 / f_0 \quad (5.3.2)$$

Here, T is the number of observations, S is the cumulative residual function, calculated as

$$S(t) = \sum_{r=1}^t \hat{u}_r, \quad f_0 \text{ is the estimator of the residual spectrum at zero frequency.}$$

It can be seen that the Bartlett Kernel function is widely used in the application of the KPSS test. In addition, the Quadratic Spectral Kernel function, which was shown to be more effective by Andrews (1991), can also be used. In the KPSS test, unlike other unit root tests, the basic hypothesis is that there is no unit root, and the hypothesis is established

as $H_0: \rho < 1$ ve $H_1: \rho = 1$. The LM test statistic is compared with the KPSS (1992) critical values.

As mentioned above, the DF test, developed by Dickey and Fuller, is a unit root test demonstrating whether time series variables can be expressed with an autoregressive (AR) process, if there is auto-correlation in the error term as a result of the test, and if the time series cannot be expressed with a first-order autoregressive process (Göktaş, 2001: 35). In the DF approach, the unit root test is applied for the $\gamma = 0$ hypothesis based on the estimation of the least squares (LMS) method and the decision is made according to the calculated statistics. Rejecting the null hypothesis of $\gamma = 0$: H_0 provides evidence of stability and supporting the alternative hypothesis of $0: H_1 \gamma p$. If the null hypothesis is not rejected, it is concluded that the series contains a unit root.

The DF-GLS test statistic proposed by Elliot, Rosenberg and Stock (1996) is based on the following test regression without deterministic exogenous variables:

$$\Delta Y_t = \alpha_0 Y_{t-1}^d + \alpha_1 \Delta Y_{t-1}^d + \dots + \alpha_p \Delta Y_{t-p}^d + \text{error} . \quad (5.3.3)$$

$H_0: \alpha_0 = 0$ null hypothesis is tested with the DF statistics. In other cases, the asymptotic distributions are different. The ERS approximates the asymptotic distributions with Monte Carlo methods and tabulates the critical values. If the calculated test statistic is less than the critical value, the unit root null hypothesis is rejected.

There are non-parametric corrections in this unit root test proposed by Phillips and Perron. Equation for the test (Phillips and Perron, 1988) is determined as follows:

$$\Delta y_t = \alpha y_{t-1} + x_t' \delta + \varepsilon_t \quad (5.3.4)$$

Here, $\alpha = \rho - 1$, and x_t is the deterministic component that expresses the “constant” or “the constant and the trend”. Non-parametric corrections are made to calculate the test statistic in the Phillips-Perron test. Therefore, auto-correlation does not affect the asymptotic distribution of the test statistics. These corrections are based on the spectrum estimate of ε_t at zero frequency and provide consistent estimates as given below:

$$\hat{t}_\alpha = t_\alpha \left(\frac{\gamma_0}{f_0} \right)^{-1/2} - \frac{T(f_0 - \gamma_0)(s_e(\hat{\alpha}))}{\alpha f_0^{1/2} s} \quad (5.3.5)$$

Here $(\hat{\alpha})_e$ is the standard error of the coefficient s , and s is the standard error of the equation; T is the number of observations, 0 is the consistent estimate of the error variance, and 0 is the estimator of the residual spectrum at zero frequency. The estimation of $0 f$ can be made by the Kernel Based Covariance Sum Method or the AR Spectral Density Estimation Method. In the Phillips-Perron test, the basic hypothesis is that there is a unit root and the hypotheses are established as $H_0 : \alpha = 0$ and $H_1 : \alpha < 0$. The asymptotic distribution of the test statistics is the same as the ADF test. Therefore, the test statistics are compared with the MacKinnon critical values.

5.4. Theoretical Analysis of the EKC

The ARDL Boundary Test or the Autoregressive Distributed Lag Bound Test, developed by Mohammad Hashem Pesaran and Yongcheol Shin in 2001, is being used to test the concept of cointegration of at least two non-stationary series. As elaborated before, it is a model for capturing long- and short-term causality relationships. In this cointegration test, there is no need for cointegration relationships to be equally stable, as in other cointegration tests.

Basically, the ARDL regression models are in the form of:

$$y_t = \beta_0 + \beta_1 y_{t-1} + \dots + \beta_p y_{t-p} + \alpha_0 x_t + \alpha_1 x_{t-1} + \alpha_2 x_{t-2} + \dots + \alpha_q x_{t-q} + \varepsilon_t \quad (5.4.1)$$

Here, the term ε_t is referred to as the random disturbance term. This model is autoregressive by its nature, since the outcome variable of the ARDL model is partly explained by its lagged values. The successive lags of the explanatory variable x constitute the distributed lag part of the model.

In the ARDL model, the lagged values of the dependent variables exist as regressors of the model, and thus, the OLS estimation of the ARDL model is expected to generate biased coefficient estimates. In the cases where the disturbance term ε_t is

autocorrelated, the OLS also turns out to be an inconsistent estimator. In such cases, Instrumental Variables Estimation is applied while using the model.

The ARDL long-run model formulation with the dependent variable of Y and two independent variables (E and M) is estimated by econometrics and statistics programs as below:

$$Y_t = a_0 + \sum_{i=1}^m a_{1i} Y_{t-i} + \sum_{i=0}^m a_{2i} M_{t-i} + \sum_{i=0}^m a_{3i} E_{t-i} + u_t \quad (5.4.2)$$

If the error-correction coefficient is significant and negative, this illustrates a long-run correlation between independent and dependent variables. Here, the long-run coefficients of the co-integrating equation illustrate the long-run impact.

After the ARDL long model based on the dependent variable of Y and two independent variables (E and M) is estimated, the EC in the formula shows the Error Correction Model. The Error Correction Model (ECM), on the other hand, manifests the duration that will take for stabilizing the shocks caused by independent changes in the short. Hence, the ECM shows the short-run dynamics of the relationship between independent and dependent variables.

$$\Delta Y_t = a_0 + \sum_{i=1}^m a_{2i} \Delta Y_{t-i} + \sum_{i=0}^m a_{3i} \Delta M_{t-i} + \sum_{i=0}^m a_{4i} \Delta E_{t-i} + a_1 EC_{t-1} + u_t \quad (5.4.3)$$

While applying the ERDL model, unit root tests are used to determine whether the variables are I (0) or I (1). The aim is to test if the data are not I (2). Suitable delays are determined using the Akaike (AIC), Schwarz (SIC) and LM statistical criteria. The LM Probe-Chi-Square > 0.05 condition, which shows that the Akaike (AIC) and Schwarz (SIC) are at the minimum and there is no autocorrelation, is important in determining the suitable delay. The F statistics table is created using the suitable delays. Here:

H0: $\theta_1 = \theta_2 = 0$ (No cointegration hypothesis)

$H_0: \theta_1 \neq \theta_2 \neq 0$ (Cointegration has an alternative hypothesis)

If the F statistic $>$ F table upper limit; $H_0: \theta_1 = \theta_2 = 0$ is rejected and this means that cointegration exists.

If the F statistic $<$ F table lower limit; $H_0: \theta_1 = \theta_2 = 0$ is considered and no cointegration is found.

If the F table lower limit $<$ F statistic, the $<$ F table upper limit; it indicates an unstable region.

If the H_0 hypothesis is rejected and it is concluded that there is cointegration, the ARDL Short-Term and Long-Term (Error Correction Model showing deviation) interpretations are made at the last stage. However, for the model to work, the Error Correction Model (also shown as EC (-1) or CointEq (-1)) must be negative and statistically significant. That is, the Probe value should be less than 0.05. The EC (-1) parameter shows a period of delay for the residues obtained from the long-term relationship between the dependent variable and the independent variables.

As the majority of the studies in the literature indicate that the ARDL method gives better and more consistent results in the Kuznets curve analysis, this study also featured the application of the ARDL method. In this context, economic time series generally have non-stationary processes (Johansen and Juselius, 1990: 170), and false regression problems may arise as a result of analyses using non-stationary time series (Granger and Newbold, 1974). Differences are applied to ensure stability. However, while causing loss of information in the series, this process can eliminate the existing relationship between the series (Tari and Yildirim, 2009: 100). Therefore, cointegration analysis is applied, which states that the series determined to be non-stationary may have a static composition and that this may be determined economically (Eriçok and Yılancı, 2013: 95).

To sum up, this chapter first dwelled upon the EKC model and the related literature followed by an introduction of the ARDL model together with its variables and statistical strengths. Finally, studies investigating the EKC with ARDL model were explained through their scientific formulations.

6. ESTIMATIONS AND EMPIRICAL RESULTS

Within the scope of the Model and Methodology chapter, the Kuznets curve relationship is tested for different regions where Turkey is engaged with trade relations. A baseline model and different models have been constructed for each of these regions with detailed analyses of the collected data. Then, in the final part of the chapter, the empirical results of the model are presented.

6.1 Introduction

According to the Kuznets Curve relationship, it is defended that up to a certain threshold level, CO₂ emissions increase as GDP of a given country increases. However, after that threshold, CO₂ emissions start to decrease along with the GDP increases. Several lines of research explain this inverse U shape relationship by stating that after a certain GDP increase, high income countries lower down their CO₂ emissions by exporting their CO₂ to the lower-income countries with which they have been engaged in trade relations (Jebli, Youssef, & Öztürk, 2016). Based on these studies, it may be claimed that trade with lower income countries decreases CO₂ emission as CO₂ is transferred to these countries again through trade; while trade with higher income countries increase CO₂ emission as these countries transfer their CO₂ to the lower income countries. In present study, the ARDL model is chosen for the analyses of this relationship, and Eviews software applied for detailed description. Thus, this chapter starts with explaining why the ARDL model is the most suitable model in this case, and then explains the regions where Turkey has trade relations with other countries. Here, Europe and Central Asia, High Income Countries, and the Arab World are selected as higher-income countries that Turkey engages in trade relationship with, while the MENA (Middle East and North Africa) are chosen as lower-income countries that Turkey engages in trade relationship with. After that, the models that are constructed in Eviews are explained. In the final step, the findings from the models are explained with various implications.

