EUROASIA JOURNAL OF SOCIAL SCIENCES & HUMANITIES
Interntional Indexed & Refereed
ISSN: 2651-5261

EMPIRICAL ANALYSIS OF THE RELATIONSHIP BETWEEN RENEWABLE ENERGY, ECONOMIC GROWTH AND ENVIRONMENT: 23 OECD COUNTRIES

Mustafa Göktuğ Kaya
Dr., Visiting Scholar, Department of Economics, University of Saint Cloud State, 720 4th Ave S., St. Cloud, Minnesota, USA.; mustafa.kaya@stcloudstate.edu.; ORCID ID: 0000-0003-4124-4733.
Ning Hou
Associate Professor, Department of Management and Entrepreneurship, Herberger Business School, University of Saint Cloud State, 720 4th Ave S., St. Cloud, Minnesota, USA., nhou@stcloudstate.edu.
James A. Tan
Professor, Department of Management and Entrepreneurship, Herberger Business School, University of Saint Cloud State, 720 4th Ave S., St. Cloud, Minnesota, USA., jatan@stcloudstate.edu.

ABSTRACT
Non–renewable energy is expected to be almost depleted as of 2050 and the share of renewable energy resources in energy consumption begun to increase. We studied the relation between renewable energy consumption and economic growth environment in 23 OECD countries for the period 1996-2015. The results of panel co-integration test identified that there was co-integration between the economic growth and renewable energy in 23 OECD countries. In most of 23 OECD countries, economic growth affects renewable energy in a positive direction, which supports conservation hypothesis in the literature, while carbon emission affects the renewable energy consumption in negative direction in the long-term.

Keywords*:* Renewable energy, economic growth, panel data analysis, OECD countries
JEL classification: O44, O57, Q20, Q43, Q50

INTRODUCTION
In most countries, the availability of energy is one of the most basic factors stimulating economic and cultural development and increasing quality of life. However, energy is still most commonly produced using fossil energy and other non-renewable sources (e.g., coal). The use of such non-renewable energy has led to the production of greenhouse gasses and other environmental pollution associated with CO_2 emissions.

Approximately 20 billion tons of CO2 are emitted to atmosphere every year. Coal and oil burned by electricity companies produce one-fourth of this amount. Combustion-based vehicles also contribute a large quantity of carbon emissions. In addition, further deforestation will also increase the amount of CO_2 gasses in the atmosphere. Finally, energy use by industries, dwellings, office buildings, and agriculture round up the contributors of carbon emissions. China produces 29% of the world's carbon emissions, followed by the United States (16%), India (7%), and the Russian Federation (5%) (Union of Concerned Scientists, 2019).

There has been a focus and awareness of the harmful effects of fossil fuels on society in general and on economic growth. Fossil fuels are non-renewable energy sources and are projected to be exhausted in the next 50 years (ecotricity, n.d.). This has led to an increase in investments in sources of renewable energy (e.g., solar, wind) and a decrease in reliance on energy produced using fossil fuels and other non-renewable sources. Indeed, Countries have signed on to the Kyoto Protocol, which calls for industrialized nations to reduce greenhouse emissions significantly. In addition, other agreements such as the Doha Amendment and the Paris Climate Agreement also have the aim of reducing carbon emissions.

World energy consumption is predicted to increase by 28% from the year 2015 to 2040 and a significant portion of this demand comes from non-OECD countries which are more likely to experience stronger economic and population growth compared to the more "mature" OECD countries. Indeed, non-OECD countries' energy consumption are projected to increase 41% compared to 9% in OECD countries (IEO, 2017:9). Due to these factors, the push to using renewable energy sources has gotten more pronounced. Other factors pushing for investment in renewable sources of energy include uncertainties and fluctuations in oil prices, reduced dependence on foreign energy sources, tax credits and discounts, and government policies and laws supporting renewable energy sources. Of the many sources of renewable energy, investments have focused on hydroelectric power, wind, and solar energy.