6. 2. Data Description

Used for analysis in this chapter, Turkey's Merchandise Trade Data are gathered from the database of the World Bank. The inputs refer to annual records from 1960 to 2020. Both Turkey's total trade openness data and regional trade data are used in the analyses. The regions with trade relations are chosen as the "Arab World", "Europe and Central Asia", "High-Income Countries", and the "Middle East and North Africa". The data analyzed include Carbon emission, GDP, the square of GDP, energy consumption, renewable energy supply, trade openness, and regional merchandise exports and imports.

The countries, which belongs to the regions, are listed below:

Arab World

Algeria, Bahrain, Comoros, Djibouti, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Qatar, Saudi Arabia, Somalia, Sudan, Syria, Tunisia, United Arab Emirates, West Bank and Gaza, Yemen.

Europe and Central Asia

Albania, Andorra, Armenia, Austria, Azerbaijan, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Channel Islands, Croatia, Cyprus, Czechia, Denmark, Estonia, Faroe Islands, Finland, France, Georgia, Germany, Gibraltar, Greece, Greenland, Hungary, Iceland, Ireland, Isle of Man, Italy, Kazakhstan, Kosovo, Kyrgyz Republic, Latvia, Liechtenstein, Lithuania, Luxembourg, Moldova, Monaco, Montenegro, Netherlands, North Macedonia, Norway, Poland, Portugal, Romania, Russian Federation, San Marino, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Tajikistan, Turkmenistan, Ukraine, United Kingdom, Uzbekistan.

High-Income Countries

Andorra, Antigua and Barbuda, Aruba, Australia, Austria, Bahamas, Bahrain, Barbados, Belgium, Bermuda, British Virgin Islands, Brunei Darussalam, Canada, Cayman Islands, Channel Islands, Chile, Croatia, Curacao, Cyprus, Czechia, Denmark, Estonia, Faroe Islands, Finland, France, French Polynesia, Germany, Gibraltar, Greece, Greenland, Guam, Hong Kong, Hungary, Iceland, Ireland, Isle of Man, Israel, Italy, Japan, Korea, Kuwait, Latvia, Liechtenstein, Lithuania, Luxembourg, China, Malta, Monaco, Nauru, Netherlands, New Caledonia, New Zealand, Northern Mariana Islands, Norway, Oman, Panama, Poland, Portugal, Puerto Rico, Qatar, Romania, San Marino, Saudi Arabia, Seychelles, Singapore, Sint Maarten (Dutch Part), Slovakia, Slovenia, Spain, St. Kitts and Nevis, St. Martin (French Part), Sweden, Switzerland, Trinidad and Tobago, Turks and Caicos Islands, United Arab Emirates, United Kingdom, United States, Uruguay, Virgin Islands (U.S.).

Middle East and North Africa

Algeria, Bahrain, Djibouti, Egypt, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Libya, Malta, Morocco, Oman, Qatar, Saudi Arabia, Syria, Tunisia, United Arab Emirates, West Bank and Gaza, Yemen.

6.3. Explaining the Model

The base equation of the model is as follows:

$$\ln CO_{2t} = \beta_0 + \beta_1 \ln GDP_t + \beta_2 \ln GDP_t^2 + \beta_3 \ln TRADE_t + \beta_4 \ln ENCON_t + \beta_5 \ln RE_t + \varepsilon_t \quad (6.3.1)$$

Here, CO_2 refers to the carbon dioxide emission, GDP refers to the gross domestic product, $TRADE$ refers to the total trade amount, $ENCON$ refers to the energy consumption, and RE refers to the renewable energy supply. CO_2 is the dependent variable, while all the other variables are predictors that are expected to have an effect on the dependent variable. There are two different approaches used while running the regional

models. The regional models that are used separately for each region, under Approach 1, are as follows:

$$\ln CO_{2t} = \beta_0 + \beta_1 \ln GDP_t + \beta_2 \ln GDP_t^2 + \beta_3 \ln ENCON_t + \beta_4 \ln RE_t + \beta_5 \ln MEXPREGION_t + \beta_6 \ln MIMPREGION_t + \varepsilon_t \quad (6.3.2)$$

In this equation, *MEXPREGION* refers to the merchandise export of a specific region, while *MIMPREGION* refers to the merchandise import of that specific region. On the other hand, under Approach 2, merchandise export and import appear as two different variables in regression. Other than merchandise export and merchandise import of the region, the variable *TRADEREGION* is also added to the model, which is the total export and import of Turkey for the remaining regions other than that specific region. This *TRADEREGION* variable is added to the model to be able to check the trade that takes place outside the region. The regional models under Approach 2 are as follows:

$$\ln CO_{2t} = \beta_0 + \beta_1 \ln GDP_t + \beta_2 \ln GDP_t^2 + \beta_3 \ln ENCON_t + \beta_4 \ln RE_t + \beta_5 \ln TRADEREGION_t + \beta_6 \ln MEXPREGION_t + \beta_7 \ln MIMPREGION_t + \varepsilon_t \quad (6.3.3)$$

In Approach 2, besides merchandize exports and imports of a specific region, the total amount of trade of that region (exports + imports) is also added to the model, named as variable *TRADEREGION*. Hence, all the models are run twice for each region, one without the variable *TRADEREGION* and one with the variable *TRADEREGION*. Consequently, there exist nine equations within the scope of the study, one as the base equation, and others as the two equations resulting from each of the four regions.

“Base Equation”

The base equation of our model is as follows:

$$\ln CO_{2t} = \beta_0 + \beta_1 \ln GDP_t + \beta_2 \ln GDP_t^2 + \beta_3 \ln TRADE_t + \beta_4 \ln ENCON_t + \beta_5 \ln RE_t + \varepsilon_t \quad (6.3.4)$$

“Arab World”

The equation of Arab World model is as follows:

$$\ln CO_{2t} = \beta_0 + \beta_1 \ln GDP_t + \beta_2 \ln GDP_t^2 + \beta_3 \ln ENCON_t + \beta_4 \ln RE_t + \beta_5 \ln MEXPARAB_t + \beta_6 \ln MIMARAB_t + \varepsilon_t \quad (6.3.5)$$

“Arab World Equation with Trade”

Here, Trade is defined as (Export + Import)/GDP, excluding Merchandise Exports and Imports to the Arab World. The equation of our model is as follows:

$$\ln CO_{2t} = \beta_0 + \beta_1 \ln GDP_t + \beta_2 \ln GDP_t^2 + \beta_3 \ln ENCON_t + \beta_4 \ln RE_t + \beta_5 \ln TRADEARAB_t + \beta_6 \ln MEXPARAB_t + \beta_7 \ln MIMPARAB_t + \varepsilon_t \quad (6.3.6)$$

“Europe and Central Asia”

The equation of Europe and Central Asia model is as follows:

$$\ln CO_{2t} = \beta_0 + \beta_1 \ln GDP_t + \beta_2 \ln GDP_t^2 + \beta_3 \ln ENCON_t + \beta_4 \ln RE_t + \beta_5 \ln MEXPEUCA_t + \beta_6 \ln MIMEUCA_t + \varepsilon_t \quad (6.3.7)$$

“Europe and Central Asia Equation with Trade”

Here, Trade is defined as (Export + Import)/GDP, excluding Merchandise Exports and Imports to the Europe and Central Asia. The equation of our model is as follows:

$$\ln CO_{2t} = \beta_0 + \beta_1 \ln GDP_t + \beta_2 \ln GDP_t^2 + \beta_3 \ln ENCON_t + \beta_4 \ln RE_t + \beta_5 \ln TRADEEUCA_t + \beta_6 \ln MEXPEUCA_t + \beta_7 \ln MIMPEUCA_t + \varepsilon_t \quad (6.3.8)$$

“High-Income Countries”

The equation of High Income Countries model is as follows:

$$\ln CO_{2t} = \beta_0 + \beta_1 \ln GDP_t + \beta_2 \ln GDP_t^2 + \beta_3 \ln ENCON_t + \beta_4 \ln RE_t + \beta_5 \ln MEXPHI_t + \beta_6 \ln MIMHI_t + \varepsilon_t \quad (6.3.9)$$

“High-Income Countries Equation with Trade”

Here, Trade is defined as (Export + Import)/GDP, excluding Merchandise Exports and Imports to the High Income Countries. The equation of our model is as follows:

$$\ln CO_{2t} = \beta_0 + \beta_1 \ln GDP_t + \beta_2 \ln GDP_t^2 + \beta_3 \ln ENCON_t + \beta_4 \ln RE_t + \beta_5 \ln TRADEHI_t + \beta_6 \ln MEXP HI_t + \beta_7 \ln MIMP HI_t + \varepsilon_t \quad (6.3.10)$$

“Middle East and North Africa”

The equation of Middle East and North Africa model is as follows:

$$\ln CO_{2t} = \beta_0 + \beta_1 \ln GDP_t + \beta_2 \ln GDP_t^2 + \beta_3 \ln ENCON_t + \beta_4 \ln RE_t + \beta_5 \ln MEXPMENA_t + \beta_6 \ln MIMP MENA_t + \varepsilon_t \quad (6.3.11)$$

“Middle East and North Africa Equation with Trade”

In this equation, Trade is defined as (Export + Import)/GDP, excluding Merchandise Exports and Imports to the Middle East and North Africa. The equation of our model is as follows:

$$\ln CO_{2t} = \beta_0 + \beta_1 \ln GDP_t + \beta_2 \ln GDP_t^2 + \beta_3 \ln ENCON_t + \beta_4 \ln RE_t + \beta_5 \ln TRADEMEN A_t + \beta_6 \ln MEXPMENA_t + \beta_7 \ln MIMP MENA_t + \varepsilon_t \quad (6.3.12)$$

The descriptive statistics are presented for each of the variables in Table 1.