Indeed, renewable energy is projected to receive 2/3 of energy investments by 2040. At the same time, energy produced using coal and other non-renewable sources is projected to decrease continually during the same time period. Shifting to using renewable energy has many benefits including less greenhouse emissions, reduced dependence on foreign sources, and energy independence. A downside to shifting to renewable energy sources is the high initial cost of investment in infrastructure ($20 trillion) (Sadorsky, 2008:462).

The interplay among economic development, energy, and environment are linked to issues such as sustainable development, the energy economy, and renewable energy resources. In the present study, we investigate the relation among renewable energy consumption, economic growth, and the environment in 23 OECD countries using panel analysis. We limit our study to the period from 1996 to 2015.

1. LITERATURE REVIEW

Due to the increased awareness of the impact of non-renewable energy sources on the environment, an increasing amount of research has focused on the relation between renewable energy production and consumption and economic growth. Unfortunately, conflicting findings have resulted. Possible causes of these conflicting results are due to methodological issues (e.g., country used, time period, etc.).

Past studies have tested different hypotheses to explain the relation between energy consumption and economic growth: 1) Feedback hypothesis positing a bi-directional relation between energy consumption and economic growth. That is, increases (or decreases) in energy consumption increases (or decreases) economic growth and vice versa (i.e., increases [or decreases] in economic grown leads to an increase [or decrease] in energy consumption; 2) Growth hypothesis, which posits a unidirectional relation in which increases (or decreases) in energy consumption; 3) Conservation hypothesis which posits a unidirectional relation in which increases (or decreases) in economic growth lead to increases (or decreases) in energy consumption. Finally, 4) Neutrality hypothesis which posits that there is no relation between energy consumption and economic growth (Isa et al., 2015:386). The following table summarizes studies investigating the relation between energy consumption and economic growth.

Table 1: Literature Review on the Relationship between Energy Consumption and Economic Growth

Study	Period	Dataset	Estimation Technique	Outcome
Lise and Van Montfort(2007)	1970-2003	Turkey	ECM	Conservation hypothesis
Sadorsky (2009)	1994-2003	18 Emerging countries	Panel cointegration	Conservation hypothesis
Apergis and Payne (2010)	1985-2005	20 OECD Countries	Panel cointegration, FMOLS, Panel Granger causality	Feedback hypothesis
Menyah and Wolde (2010)	1960-2007	US	Toda-Yamamoto causality	Conservation hypothesis
Menegaki (2011)	1997-2007	27 European Countries	Panel error correction model	Neutrality hypothesis
Ocal and Aslan (2013)	1990-2010	Turkey	ARDL ve Toda-Yamamoto causality	Conservation hypothesis
Pin (2014)	1982-2011	9 OECD countires	ARDL and VECM	Feedback hypothesis
Apergis and Danuletiu (2014)	1990-2012	80 countries	Panel VECM	Feedback hypothesis
Sebri ve Ben-Salha (2014)	1971-2010	BRICS Countries	ARDL, VECM Granger causality	Feedback hypothesis
Çınar and Yılmazer (2015)	1990-2013	8 Developing country	Panel cointegration	Growth hypothesis
Akay et al.(2015)	1988-2010	MENA Countries	Panel VAR	Feedback hypothesis
Inglesi-Lotz (2016)	1990-2010	34 OECD Countires	Fixed Effects, Pedroni Panel cointegration	Growth hypothesis
Özşahin et al. (2016)	2000-2013	BRICS Countries and Turkey	Pedroni Panel	Growth hypothesis
Ohlan (2016)	1971-2012	India	ARDL, VECM	Neutrality hypothesis
Neuhaus (2016)	1990-2011	Sub-Sahran African countires	Panel cointegration, FOLMS, PVECM	Feedback hypothesis
Bakırtaş and Çetin (2016)	1992-2010	G-20 Countries	Panel cointegration	Conservation hypothesis
Hassine and Harrathi (2017)	1980-2012	GCC countries	Pedroni Panel, Granger Causality	Growth hypothesis
Armeanu et. Al (2017)	2003-2014	28 EU countries	Panel VECM	Feedback hypothesis
Yazdi and Shakouri (2017)	1975-2014	Germany	ARDL, VECM	Growth hypothesis
Karaaslan et al. (2017)	1990-2012	34 OECD countries	Panel ARDL	Feedback hypothesis

*__Note:__Table was formed by the authors.