Table 1*Descriptive statistics*

	Mean	Median	Max	Min	Std. Dev.	Obs.
CO2	164915,7	145859	414898	16821	117947,7	61
ENCON	58,57557	50,58	128,7	10,69	37,56055	61
EXPORT	62267,61	20138,04	247186,4	287,7106	80160,89	61
GDP	281592,3	130690	950579	8022	319153,5	61
GDP2	1,81E+11	1,71E+10	9,04E+11	64356049	2,89E+11	61
TRADE	0,323444	0,33984	0,564	0,05727	0,166243	61
RE	9441,721	9636	15130	5966	2378,732	61
IMPORT	71085,54	24956,95	266904,3	513,769	90842,76	61
LOGGDP	11,67608	11,78058	13,76483	8,989943	1,479938	61
LOGGDP2	138,5211	138,7821	189,4704	80,81908	34,28753	61
MEXPARAB	8,29E+09	2,22E+09	3,67E+10	24692185	1,24E+10	61
MEXPEUCA	5,32E+09	1,07E+08	2,43E+10	2101654	7,83E+09	61
MEXPHI	2,82E+10	9,36E+09	1,17E+11	2,48E+08	3,67E+10	61
MEXPMENA	6,68E+09	1,96E+09	3,29E+10	24812808	9,97E+09	61
MIMPARAB	4,26E+09	2,47E+09	2,17E+10	14014967	4,75E+09	61
MIMPEUCA	1,01E+10	4,14E+08	4,82E+10	3103314	1,49E+10	61
MIMPHI	3,83E+10	1,55E+10	1,36E+11	4,14E+08	4,63E+10	61
MIMPMENA	4,54E+09	2,51E+09	1,66E+10	600641	5,17E+09	61

Table 1 shows the average, minimum, maximum and standard deviations of each variable. It can also be found on this table that there are 61 observations. Here, ARAB refers to Arab World, EUCA refers to Europe and Central Asia, HI refers to High-Income Countries, and MENA refers to the Middle East and North Africa.

To investigate the order of integration of the variables, four alternative unit root tests are performed, which are the PP, the KPSS, ADF, and the DF-GLS. The outcomes of the unit root analysis are shown in Table 2. The null hypothesis of PP, ADF, and DF-GLS unit root tests claims that the unit root is present and series are non-stationary. Whereas, the null hypothesis of the KPSS test claims that the variables are stationary. Here, all the

variables except RE (renewable energy supply) have unit roots. On the other hand, the variable RE is generated by stationary processes.

Table 2

Unit root analysis.

	ADF	DF-GLS	PP	KPSS
CO ₂	2,197	3,741*	8,341	0,876*
ENCON	2,181	3,701*	6,903	0,871*
GDP	2,43	2,724*	2,834	0,806*
GDP ²	1,279	-0,745	3,51	0,636*
TRADE	-1,051	-0,063	-0,868	0,859*
RE	-3,494*	-3,529*	-3,467*	0,484*
TRADEARAB	-1,051	-0,063	-0,868	0,859*
MEXPARAB	3,024	-1,125	2,722	0,655*
MIMPARAB	1,223	1,646	0,395	0,860*
MEXPEUCA	1,15	-0,105	2,012	0,696*
MIMPEUCA	7,546	0,478	0,354	0,675*
TRADEEUCA	-1,259	-0,236	-1,182	0,837*
MEXPHI	5,919	-0,23	2,814	0,705*
MIMPHI	3,784	1,398	1,908	0,815*
TRADEHI	-0,724	0,263	-0,235	0,871*
MEXPMENA	-1,012	-1,447	2,382	0,631*
MIMPMENA	0,421	0,694	0,003	0,736*
TRADEMENA	-0,931	0,008	-0,774	0,844*

Before the long-run and short-run ARDL tests, bounds tests are applied as the first step of analysis, indicating the long-term correlation among the variables. In the bounds test, if F statistics is over the upper bounds this means that there is a long-run relationship. If F statistics is lower than the lower bounds, then there is no long-run relationship. If the F statistic is between the lower and upper bound, then the test is inconclusive.

Additionally, the cointegration F test for the base equation can be found below. Here, the F statistics are over the upper bound, thus there exists a long-run relationship between the variables.

Table 3

Base equation bounds test.

F-Statistic	95% LB	95% UB	90% LB	90% UB	99% LB	99% UB
5.57215	2.14	3.34	1.81	2.93	2.82	4.21

The cointegration F test for Approach 1 of the Arab World can be found below. Again, F statistics are over the upper bound, and thus there is a long-run relationship between the variables.

Table 4

Arab World Approach 1 bounds test.

F-Statistic	95% LB	95% UB	90% LB	90% UB	99% LB	99% UB
6.261029	2.04	3.24	1.75	2.87	2.66	4.05

The cointegration F test for Approach 2 of the Arab World, shown below, manifests that F statistics are over the upper bound, so there is a long-run relationship between the variables.

Table 5

Arab World Approach 2 bounds test.

F-Statistic	95% LB	95% UB	90% LB	90% UB	99% LB	99% UB
6.120069	1.97	3.18	1.70	2.83	2.54	3.91

The cointegration F test for Approach 1 of Europe and Central Asia, given below, demonstrates that at the level of 95%, F statistics are over the upper bound, thus there is a long-run relationship between the variables.

Table 6

Europe and Central Asia Approach 1 bounds test.

F-Statistic	95% LB	95% UB	90% LB	90% UB	99% LB	99% UB
3.274264	2.04	3.24	1.75	2.87	2.66	4.05

The cointegration F test for Approach 2 of Europe and Central Asia can be found below. Here, F statistics are also over the upper bound, proving the existence of a long-run relationship between the variables.

Table 7

Europe and Central Asia Approach 2 bounds test.

F-Statistic	95% LB	95% UB	90% LB	90% UB	99% LB	99% UB
10.23146	1.97	3.18	1.70	2.83	2.54	3.91

The cointegration F test for Approach 1 of High Income Countries, again at the level of 95%, shows that F statistics are over the upper bound, so there exists a long-run relationship between the variables.

Table 8

High-Income Countries Approach 1 bounds test.

F-Statistic	95% LB	95% UB	90% LB	90% UB	99% LB	99% UB
3.625976	2.63	3.62	2.33	3.25	3.27	4.39

As the cointegration F test for Approach 2 of High Income Countries can be found below, F statistics are between the upper and lower bounds, and therefore the test is inconclusive.

Table 9

High-Income Countries Approach 2 bounds test.

F-Statistic	95% LB	95% UB	90% LB	90% UB	99% LB	99% UB
2.959497	2.50	3.50	2.22	3.17	3.07	4.23

The cointegration F test for Approach 1 of the Middle East and North Africa below shows that F statistics are over the upper bound. Thus, one can find a long-run relationship between the variables.

Table 10

Middle East and North Africa Approach 1 bounds test.

F-Statistic	95% LB	95% UB	90% LB	90% UB	99% LB	99% UB
9.042620	2.04	3.24	1.75	2.87	2.66	4.05

The below cointegration F test for Approach 2 of Middle East and North Africa demonstrates that F statistics are over the upper bound, so there exists a long-run relationship between the variables.

Table 11

Middle East and North Africa Approach 1 bounds test.

F-Statistic	95% LB	95% UB	90% LB	90% UB	99% LB	99% UB
3.945600	1.97	3.18	1.70	2.83	2.54	3.91

After this step, short-run and long-run analyses are conducted for Approach 1 and Approach 2 of each model. Here, it is worth consideration that when no short-run

relationship is found between the variables of the model, then this means that the obtained significant results might not be due to a short-run shock or a short-term recursive deviation of the variable, but a real long-term relationship might exist. After this step, long-run tests are applied to see whether there really exists a long-run relationship.

In the short-run analysis of the base equation, it might be seen that $CointEq(-1)$ is significant. Thus, there is no short-term Kuznets curve relationship.



Table 12*Base equation short-run analysis.*

Regressors	Coefficient	Prob.
DLOGGDP	-1.103373	0.0002
DLOGGDP2	0.002380	0.0001
DLOGTRADE	-0.069694	0.0843
DLOGENCON	0.451344	0
DLOGRE	0.01119	0.0056
CointEq(-1)	0.070061	0

In the long-run analysis, it can be observed that the long-run Kuznets relationship is significant. All the regressors have a significant relationship with CO₂ emissions.

Table 13*Base equation long-run analysis.*

Regressors	Coefficient	Prob.
DLOGGDP	4.629354	0.0042
DLOGGDP2	-0.188944	0.0011
DLOGTRADE	-0.060811	0.0143
DLOGENCON	2.138977	0
DLOGRE	-0.012534	0.0055

$$\ln CO_{2t} = \beta_0 + \beta_1 \ln GDP_t + \beta_2 \ln GDP_t^2 + \beta_3 \ln ENCON_t + \beta_4 \ln RE_t + \beta_5 \ln MEXPARAB_t + \beta_6 \ln MIMPARAB_t + \varepsilon_t \quad (6.3.4)$$

Here, besides the effect of GDP, there is an investigation of the square of GDP, environmental consumption, and renewable energy supply, the effects of merchandise exports and imports from and to the Arab World, on CO₂ emissions. In the short-run analysis of the trade with the Arab World under Approach 1, it can be seen that CointEq(-1) is significant, implying that there is no short-term Kuznets curve relationship.

Table 14

Short-run analysis of trade with the Arab World under Approach 1.

Regressors	Coefficient	Prob.
DLOGGDP	0.773645	0.0026
DLOGGDP2	0.034211	0.0019
DLOGENCON	0.788810	0.0000
DLOGRE	0.006165	0.0088
DLOGMEXPARAB	-0.027728	0.2250
DLOGMIMPARAB	-0.013280	0.2150
CointEq(-1)	-0.007429	0.0000

Under Approach 1, there is a long-run Kuznets curve relationship. Here, all of the regressors have marginal significant relationship with CO₂ emissions.

Table 15*Long-run analysis of trade with the Arab World under Approach 1.*

Regressors	Coefficient	Prob.
DLOGGDP	10.968426	0.0388
DLOGGDP2	-0.390755	0.0414
DLOGENCON	0.059147	0.0545
DLOGRE	-0.112014	0.0939
DLOGMEXPARAB	-0.084214	0.0639
DLOGMIMPARAB	-0.454201	0.0538

$$\ln\text{CO}_{2t} = \beta_0 + \beta_1 \ln\text{GDP}_t + \beta_2 \ln\text{GDP}_t^2 + \beta_3 \ln\text{ENCON}_t + \beta_4 \ln\text{RE}_t + \beta_5 \ln\text{TRADEARAB}_t + \beta_6 \ln\text{MEXPARAB}_t + \beta_7 \ln\text{MIMPARAB}_t + \varepsilon_t \quad (6.3.5)$$

As can be seen on the table, total trade in Turkey besides the Arab World is also included to the model as a control variable. In the short-run analysis for the trade with the Arab World under Approach 2, it can be seen that CointEq(-1) is significant and that there is no short-term Kuznets curve relationship.

Table 16*Short-run analysis of trade with the Arab World under Approach 2.*

Regressors	Coefficient	Prob.
DLOGGDP	-0.218033	0.0388
DLOGGDP2	0.008476	0.0232
DLOGENCON	1.044598	0.0000
DLOGRE	0.001848	0.6099
DLOGTRADEARAB	0.040969	0.2574
DLOGMEXPARAB	-0.005585	0.0004
DLOGMIMPARAB	-0.012924	0.0011
CointEq(-1)	-0.436411	0.0000

For the long-run analysis under Approach 2, considering the trade with the Arab World, there exists a significant Kuznets curve relationship. GDP, GDP² and ENCON have a significant relationship with CO₂ emissions. Here, it is worth to consider the merchandise imports and exports of the Arab World, and that trade outside the Arab World have marginal significant relationship with CO₂ emissions.

Table 17*Long-run analysis of trade with the Arab World under Approach 2.*

Regressors	Coefficient	Prob.
DLOGGDP	1.005311	0.0002
DLOGGDP2	-0.050531	0.0003
DLOGENCON	1.521470	0.0000
DLOGRE	-0.049348	0.0071
DLOGTRADEARAB	-0.066979	0.0326
DLOGMEXPARAB	-0.055546	0.0426
DLOGMIMPARAB	0.042993	0.0396

$$\ln\text{CO}_{2t} = \beta_0 + \beta_1 \ln\text{GDP}_t + \beta_2 \ln\text{GDP}_t^2 + \beta_3 \ln\text{ENCON}_t + \beta_4 \ln\text{RE}_t + \beta_5 \ln\text{MEXPEUCA}_t + \beta_6 \ln\text{MIMPEUCA}_t + \varepsilon_t \quad (6.3.6)$$

In the short-run analysis of trade with Europe and Central Asia under Approach 1, it can be seen that CointEq(-1) is significant and that there is no short-term Kuznets curve relationship.

Table 18*Short-run analysis of trade with Europe and Central Asia under Approach 1.*

Regressors	Coefficient	Prob.
DLOGGDP	-0.470293	0.0012
DLOGGDP2	0.021376	0.0000
DLOGENCON	1.113164	0.0000
DLOGRE	0.009054	0.0014
DLOGMEXPEUCA	-0.006463	0.5867
DLOGMIMPEUCA	-0.046017	0.0008
CointEq(-1)	-0.000040	0.0000

In the long-run, there exists no long-run Kuznets curve relationship for trade with Europe and Central Asia under Approach 1. GDP, GDP², ENCON, merchandise exports and merchandise imports have a significant relationship with CO₂ emissions. Here, also merchandise exports to EUCA have marginal significant relationship with CO₂ emissions.

Table 19*Long-run analysis of trade with Europe and Central Asia under Approach 1.*

Regressors	Coefficient	Prob.
DLOGGDP	-0.818635	0.0000
DLOGGDP2	1.424658	0.0001
DLOGENCON	1.140017	0.0000
DLOGRE	-0.020030	0.0064
DLOGMEXPEUCA	-0.011901	0.3239
DLOGMIMPEUCA	-0.030140	0.0474

$$\ln\text{CO}_{2t} = \beta_0 + \beta_1 \ln\text{GDP}_t + \beta_2 \ln\text{GDP}_t^2 + \beta_3 \ln\text{ENCON}_t + \beta_4 \ln\text{RE}_t + \beta_5 \ln\text{TRADEEUCA}_t + \beta_6 \ln\text{MEXPEUCA}_t + \beta_7 \ln\text{MIMPEUCA}_t + \varepsilon_t \quad (6.3.7)$$

In the short-run analysis of trade with Europe and Central Asia under Approach 2, it can be observed that CointEq(-1) is significant. Hence, there is no short-term Kuznets curve relationship.

Table 20*Short-run analysis of trade with Europe and Central Asia under Approach 2.*

Regressors	Coefficient	Prob.
DLOGGDP	-0.334596	0.0000
DLOGGDP2	0.016062	0.0000
DLOGENCON	1.088929	0.0000
DLOGRE	0.007246	0.2971
DLOGTRADEEUCA	0.020097	0.0690
DLOGMEXPEUCA	-0.003536	0.0860
DLOGMIMPEUCA	-0.033709	0.0238
CointEq(-1)	0.000578	0.0000

For the long-run relationship in trade with Europe and Central Asia under Approach 2, there exists a significant Kuznets curve relationship. Here, GDP, GDP², total trade and merchandise exports have a significant relationship with CO₂ emissions. This time, merchandise exports to EUCA have a significant relationship with CO₂ emissions, while merchandise imports from EUCA have marginal significant relationship with CO₂ emissions.

Table 21

Long-run analysis of trade with Europe and Central Asia under Approach 2.

Regressors	Coefficient	Prob.
DLOGGDP	0.519896	0.0000
DLOGGDP2	-0.143590	0.0000
DLOGENCON	0.893957	0.0001
DLOGRE	-1.012290	0.0034
DLOGTRADEEUCA	-0.002386	0.0214
DLOGMEXPEUCA	-0.015248	0.0110
DLOGMIMPEUCA	-0.108142	0.0496

$$\ln\text{CO}_{2t} = \beta_0 + \beta_1 \ln\text{GDP}_t + \beta_2 \ln\text{GDP}_t^2 + \beta_3 \ln\text{ENCON}_t + \beta_4 \ln\text{RE}_t + \beta_5 \ln\text{MEXPHI}_t + \beta_6 \ln\text{MIMPHI}_t + \varepsilon_t \quad (6.3.8)$$

In the short-run analysis of trade with High-Income Countries under Approach 1, it can be seen that CointEq(-1) is significant. So, there is no short-term Kuznets curve relationship.

Table 22*Short-run analysis of trade with High-Income Countries under Approach 1.*

Regressors	Coefficient	Prob.
DLOGGDP	-0.866760	0.0002
DLOGGDP2	0.036626	0.0002
DLOGENCON	1.211071	0.0000
DLOGRE	0.018090	0.0000
DLOGMEXPFI	-0.046381	0.0348
DLOGMIMPFI	-0.028733	0.2028
CointEq(-1)	-0.229687	0.0000

In the long-run, while doing trade with High-Income Countries, as GDP is significant but GDP² is non-significant, CO₂ emissions increase linearly due to economic growth and no Kuznets curve relationship exists. GDR, ENCON, RE, merchandise exports and merchandise imports have a significant relationship with CO₂ emissions. Here, it is worth consideration that merchandise exports to High-Income Countries and merchandise imports from High-Income countries have a significant relationship with CO₂ emissions, as well.

Table 23

Long-run analysis of trade with High-Income Countries under Approach 1.

Regressors	Coefficient	Prob.
DLOGGDP	-0.795185	0.0183
DLOGGDP2	0.015811	0.6131
DLOGENCON	1.380292	0.0000
DLOGRE	0.082227	0.0188
DLOGMEXPHI	0.068042	0.0455
DLOGMIMPHI	0.103829	0.0345

$$\ln CO_{2t} = \beta_0 + \beta_1 \ln GDP_t + \beta_2 \ln GDP_t^2 + \beta_3 \ln ENCON_t + \beta_4 \ln RE_t + \beta_5 \ln TRADEHI_t + \beta_6 \ln MEXPHI_t + \beta_7 \ln MIMPHI_t + \varepsilon_t \quad (6.3.9)$$

In the short-run analysis of trade with High-Income Countries under Approach 2, it can be found that CointEq(-1) is significant and that there is no short-term Kuznets curve relationship.

Table 24*Short-run analysis of trade with High-Income Countries under Approach 2.*

Regressors	Coefficient	Prob.
DLOGGDP	-0.010989	0.0000
DLOGGDP2	0.002457	0.0000
DLOGENCON	1.088830	0.0000
DLOGRE	0.008935	0.2140
DLOGTRADEHI	0.020228	0.0367
DLOGMEXPFI	0.009730	0.8358
DLOGMIMPFI	-0.023298	0.2234
CointEq(-1)	- 0.001418	0.0000

In the long-run analysis of trade with High-Income Countries under Approach 2, it can be seen that both GDP and GDP² are non-significant and there is no Kuznets curve relationship. ENCON, merchandise exports and merchandise imports have a significant relationship with CO₂ emission. It should be noted that merchandise exports to High-Income Countries and merchandise imports from High-Income countries again have a significant relationship with CO₂ emissions.