Apergis and Payne (2010), using the data of the period 1985-2005, studied the relationship between renewable energy and economic growth for 20 OECD country. They also added the statistics of the labor force and fixed capital formation to their analyses. According to the results of panel co-integration and Granger causality, in the countries dealt with the short and long term, a bidirectional relationship was found between renewable energy and economic growth. In the studies they carried out in 2010, they dealt with six America countries. Using the data of the period 1980-2016, they concluded that there was a bidirectional causality between renewable energy and economic growth.

Sadorsky (2009), for 18 developing countries, using the data of renewable energy consumption and economic growth belonging to the period 1994-2003, reached a causality relationship from economic growth to renewable energy.

Menegaki (2011), dealing with the economic growth, energy consumption, CO_2 emission, and share of renewable energy in consumption of 27 European countries, analyzed them by means of panel causality test. According to the analysis results, no relationship was established between renewable energy and economic growth.

Akay et al. (2015), in terms of MENA countries, studied the relationship between economic growth, renewable energy, and carbon emission. According to the results of panel VAR and Causality results, there is a bidirectional relationship between economic growth and renewable energy and, in return to this, there is a unidirectional relationship between carbon emission and renewable energy consumption.

Özşahin et al. (2016), in their study, using the data of the period 2000-2013 specific to BRICS countries and Turkey, studied the relationship between renewable energy consumption and economic growth by means of Pedroni, Westerlund panel co-integration test and obtained a causality relationship from renewable energy to economic growth in the long period.

Karaaslan et al. (2017), in 34 OECD countries, analyzed the relationship between economic growth, renewable energy consumption, and population increase by means of ARDL method. According to analysis results, there is a positive directional relationship between renewable energy and economic growth and, in return to this, there is a negative directional relationship between carbon emission and renewable energy.

2. MODEL

While analyzing the relationship of energy, growth, and environment belonging to 23 selected OECD countries, the function regarding the model developed with moving from the literature is:

$$REN = f(CO, PGDP) \quad (1)$$

Where REN denotes the relationships of renewable energy demand; CO, the amounts of Carbon emission; and PGDP, per capita gross domestic product. Transformation of this model to logarithmic state enables both to empirically predict the model and to obtain the flexibilities belonging to explanatory variables.

Logarithmic panel form of the model can be shown as follows:

$$\ln ren_{it} = \alpha_0 + \alpha_1 \ln co_{it} + \alpha_2 \ln pgdp_{it} + \varepsilon_{it} \quad (2)$$

Where $i = 1,..., N$ denotes the number of horizontal section and $t = 1,..., T$, time dimension.

2.1. Dataset

In the model, about the selection of sample and country, 23 selected OECD countries were dealt in the model. The countries included in the analysis were presented in Table 2.

Table 2. Countries in the Analysis.

1	Australia	13	Belgium
2	France	14	Hungary
3	Luxembourg	15	Norway
4	Portugal	16	USA
5	Austria	17	Canada
6	Czech Republic	18	Denmark
7	Finland	19	Greece
8	Germany	20	Italy
9	Japan	21	Turkey
10	Netherlands	22	Switzerland
11	England	23	Poland
12	Spain		

In model estimations, the annual data belonging to the period of 1996-2015 were used and the data belonging to this period associated with the variables determined were included in the study. The data used in the study were obtained from the database of World Bank.

Table 3: Explanation of Variables

Symbol of Variable Explanation	Explanation	Resource	Period
lnren	Renewable Energy	World Bank WDI)	1996–2015
lenco	Carbon Emission	World Bank (WDI)	1996–2015
lnpgdp	Per Capita Gross Domestic Product (PCGDP)	World Bank (WDI)	1996–2015

For the variables to be used in the analyses, their commonly used definitions in the literature were taken into consideration.

3. EMPIRICAL FINDINGS

3.1. Results of Panel Unit Root Test

In making co-integration analyses, unit root features of the variables have an important role. For both level and first difference of the series, LLC (Levin, Lin and Chu 2002), IPS (Im, Pesaran ve Shin (2003) and Hadri (2000) unit root tests were applied and the results were presented in Table 4.

Table 4: Panel Unit Root Tests

		Level Values				**First Difference**			
				Constant+Trend					Constant+Trend
		Constant Statistic	Prob.	Statistic	Olasılık	Constant Statistic	Prob.	Statistic	Statistic
lnREN	LLC	1.49135	0.9321	-1.12248	0.1308	-4.91177	0.0000	-3.15558	0.0008
	IPS	5.85946	1.0000	1.96509	0.9753	-7.44775	0.0000	-5.84572	0.0000
	Hadri	12.0477	0.0000	9.19482	0.0000	1.42669	0.0768	3.40274	0.0003
lnCO	LLC	5.17737	1.0000	0.20932	0.5829	-4.98809	0.0000	-6.56021	0.0000
	IPS	5.76758	1.0000	3.27162	0.9995	-6.99953	0.0000	-7.58262	0.0000
	Hadri	9.04837	0.0000	10.1385	0.0000	8.08299	0.0000	14.1940	0.0000
lnPGDP	LLC	-3.85483	0.0001	6.15892	1.0000	-3.26466	0.0005	-5.74857	0.0000
	IPS	0.24272	0.5959	5.26867	1.0000	-4.02752	0.0000	-1.29628	0.0974
	Hadri	11.6109	0.0000	6.49509	0.0000	1.56676	0.0586	10.3858	0.0000

The LLC (Levin, Lin ve Chu 2002), IPS (Im, Pesaran ve Shin (2003) and Hadri (2000) applied show that they are not stationary at *LNREN, LNCO, LNPGDP* level; however, when its difference is taken, they are stationary.It expresses that the effect of the shocks occurring in three variables used in the model is permanent..

Panel unit root tests shows a full consistency about that the level values of all variables are not stationary. It is concluded that they are stationary, when their first differences are taken. Thus, the condition that it is necessary for series is first degree integrated (I (1)), one of the main assumptions of Pedroni (1999) and Kao (1999) co-integration tests, is provided.

3.2. Panel Co-integration Test Results

Table 5 shows the panel cointegration test results. Most of the Pedroni (1999) tests in the table indicate that there is a cointegrated relationship between the variables of renewable energy, economic growth and environment for 23 countries. The test results in Table 5 do not take into account the dependency between the horizontal sections forming the panel.

Table 5:Panel Cointegration Test

		Constant Statistic	Prob.	Constant+Trend Statistic	Prob.
Pedroni (1999)	**Panel-v**	2.400	0.008	1.282	0.099
	Panel-rho	-1.940	0.026	1.944	0.974
	Panel-pp	-4.451	0.000	-2.469	0.006
	Panel-adf	-3.878	0.000	-3.072	0.001
	Grup-rho	0.0527	0.521	2.750	0.997
	Grup-pp	-8.311	0.000	-8.388	0.000
	Grup –adf	-4.680	0.000	-2.616	0.004
***Kao* Panel Cointegration Tests Results**					
	t-Statistic	Prob.			
ADF	-1.394	0.081*			
Residual variance	0.011				
HAC variance	0.015				

In the Pedroni (1999) tests, the number of delays is assumed to be 2. The critical value at the 5% significance level is 1,645 because the paralel v-statistic shows the right tail distribution, as the other statistics show the left tail distribution, the critical value is -1,645. *** Significant at the 1% level, ** Significant at the 5% level, * Significant at the 10% level. In the Pedroni and Kao cointegration test, the Barlett Kernel method was used and the Bandwith width was determined by the Newey-West method.