Table 25*Long-run analysis of trade with High-Income Countries under Approach 2.*

Regressors	Coefficient	Prob.
DLOGGDP	-0.541856	0.2163
DLOGGDP2	0.027128	0.8314
DLOGENCON	0.029525	0.0254
DLOGRE	-0.262629	0.2602
DLOGTRADEHI	0.024828	0.4857
DLOGMEXPHI	-0.086472	0.0328
DLOGMIMPHI	0.098779	0.0083

$$\ln\text{CO}_{2t} = \beta_0 + \beta_1 \ln\text{GDP}_t + \beta_2 \ln\text{GDP}_t^2 + \beta_3 \ln\text{ENCON}_t + \beta_4 \ln\text{RE}_t + \beta_5 \ln\text{MEXPMENA}_t + \beta_6 \ln\text{MIMPMENA}_t + \varepsilon_t \quad (6.3.10)$$

In the short-run analysis of trade with the Middle East and North Africa under Approach 1, it can be seen that CointEq(-1) is significant. Thus, there is no short-term Kuznets curve relationship.

Table 26*Short-run analysis of trade with the Middle East and North Africa under Approach 1.*

Regressors	Coefficient	Prob.
DLOGGDP	-0.583861	0.0060
DLOGGDP2	0.027202	0.0028
DLOGENCON	0.817990	0.0000
DLOGRE	-0.002821	0.4529
DLOGMEXPMENA	-0.035701	0.0040
DLOGMIMPMENA	0.000885	0.6524
CointEq(-1)	0.115809	0.0000

In the long-run analysis of trade with the Middle East and North Africa under Approach 1, both GDP and GDP² are significant and there exists a Kuznets curve relationship. Therefore, there is a reverse-U shaped relationship between economic growth and CO₂ emissions. There is also a significant relationship between ENCON, RE, and merchandise exports and CO₂ emissions. The variable of merchandise exports to MENA is significant, while merchandise imports from MENA is non-significant.

Table 27

Long-run analysis of trade with the Middle East and North Africa under Approach 1.

Regressors	Coefficient	Prob.
DLOGGDP	4.354020	0.0000
DLOGGDP2	-0.162435	0.0000
DLOGENCON	1.604423	0.0000
DLOGRE	-0.022546	0.0385
DLOGMEXPMENA	-0.302009	0.0196
DLOGMIMPMENA	- 0.020135	0.6482

$$\ln CO_{2t} = \beta_0 + \beta_1 \ln GDP_t + \beta_2 \ln GDP_t^2 + \beta_3 \ln ENCON_t + \beta_4 \ln RE_t + \beta_5 \ln TRADEMENA_t + \beta_6 \ln MEXPMENA_t + \beta_7 \ln MIMPMENA_t + \varepsilon_t \quad (6.3.11)$$

In the short-run analysis of trade with Middle East and North Africa Countries under Approach 2, it can be seen that CointEq(-1) is significant. So, there is no short-term Kuznets curve relationship.

Table 28*Short-run analysis of trade with the Middle East and North Africa under Approach 2.*

Regressors	Coefficient	Prob.
DLOGGDP	-0.292540	0.0001
DLOGGDP2	0.011502	0.0004
DLOGENCON	1.172420	0.0000
DLOGRE	-0.003853	0.2818
DLOGTRADEMENA	-0.015520	0.6324
DLOGMEXPMENA	-0.056125	0.0002
DLOGMIMPMENA	-0.026032	0.0040
CointEq(-1)	-0.699952	0.0000

In the long-run analysis of trade with the Middle East and North Africa under Approach 2, both GDP and GDP² are again significant and there exists a Kuznets curve relationship. So, there is a reverse U-shaped relationship between economic growth and CO₂ emissions.

Table 29

Long-run analysis of trade with the Middle East and North Africa under Approach 2.

Regressors	Coefficient	Prob.
DLOGGDP	1.256793	0.0000
DLOGGDP2	-0.003112	0.0000
DLOGENCON	1.522776	0.0000
DLOGRE	-0.033469	0.0084
DLOGTRADEMENA	-0.107633	0.0186
DLOGMEXPMENA	-0.022680	0.0394
DLOGMIMPMENA	-0.036055	0.0082

In the next step, Pairwise Granger Causality Tests are applied. The null hypothesis of the test is that there is no causality between the variables. From the Pairwise Granger-Causality Tests it can be understood that there is a unidirectional causality between the variables of CO₂ and GDP², CO₂ and trade, CO₂ and merchandise exports in Europe and Central Asia, CO₂ and merchandise imports in Europe and Central Asia, CO₂ and merchandise exports in High-Income Countries, CO₂ and merchandise imports in High-Income Countries, and CO₂ and merchandise imports in the Middle East and North Africa. Moreover, there is a bi-directional causality between the variables of CO₂ and merchandise exports in the Arab World, and CO₂ and merchandise exports in the Middle East and North Africa. This means that CO₂ is the cause for GDP², the total trade in Turkey, merchandise exports in Europe and Central Asia, merchandise exports in Europe and Central Asia, merchandise exports in High-Income Countries, merchandise imports in High-Income Countries and merchandise imports in the Middle East and North Africa. Meanwhile, CO₂ emission affects merchandise exports in the Arab World, while merchandise exports in the Arab World also affect CO₂ emission. Similarly, CO₂ emission affects merchandise exports in the Middle East and North Africa, while merchandise exports in Middle East and North Africa also affect CO₂ emission. For the rest of the variables, the causality test did not reject the null hypothesis that there is no causality.

Table 30*Pairwise Granger Causality tests.*

Null Hypothesis	F-statistics	Probability
D(GDP) does not Granger Cause D(CO ₂)	167.301	0.1987
D(CO ₂) does not Granger Cause D(GDP)	233.843	0.1076
D(GDP2) does not Granger Cause D(CO ₂)	0.94620	0.3955
D(CO ₂) does not Granger Cause D(GDP2)	420.621	0.0209
D(ENCON) does not Granger Cause D(CO ₂)	0.42116	0.6587
D(CO ₂) does not Granger Cause D(ENCON)	0.35030	0.7063
D(RE) does not Granger Cause D(CO ₂)	0.95127	0.3936
D(CO ₂) does not Granger Cause D(RE)	319.129	0.0502
D(TRADE) does not Granger Cause D(CO ₂)	0.01979	0.9804
D(CO ₂) does not Granger Cause D(TRADE)	327.494	0.0466
D(TRADEARAB) does not Granger Cause D(CO ₂)	0.11299	0.8934
D(CO ₂) does not Granger Cause D(TRADEARAB)	316.615	0.0513

D(TRADEEUCA) does not Granger Cause D(CO ₂)	0.02956	0.9709
D(CO ₂) does not Granger Cause D(TRADEEUCA)	310.430	0.0542
D(TRADEHI) does not Granger Cause D(CO ₂)	0.31125	0.7340
D(CO ₂) does not Granger Cause D(TRADEHI)	214.727	0.1281
D(TRADEMENA) does not Granger Cause D(CO ₂)	0.18590	0.8310
D(CO ₂) does not Granger Cause D(TRADEMENA)	310.680	0.0540
D(MEXPARAB) does not Granger Cause D(CO ₂)	360.218	0.0350
D(CO ₂) does not Granger Cause D(MEXPARAB)	145.065	1.E-05
D(MIMPARAB) does not Granger Cause D(CO ₂)	166.789	0.1996
D(CO ₂) does not Granger Cause D(MIMPARAB)	201.377	0.1448
D(MEXPEUCA) does not Granger Cause D(CO ₂)	0.02675	0.9736
D(CO ₂) does not Granger Cause D(MEXPEUCA)	744.128	0.0016
D(MIMPEUCA) does not Granger Cause D(CO ₂)	0.15509	0.8568

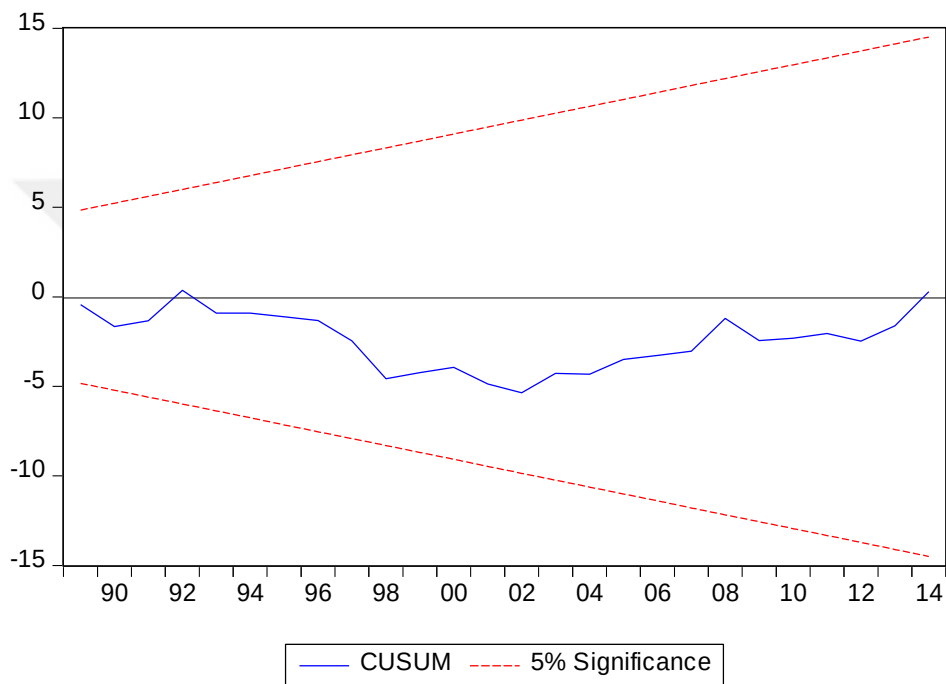
Granger Cause $D(CO_2)$		
$D(CO_2)$ does not Granger Cause $D(MIMPEUCA)$	542.425	0.0076
$D(MEXPPI)$ does not Granger Cause $D(CO_2)$	0.00936	0.9907
$D(CO_2)$ does not Granger Cause $D(MEXPPI)$	438.478	0.0179
$D(MIMPPI)$ does not Granger Cause $D(CO_2)$	0.23267	0.7933
$D(CO_2)$ does not Granger Cause $D(MIMPPI)$	419.110	0.0211
$D(MEXPMENA)$ does not Granger Cause $D(CO_2)$	619.547	0.0041
$D(CO_2)$ does not Granger Cause $D(MEXPMENA)$	607.589	0.0045
$D(MIMPMENA)$ does not Granger Cause $D(CO_2)$	0.03905	0.9617
$D(CO_2)$ does not Granger Cause $D(MIMPMENA)$	487.497	0.0119