In terms of the reliability of the findings regarding the existence of the cointegration relation obtained from the Pedroni tests; Kao panel cointegration test was also performed and the results are reported in Table 5. Accordingly, the panel data set addressed is the result of the "Cointegration Relation".

3.3. Panel Cointegration Estimated Results

Empirical findings from the econometric analysis of the model defined in Equation (2) are presented in Table 6. From these findings, the results of renewable energy, economic growth and environment-related cointegration will be emphasized.

Table 6. Panel Cointegration Estimated Results

	DOLS			**FMOLS**		
	Coefficient	***t-stastistic***	***Prob.***	***Coefficient***	***t-stastistic***	***Prob.***
LNPGDP	0.384	0.058	0.000***	0.317	0.052	0.000***
LNCO	-2.519	0.229	0.000***	-2.363	0.173	0.000***

The premise and delay numbers in the DOLS estimation are determined according to the Schwarz information criterion, and the number of delays in FMOLS and 2-stage estimates are 2. ***, **, * statistically significant at 1%, 5% and 10%, respectively.

The effect of DOLS, FMOLS, and estimator estimates on economic growth (LNPGDP) and environmental (LNCO) coefficient coefficients is also consistent with theory.It is concluded that the economic growth (LNGDP) variable positively affects the renewable energy variable. It is seen that the carbon emission (lnCO) variable used as a representative of the environment has a negative effect. When the findings are evaluated in terms of the coefficients in the model, it is concluded that a unit change in economic growth increases renewable energy by 0.38%. Similarly, the FMOLS results have also increased by 0.317%. A change in carbon emissions results in a reduction of renewable energy by 2.519%. FMOLS results are similarly reduced by 2.36%. The coefficients of both variables are also valid at the 1% level of significance.

Table 7: Country Based Panel DOLS and FMOLS Results

	DOLS		FMOLS	
	LNPGDP	*LNCO*	*LNPGDP*	*LNCO*
Australia	0.004 (-0.054)	0.004 (0.003)	-0.032 (-0.547)	-1.514(-2.323)**
Austria	0.270 (4.594)***	-1.414 (-5.732)***	0.288 (8.384)***	-1.191(-8.723)***
Belgium	0.564 (1.851)	-5.777(-5.796)***	0.726 (2.753)***	-5.002 (-6.863)***
Canada	0.054(4.884)***	0.090 (1.179)	0.048 (4.260)***	0.011 (0.160)
Czech Republic	0.228 (8.339)***	-2.568 (-1.257)***	0.263 (7.420)***	-2.256 (-1.178)***
Denmark	0.609 (1.451)***	-1.502(-2.165)***	0.628 (8.556)***	-1.399 (-1.255)***
Finland	0.145 (1.020)***	-0.690 (-1.247)***	0.181 (6.153)***	-0.624 (-8.873)***
France	-0.106 (-1.131)	-1.803 (-5.795)***	-0.063 (-0.902)	-1.581 (-7.671)***
Greece	0.443 (5.868)***	-3.123 (-1.397)***	0.270 (5.173)***	-2.228(-1.472)***
Germany	1.259 (6.354)***	-3.384 (-3.264)***	0.874 (3.590)***	-5.722 (-4.908)***
Hungary	0.132(1.725)	-4.719(-9.597)***	0.079 (0.790)	-3.998 (-9.350)***
Italy	0.949(5.124)***	-1.966 (-4.731)***	1.062 (8.623)***	-1.918 (-8.157)***
Japan	0.214(0.632)***	-3.141(-2.603)	0.746 (4.003)***	0.104 (0.148)
Luxembourg	0.214(0.632)	-3.141(-2.603)**	0.318 (1.249)	-3.771 (-4.610)***
Netherlands	1.095(3.620)***	-4.817(-1.670)***	1.088 (1.837)***	-4.635 (-1.083)***
Norway	-0.034(-1.693)	-0.014 (-0.167)	-0.032 (-2.609)	-0.005(-0.120)
Poland	0.321(6.655)***	-2.398 (-3.166)***	0.357 (5.806)***	-1.565 (-2.219)**
Portugal	0.008(0.080)	-1.053(-5.817)***	-0.019 (-0.430)	-1.119 (-1.221)***
Switzerland	-0.042(-0.718)	-1.370 (-5.398)***	0.100 (1.695)	-0.668 (-3.188)***
Spain	0.300(3.847)***	-1.673 (-1.172)***	0.339 (6.275)***	-1.625 (-1.419)***
Turkey	-0.854(-3.715)***	1.879(2.179)**	-0.430 (-2.443)***	0.315 (0.473)
United Kingdom	0.540 (3.836)***	-5.930 (-1.871)***	0.693 (4.379)***	-5.546 (-1.814)***
United States	0.684(4.557)***	-1.648 (-4.690)***	0.627 (4.572)***	-1.670 (-5.490)***