CUSUM tests are applied to measure the coefficient stability. Here, if the CUSUM line is within the critical lines showing 5% significance level, this indicates that the coefficient is stable. Meanwhile, if the CUSUM line exceeds the significance lines, then this means that the coefficient is unstable.

For High-Income Countries, it can be understood that the CUSUM line does not exceed the upper and lower lines of significance, meaning that the coefficient is stable for these models.

Table 31

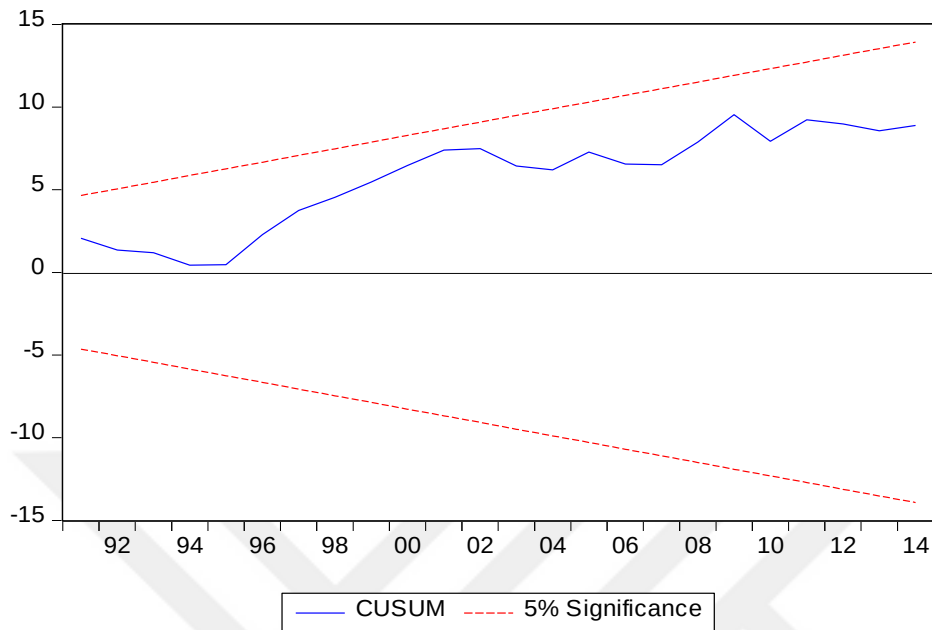
CUSUM test for High Income Countries.



When the CUSUM test is applied for the Middle East and North Africa, even though this time the CUSUM line moves upward and is close to the upper critical line, it can again be seen that it does not exceed the critical lines. Therefore, the coefficient in the Middle East and North Africa models is again stable.

Table 32

CUSUM test for the Middle East and North Africa.

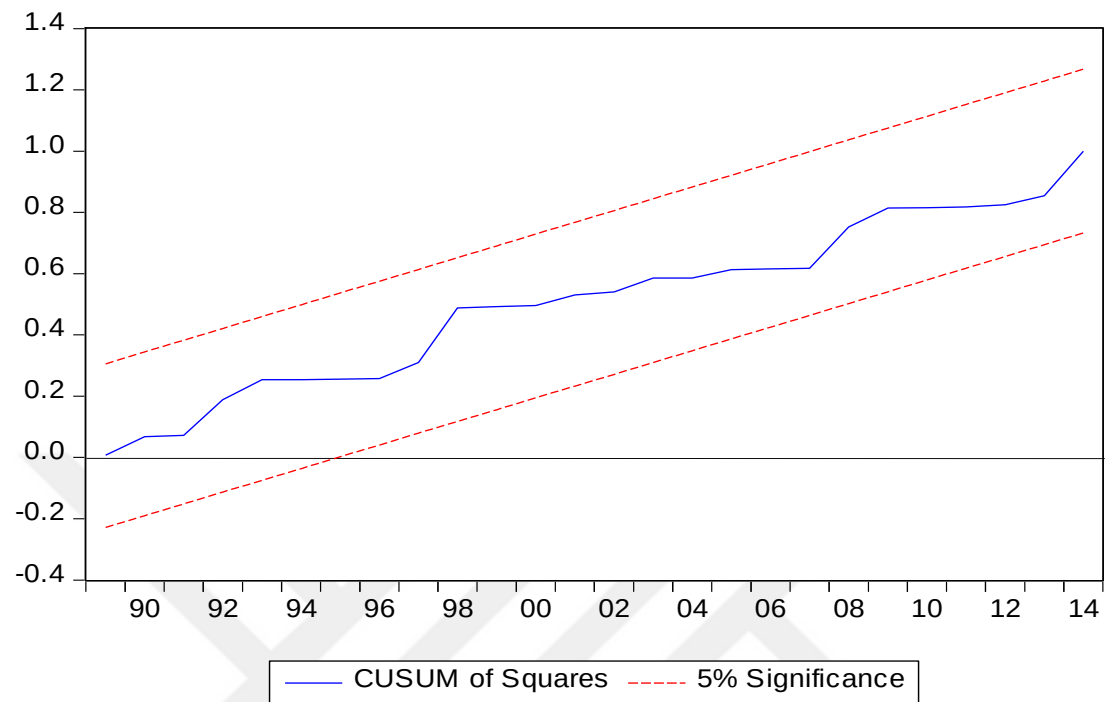


On the other hand, in CUSUM square tests, whenever the CUSUM of squares line exceeds the upper and lower critical lines, this indicates parameter or variance instability. However, if the CUSUM of square line is within the borders of two critical lines, then the parameter or variance of the models are stable.

For High-Income Countries, the CUSUM of square line does not exceed the upper and lower critical lines, while showing an upward trend. This means that the variance of the models is stable.

Table 33

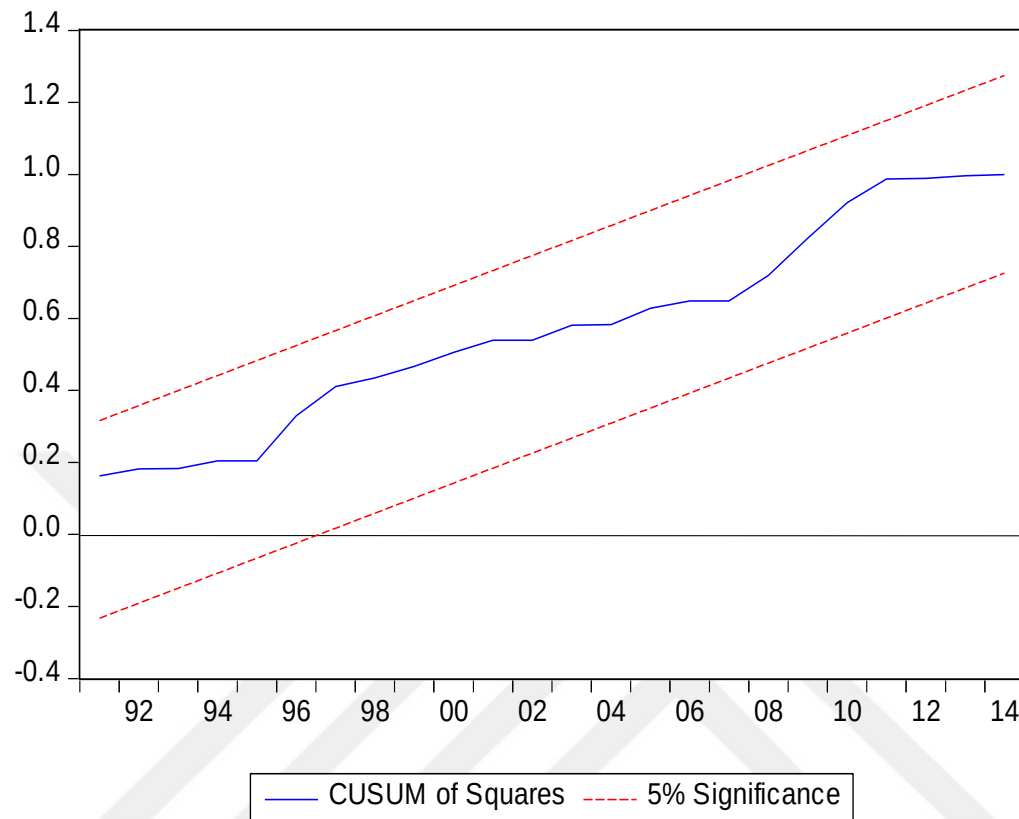
CUSUM of squares test for High-Income Countries.