Note: Values in parentheses represent t statistics values., **,*** respectively %10,%5 and %1 represent a level of significance.*

Table 7 shows the individual effects of the countries in the study panel. In a large majority of the 23 OECD countries, there appears to be a significant relationship between renewable energy, economic growth and carbon emissions. According to the DOLS results, the economic growth in Australia, Belgium, France, Hungary, Luxembourg, Norway, Portugal and Switzerland is not effective on renewable energy consumption. In other countries, there is a statistically significant relationship at different meaning levels. According to FMOLS results, there is a result similar to the DOLS findings that economic growth in countries like Australia, France, Hungary, Luxembourg, Norway, Portugal and Switzerland does not affect renewable energy consumption. DOLS and FMOLS show that economic growth affects renewable energy positively.

Table 8. Results for panel Granger causality

	Short-run causality			Long-run causality	
	ΔLNREN	ΔLNCO	ΔLNPGDP	ECT(-1)	t-stat
ΔLNREN	-	3.505(0.061)	0.250(0.616)	-0.399	-7.586***
ΔLNCO	6.294(0.012)	-	2.941(0.0863)	-0.087	-3.058**
ΔLNPGDP	0.555(0.456)	4.066(0.043)	-	-0.007	-0.150

The optimal lag length was selected using the Schwarz information criteria. Figures in parentheses is *p*-values. *** indicate statistical significance at 1 percent level of significance.

In the first line, where lnREN is dependable variable at 5% significance level, it is seen that lnCO is the cause of InRen in short term. Also, it is seen that InCO is the cause of InREN. That is, there is a bidirectional causality. On the one hand, there is a causality relationship from lnPGDP and lnREN to InCO. In similar way, there is also a causality relationship from Inco to lnPGDP. On the other hand, there is also a causality relationship from InREN to InPGDP.

I) in long term, lnCO and LNPGDP are the causes of InREN at 1% significance level. That lagged values of error terms, obtained from regressions predicted in long term, are negative and significant expresses that 39% of the effect of a shock that may form between variables in short term will get better in long term.

II) In long term, in regression, where dependable variable is InCO, both InREN and InPGDP are the causes of InCO. That lagged values of error terms obtained are negative and significant expresses that 0.87% of the effect of a shock that may form between variables in short term will get better in long term. iii) Finally, in the model, where lnpgdp takes place as dependable variable, there is not any causality relationship in long term.

CONCLUSIONS

Energy is one of the most important factors for economic development as well as social and cultural development and for increasing the quality of life for a country. The energy sources used in the world are divided into two as non-renewable and renewable energy sources. Along with the creation of coal, natural gas and petroleum as the basis of non-renewable energy sources, it is suggested that these resources will start to run out after 2050. Moreover, the fact that these sources have environmentally harmful emissions of greenhouse gases is seen as the most critical reasons for the recent global warming. Sustainability of growth and development is possible with the sustainability of the environment. For all these reasons, countries are investing in renewable energy sources.

In this study, 23 selected OECD country data were used to explore the reciprocal relationship between renewable energy (lnREN) Economic Growth (lnPGDP) and Environment (lnCO) for the period of 1996-2015.

In the study, we observed that the series used in the panel unit root analysis were stationary (I (1)) in their first differences. Since the variables are stationary, it is passed to the cointegration test. Panel cointegration test results show that there is a cointegration relationship in a large majority of the 23 OECD countries among the variables of renewable energy, economic growth and carbon emissions. The results of the DOLS and FMOLS also show that in general, the majority of countries are affected by economic growth in the positive direction of renewable energies. This result is consistent with the conservation hypothesis in the literature. The results of our analysis on the causality relationship between renewable energy and economic growth have been similar to the studies of Lise and Van Montfort (2007), Sadorsky (2009), Menyah and Wolde (2010), Ocal and Aslan (2013) and Bakırtaş and Çetin (2016) findings in the literature. If we look at the country in particular, DOLS results in Australia, Belgium, France, Hungary, Luxembourg, Norway, Portugal and Switzerland and FMOLS results in Australia, France, Hungary, Luxembourg, Norway, Portugal In countries such as Switzerland, showed that economical development did not effect renewable energy consumption. The results of the analyzes showed that there is a negative relationship between carbon emissions and renewable energy in accordance with the literature. An increase in carbon emissions reduces renewable energy consumption. This result is similar to the studies of in Menyah and Wolde (2010), Akay et al. (2015) and Karaaslan et al. (2017) in the literature.

Renewable energy has the advantages of less greenhouse gas emissions, reduced external dependence on energy, higher energy security and generating domestic energy compared to nonrenewable energy sources. The increase in renewable energy production and consumption, on the one hand, affects the economy in a positive way, while on the other hand it provides countries with energy dependency abroad, fluctuations in oil and natural gas prices in international markets and long term decline in environmentally harmful carbon emissions.

REFERENCES

Akay, E. and R. Abdieva, Z. Oskonbaeva (2015), Yenilenebilir Enerji Tüketimi, İktisadi Büyüme ve Karbondioksit Emisyonu Arasındaki Nedensel İlişki: Orta Doğu ve Kuzey Afrika Ülkeleri Örneği, International Conference on Eurasian Economics

Apergis, N. and J.Payne (2010), Renewable Energy Consumption and Economic Growth: Evidence from a Panel of OECD Countries, Energy Policies, 38: 656-660

Apergis, N. and D.C. Danuletiu (2014), Renewable Energy and Economic Growth: Evidence From the Sign of Panel Long-Run Causality, International Journal of Energy Economics and Policy, Vol. 4, No. 4:578-587

Armeanu, D., G. Vintilă and S. Gherghina (2017), Does Renewable Energy Drive Sustainable Economic Growth? Multivariate Panel Data Evidence for EU-28 Countries, Energies

Bakırtaş, I. and M. A. Çetin (2016), Yenilenebilir Enerji Tüketimi ile Ekonomik Büyüme Arasındaki İlişki: G-20 Ülkeleri, Sosyoekonomi, 24(28):131-145.

Çınar, S. and M. Yılmazer (2015), Yenilenebilir Enerji Kaynaklarının Belirleyicileri ve Ekonomik Büyüme İlişkisi: Gelişmekte Olan Ülkeler Örneği, Dokuz Eylül Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, V.:30-1: 55-78

Hadri, K. (2000), Testing for stationarity in heterogeneous panel data, The Econometrics Journal, Volume 3, Issue 2, 1 December: 148–161

Hassine, M. and N. Harrathi (2017), The Causal Links between Economic Growth, Renewable Energy, Financial Development and Foreign Trade in Gulf Cooperation Council Countries, International Journal of Energy Economics and Policy, 7(2): 76-85

Im, K., Pesaran, H. and Shin, Y., (2003), Testing For Unit Roots in Heterogenous Panels, Journal of Econometrics, 115: 53–74.