For the Middle East and North Africa models, the CUSUM of squares line again shows an upward trend and does not exceed the critical lines, which again illustrates variance stability in the models.

Table 34

CUSUM of squares test for the Middle East and North Africa.



Here, the fact that the CUSUM and CUSUM of squares tests indicate stability for both High-Income Countries and the Middle East and North Africa indicates that the implications regarding trade with High-Income Countries and the Middle East and North Africa are reliable and also stable in the longer-term.

6.4. Conclusions of the Model Application

According to the results of the model application, there is a Kuznets Curve Relationship for the regions of the Middle East and North Africa, and Europe and Central Asia. The results of the application of the ARDL Model demonstrate that there is no Environmental Kuznets Curve Relationship for High-Income Countries. The most significant contribution to the literature that might be derived from these results is that trade with the Middle East and North Africa lowers down Turkey's CO₂ emission, while trade with High-Income Countries increases Turkey's CO₂ emission. This means that High-Income Countries, which have a higher level of development compared to Turkey, lower down their own carbon emissions by engaging in trade relations with Turkey, while Turkey does the same by engaging in trade relations with the Middle East and North Africa, which have a lower level of development in comparison to Turkey.

Table 35

Long run and short run results of the models

MODEL	KUZNETS CURVE			
	SHORT RUN		LONG RUN	
	YES	NO	YES	NO
Base Equation		✓	✓	
Arab World V1		✓	✓	
Arab World V2		✓	✓	
Europe and Central Asia V1		✓		✓
Europe and Central Asia V2		✓	✓	
High Income Countries V1		✓		✓
High Income Countries V2		✓		✓
Middle East and North Africa V1		✓	✓	
Middle East and North Africa V2		✓	✓	

To be able to provide a succinct examination of Turkey's merchandise trade dynamics, one must focus on its significant export and import products. Turkey, strategically positioned between Europe and Asia, boasts a diverse economy with a wide array of exportable goods. Conversely, its import portfolio reflects the nation's reliance on various commodities and technologies. Through an analysis of Turkey's trade patterns, this article sheds light on the key

industries driving the country's economy and the challenges and opportunities inherent in its trade relations. Turkey, renowned for its rich history and vibrant culture, stands as a pivotal player in the global trade arena. Situated at the crossroads of Europe and Asia, Turkey enjoys a strategic geographic position that has historically facilitated extensive trade activities. This article delves into Turkey's merchandise trade landscape, highlighting the major export and import commodities that contribute to the nation's economic vitality.

Turkey's export sector encompasses a diverse range of products, reflecting the nation's multifaceted economy. One of the standout export categories is textiles and apparel, where Turkey leverages its strong manufacturing base to produce high-quality garments and fabrics. Additionally, the country is a prominent exporter of automotive products, including vehicles, parts, and accessories. Turkey's automotive industry has experienced substantial growth, fueled by both domestic demand and international exports. Another notable export segment is the food and agriculture sector, with Turkey being a leading producer of fruits, vegetables, grains, and processed food products. The country's geographical diversity and favorable climate conditions contribute to its agricultural prowess, allowing for a wide variety of crops to thrive. Furthermore, Turkey's jewelry and precious metals industry has gained international recognition, with exports of gold, silver, and other ornamental items contributing significantly to foreign exchange earnings.

Turkey's export profile encompasses a diverse array of commodities directed towards the nations enumerated. A comprehensive overview reveals the following: In the realm of textiles and clothing, Turkey's export prowess is evident, with notable destinations including Algeria, Saudi Arabia, Sudan, Jordan, Lebanon, Libya, Egypt, Iraq, the United Arab Emirates, Morocco, and Tunisia. Turkey's export landscape extends to the machinery sector, where it dispatches machinery and mechanical appliances to countries such as Egypt, Iraq, Algeria, Lebanon, Libya, Morocco, Jordan, Kuwait, Tunisia, the United Arab Emirates, Qatar, and Saudi Arabia. The export of iron and steel products plays a pivotal role in Turkey's trade relations, with destinations including Egypt, Iraq, Algeria, Tunisia, the United Arab Emirates, Lebanon, Libya, Morocco, Jordan, Saudi Arabia. Furthermore, Turkey's automotive industry contributes significantly to its export portfolio, supplying vehicles and automotive parts to Egypt, Iraq, Jordan, Algeria, Lebanon, Tunisia, the United Arab Emirates, Morocco, Libya, and Saudi Arabia. Electronics constitute another key export category for Turkey, with

electrical machinery and equipment finding their way to Egypt, Iraq, Jordan, Algeria, Lebanon, Tunisia, the United Arab Emirates, Libya, Morocco, Saudi Arabia. In the realm of plastics and plastic products, Turkey's exports cater to the needs of various countries, including Lebanon, Libya, Morocco, Saudi Arabia, Iraq, Jordan, Tunisia, the United Arab Emirates, Algeria, and Egypt. Moreover, Turkey's export basket encompasses food products such as fruits, nuts, and vegetables, which are sought after by Jordan, Egypt, Iraq, Algeria, Lebanon, Saudi Arabia, Tunisia, the United Arab Emirates, Libya, and Morocco. It is imperative to acknowledge that the specific products and quantities transacted are subject to fluctuations influenced by trade agreements, market demand dynamics, and other contextual factors.

In tandem with its export activities, Turkey maintains a robust import portfolio to satisfy domestic demand and support industrial growth. Energy imports constitute a significant portion of Turkey's inbound trade, with the nation relying heavily on imports of crude oil, petroleum products, and natural gas to meet its energy needs. Despite efforts to diversify its energy sources, Turkey remains susceptible to global energy market fluctuations. Machinery and equipment represent another key import category for Turkey, encompassing a wide range of industrial machinery, electrical appliances, and technological devices. As Turkey aims to modernize its industrial infrastructure and enhance productivity, the importation of advanced machinery plays a pivotal role in achieving these objectives. Additionally, Turkey imports a variety of raw materials and intermediate goods to support its manufacturing sector, including metals, chemicals, and plastics.

Turkey's import profile includes energy resources in the form of natural gas, crude oil, and coal sourced from several regional partners, including Algeria, Iraq, Libya, and Saudi Arabia. Machinery imports constitute a significant aspect of Turkey's trade dynamics, with key suppliers including Germany, China, Italy, and the United States. Electronics form another vital import category for Turkey, with electrical machinery and equipment sourced from countries such as Germany, South Korea, China, and the United States. Iron and steel products are also imported by Turkey, sourced from nations like Russia, Germany, Ukraine, and Italy. Plastics and plastic products constitute a notable segment of Turkey's imports, with suppliers hailing from countries such as Germany, Belgium, Italy, and China. Turkey's automotive sector relies on imports for vehicles, parts, and accessories, sourced primarily

from Germany, France, Italy, and Japan. Chemical products, including pharmaceuticals, are imported by Turkey from countries like Germany, China, Belgium, and the United States. The importation of energy resources, including coal, natural gas, and crude oil, remains a significant component of Turkey's trade activity, with sourcing extending to countries such as Russia and Azerbaijan. It is essential to recognize that the nature and volume of imports are contingent upon various factors, including trade agreements, market dynamics, and national policies.

Turkey's merchandise trade dynamics underscore the nation's status as a vital player in the global economy. With a diverse export portfolio spanning textiles, automotive products, agriculture, and jewelry, Turkey capitalizes on its economic strengths to maintain a competitive edge in international markets. However, challenges such as energy dependence and the need for technological advancements persist, highlighting areas for strategic focus and policy intervention. By leveraging its geographical advantage and fostering innovation and diversification, Turkey can continue to thrive in the ever-evolving landscape of global trade.

In conclusion, this final chapter first explained the models used in this study, and then applied the models to clearly manifest their empirical results along with detailed descriptions of the related data and findings, as well as future implications, both in the short- and long-run. The empirical results showed that it is possible to observe a statistically significant Environmental Kuznets Curve not in the short run but in the long run. It is possible to state that merchandise trading is capable of having effect over a country's carbon emissions, at least, in the long run according to ARDL analysis.

7. OVERALL CONCLUSION

Economic activity, as has been explored in the previous chapters, is intrinsically linked to the continuous supply of raw materials, making the environment an indispensable resource for countries striving to sustain their economic growth. However, as nations tread the path of industrialization and economic expansion over prolonged periods, they unwittingly inflict significant harm upon the environment. This environmental degradation, in turn, acts as a double-edged sword, eventually undermining economic growth due to the depletion of vital raw materials and the adverse impacts of a deteriorating environment. This intrinsic relationship between environmental challenges and economic prosperity cannot be overstated, forming the core subject of this study.

Historical context provides a valuable backdrop for understanding this dynamic. The onset of mass production during the Industrial Revolution ushered in an era of increased resource utilization to meet the growing demands of expanding economies. This unbridled industrial growth led to a cascade of environmental challenges, including the depletion of the ozone layer, global climate change, widespread erosion, the diminishing of fresh water resources, and a pervasive rise in air pollution. The concurrent evolution of the relationship between the environment and the economy was significantly influenced by the development level of each country. Developed nations exhibited a propensity to invest in environmental solutions through technological innovations and other strategic investments. In stark contrast, underdeveloped and developing countries placed a predominant emphasis on economic growth and improved living standards, often at the expense of environmental pollution. In addition, these nations often lacked a comparative advantage in their industrial production. Consequently, it can be argued that lesser-developed countries have a diminished awareness of environmental concerns compared to their developed counterparts.

Recognizing these underlying dynamics, economists have long been immersed in the study of the repercussions of economic growth on the environment. Among these endeavors, our study specifically sought to dissect the EKC (Environmental Kuznets Curve) hypothesis, which elucidates the intricate relationship between environmental pollution and per capita income. Based on this model, environmental quality initially deteriorates as a consequence of increased industrialization and economic activity, but as per capita income continues to rise,

there is a subsequent improvement in environmental conditions. In simpler terms, this theory posits an inverse-U shaped correlation between environmental degradation and economic growth.