Inglesi-Lotz, R. (2016). The impact of renewable energy consumption to economic growth: A panel data application. Energy Economics, 53: 58-63.

International Energy Outlook (IEO) (2017), https://www.eia.gov/outlooks/ieo/, D.A.:20.05.2018

Isa, Z. Ahmed R.M. Al Sayed, S. S. Kun (2015), Review Paper on Economic Growth–Aggregate Energy Consumption Nexus, International Journal of Energy Economics and Policy, 5(2): 385-401

Kao, C.. (1999). Spurious Regression and Residual - Based Tests for Cointegration in Panel Data, Journal of Econometrics 90: 1-44.

Karaaslan A. and H.Abar, S. Çamkaya (2017), CO2 Salınımı Üzerinde Etkili Olan Faktörlerin Araştırılması: OECD Ülkeleri Üzerine Ekonometrik Bir Araştırma, Atatürk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 21(4):1297-1310

Levin, A., Lin, C.F. and Chu, J, (2002), Unit Root Tests in Panel Data: Asymptotic and Finite Sample Properties, Journal of Econometrics, 108(1): 1-24.

Lise, W.; Van Montfort, K.(2007), Energy consumption and GDP in Turkey: Is there a co-integration relationship?, Energy Econ. 29: 1166–1178

Menegaki, A. N. (2011). Growth and renewable energy in Europe: A random effect model with evidence for neutrality hypothesis. Energy Economics, 33(2): 257-263.

Menyah, K.; Wolde-Rufael, Y. (2010), CO2 emissions, nuclear energy, renewable energy and economic growth in the us. Energy Policy 38: 2911–2915

Neuhaus L. (2016), Examining the renewable energy consumption economic growth nexus in sub-Saharan African countries, https://scholarworks.uni.edu/hpt/241

Ocal, O., and Aslan, A. (2013). Renewable energy consumption–economic growth nexus in Turkey. Renewable and Sustainable Energy Reviews, 28

Ohlan R. (2016), Renewable and Non-Renewable Energy Consumption and Economic Growth in India, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2903030, D.A.20.05.2018

Özşahin Ş., M. Mucuk and M. Gerçeker (2016), Yenilenebilir Enerji ve Ekonomik Büyüme Arasındaki İlişki: BRICS-T Ülkeleri Üzerine Panel ARDL Analizi, Siyaset, Ekonomi ve Yönetim Araştırmaları Dergisi, 4(4)

Pedroni, P, (1999), Critical Values for Cointegrating Tests in Heterogeneous Panels with Multiple Regressors, Oxford Bulletin of Economics and Statistics, 61(1): 653-570.

Pin, L.H.(2014), Renewable Energy Consumption and Economic Growth in Nine OECD Countries: Bounds Test Approach and Causality Analysis, The Scientific World Journal, 1-7

Sadorsky, P. (2008). Renewable energy consumption, CO2 emissions and oil prices in the G7 countries. Energy Economics 31: 456 – 462

Sadorsky, P.(2009). Renewable energy consumption and income in emerging economies. Energy Policy 37: 4021-4028.

Sebri, M. and O. Ben-Salha (2014), On The Causal Dynamics Between Economic Growth, Renewable Energy Consumption, CO2 Emissions and Trade Openess: Fresh Evidence From BRICS Countries, Renewable and Sustainable Energy Reviews, 39(2014):14-23.

Yazdi, S. and B. Shakouri (2017), The renewable energy, CO2 emissions, and economic growth: VAR model, Energy Sources, Part B: Economics, Planning, and Policy, V.13, N.1

Union of Concerned Scientists (2019, October 10). Each country's share of CO2 emissions. Retrieved from: https://www.ucsusa.org/resources/each-countrys-share-co2-emissions.