To illustrate this hypothesis, one can draw a historical parallel by observing that industrial pollution was virtually non-existent in pre-industrial societies, largely due to their low per capita income and limited industrial activities, which were predominantly confined to agriculture. However, the course of industrialization over time gave rise to severe environmental degradation. In response to this challenge, countries began to realign their economic structures in the wake of economic development. Clean technologies emerged, and economies started transitioning to service-oriented sectors, which, in turn, contributed to a more balanced relationship between environmental sustainability and economic growth.

Delving into the core tenets of the Environmental Kuznets Curve, it is imperative to recognize its function as a tool designed to delineate the relationship between economic growth, chiefly in terms of per capita income, and environmental degradation. Scholars operating within this framework posit that as per capita income rises, so too does environmental pollution. Nevertheless, they postulate that over time, this trend undergoes a reversal. The seminal work of Simon Kuznets in 1955 laid the foundational groundwork for this concept by initially exploring the relationship between income distribution and economic growth. Subsequently, this concept was adapted to the realm of environmental issues by Grossman and Krueger, who contended that, in the course of economic growth, environmental pollution initially surges, but then begins to decline, resulting in an inverse U-shaped relationship between per capita income and pollution levels.

This theoretical framework gave rise to a plethora of studies attempting to apply the EKC model to a range of variables. Such studies encompassed diverse facets, including the relationship between air pollution and economic growth, as measured by values like SO₂, PM, nitrous oxide (NOX), and carbon monoxide (CO), as well as investigations into greenhouse gases and water quality in relation to economic growth through causality analysis.

The culmination of these theoretical analyses sets the stage for a more comprehensive understanding of EKC approach, which elucidates the hypothetical relationship between per capita income and environmental pollution. This model proposes that the quality of life

initially deteriorates as a consequence of environmental pollution, but subsequently experiences an improvement as per capita income increases. Building upon these theoretical foundations, our study provided an in-depth exploration of the Turkish context, serving to create a bridge for the gap, which is between theory and empirical evidence.

In this vein, it was paramount to gain insight into Turkey's international trade relations and to assess their impacts on the environment. Understanding the historical context from the Ottoman Empire through the establishment of the Republic of Turkey in 1923 and beyond was essential to this analysis. Foreign capital inflow to the Ottoman Empire was initially constrained, evolving more slowly than in other countries due to diplomatic treaties. Notably, foreign capital started making inroads in the mid-19th century, driven by the pursuit of financial assets by the Ottoman Empire and external pressure. The 1838 Trade Agreement marked a significant turning point in these developments. Until the 19th century, the Ottoman Empire primarily sought solutions for its financial difficulties through domestic resources. However, from the 1840's onwards, European plutocrats and statesmen exerted considerable pressure on the central Ottoman bureaucracy to accept the policies in terms of foreign borrowing, leading to a substantial influx of European capital for investments. Given the circumstances of the time, foreign capital investments represented the most attractive and lucrative options for the Ottoman Empire to service its debts. These policies and foreign capital endeavors continued through the Republican period.

With the founding of the Republic of Turkey, the nation increasingly sought foreign capital to compensate for the inadequacies of domestic resources. It achieved remarkable progress in attracting foreign capital through new legislation, even amidst economic crises and the implementation of statist and nationalization approaches. The utilization of development plans, combined with legislative reforms aimed at liberalization, albeit limited during periods of conflict, played a pivotal role in securing foreign investments.

Building on our analyses of international trade, it was imperative to delve into the realm of renewable energy to comprehend the nuanced dynamics underpinning the relationship between the economic growth and the environment. Renewable energy sources, such as sunlight, wind, rain, waves, and geothermal heat, offer several distinct advantages, particularly in their capacity to mitigate nuclear pollution, water pollution, air pollution, the greenhouse effect, and soil erosion. These sources of energy also contribute to the

preservation of flora and fauna. A global analysis of energy production revealed that fossil fuels retain the largest share, accounting for 60% of the energy market. However, developed nations have steadily increased their utilization of renewable energy sources, signaling a shift toward more sustainable practices. For Turkey, the nation boasts a substantial solar potential, driving a burgeoning interest in renewable energy sources that align with global initiatives to fight against the climate change and pursue sustainable development targets. Private companies in Turkey are increasingly focusing on adjusting their production processes to align with these environmental trends, thus contributing to a greener and more sustainable environment in the country.

The comprehensive exploration of international trade, renewable energy trends, and the EKC model and its theoretical underpinnings serves as a valuable precursor to our study's in-depth analysis of the Turkish context. By elucidating the historical landscape and contemporary factors influencing Turkey's economic and environmental dynamics, we have laid the foundation for a more thorough understanding of the intricate interplay between environmental sustainability and economic growth within the nation.

In light of the dynamic nature of international trade, the economy, and the environment, this study recognized the importance of conducting an empirical analysis specific to the Turkish context. This approach ensures that the theories and models, it is explored resonate with the unique conditions of Turkey, offering a more accurate and region-specific perspective on the relationship between economic growth and environmental sustainability.

This research journey, however, did not stop at the national level. We extended our focus to a global context by examining the application of the Kuznets Curve model beyond Turkey. Notably, we delved into regions such as Europe, the Middle East, and North Africa, uncovering results that resonated with long- and short-run analyses. These findings underscored a compelling correlation between Gross Domestic Product (GDP) and CO₂ emissions, serving as evidence of a Kuznets Curve Relationship within the Middle East and North Africa, as well as Europe and Central Asia.

Contrastingly, our analysis via the Autoregressive Distributed Lag (ARDL) Model cast a different light on the relationship within High-Income Countries. Here, it was clear that

the Environmental Kuznets Curve Relationship did not manifest. Furthermore, our investigation into Turkey's trade interactions with the Middle East and North Africa region suggested that trade with these regions led to a reduction in Turkey's CO₂ emissions. In contrast, trade with High-Income Countries appeared to increase Turkey's CO₂ emissions. In conclusion, our research confidently lends empirical support to the concept of carbon leakage, where carbon emissions are transposed through merchandise trading. This finding holds significant implications for future research, advocating for a closer examination of the impact of foreign trade and economic growth on environmental degradation in countries beyond Turkey.

According to Republic of Turkey, Ministry of Trade; the main exports and imports of Turkey are raw materials, approximately the prior has more than 50% of the share while the latter has around 70% share. This indicates the possibility to transfer the carbon emissions from one country to another one. In this study, the empirical result showed that High-Income-Level countries transfer their pollution-creating production to Turkey; however, Turkey also does the same for Europe and Central Asia, Arab World, and Middle East and North Africa region. Nevertheless, Turkey has no policy transferring the carbon emissions. Economic relations of Turkey are not planned considering the environmental issues.

The culmination of this research stands as a testament to the dynamic interplay between economic growth and environmental sustainability. In the quest to comprehend this intricate relationship, it is navigated the intricate pathways of history, theory, and empirical analysis. This thesis extends beyond the theoretical realm, offering a bridge between academic discourse and real-world implications as well as it invites policymakers, scholars, and concerned citizens to draw upon our findings, for they resonate with the global challenge of balancing economic development with environmental stewardship.

In essence, this research serves as a reminder of the profound impact of economic decisions on our environment and, reciprocally, the influence of environmental conditions on the prosperity of nations. One can offer this thesis as a contribution to the ongoing dialogue surrounding the quest for sustainable development, and we are eager to witness how this discourse shapes the future of our world. A notable characteristic of our research is its specific focus on Turkey. While the EKC model has been widely applied in various contexts, this study extends its application to this particular geographic and economic setting. By doing so,

this study fills a critical gap in the literature, providing a more region-specific understanding of the relationship between environmental degradation and economic growth. This regional specificity adds depth and richness to the global understanding of the EKC hypothesis.

Previous studies have underlined the EKC hypothesis holds in Turkey. Carbon emissions data showed a behavior of decline in the long run in the study of Bölük and Mert (2014), which proves that although other econometric methods such as panel cannot indicated the EKC relationship in Turkey; ARDL method enables the possibility for a U-shaped EKC in the long run. It is well known that renewable energy sources such as solar and wind are key factors for a green economy. In case of economic development, if a country applies required policies for an efficient endowment of renewable energy production, this country is likely to reach a U-shaped EKC eventually. “However, this study aims to show the effects of trading pollution intensive produce trade. This trade also holds the required conditions of reaching the EKC. Ben Jebli, Ben Youssef, Ozturk (2016) indicate the importance of trade as a tool to combat against the global warming.” Their study consists of 25 OECD countries in the years between 1980 and 2010 and their findings are parallel to this thesis. Lu, Venevsky, et al (2021) applied the same method for the eight economic zones in China. The main difference between the China case and the Turkey case is that the Chinese government applied required policies to fight against pollution, which is mainly created by the economic activities. As it is mentioned before, Turkey does not have policies that are introduced to reduce the carbon emission with respect to international trade. Another study for this aspect belongs to Shang, et al. (2023), underlining the importance of high technology exports on carbon emissions in China. Their study explains that high technology product exports have tendency the reduce the carbon footprint.

Another aspect that sets our research apart is the depth of analysis on specific variables, such as any specific variables, like income, trade, or environmental indicators. Our comprehensive examination of these variables within the context of Turkey uncovers insights that are distinct from general findings in the literature.

In summary, the novelty of our thesis is twofold: the regional focus and the in-depth analysis of specific variables. These elements not only contribute to a more comprehensive understanding of the complex relationship between economic growth and environmental degradation but also offer practical insights that can be applied to real-world challenges.

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