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IN THE CONTEXT OF ARDL BOUND TEST APPROACH, ENERGY CONSUMPTION AND ENERGY PRICES EFFECTS ON QUALITY OF LIFE

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Abstract

Energy has become one of the basic requirements for human welfare and for the sustainability of economic activities. Empirical results from many studies have shown that energy consumption increases economic growth and welfare. There are very few studies in the literature examining the relationship between energy consumption, energy prices and quality of life. The aim of this study is examining the hypothesis of the necessity of increasing the use of energy in order to reduce poverty and quality of life for Turkey. The study contributes to the literature due to the small number of studies conducted in this field and the fact that it investigates the relationship between energy consumption, energy prices and human development index with the help of the Autoregressive Distributed Lags model using current data for the period 1990-2019. Findings demonstrate that energy consumption is important for increasing human welfare and has little response to energy price changes in the long term. In the short term, it was found that the human development index was affected positively by energy consumption in the current period, and negatively affected in one lag, but neutral to energy prices.

Keywords: *Energy Consumption, Energy Prices, Quality of Life, Turkey, Human Development Index*

JEL Classification: *Q40, Q41, I31*

ARDL SINIR TESTİ YAKLAŞIMI BAĞLAMINDA, ENERJİ TÜKETİMİ VE ENERJİ FİYATLARININ YAŞAM KALİTESİ ÜZERİNE ETKİSİ

Öz

Enerji hem insanların refahı hem de ekonomik faaliyetlerin sürdürülebilmesi için temel gereksinimlerden biri haline gelmiştir. Birçok çalışmadan elde edilen ampirik sonuçlar enerji tüketiminin ekonomik büyümeyi ve refahı arttırdığını göstermiştir. Literatürde enerji tüketimi, enerji fiyatları-yaşam kalitesi ilişkisini inceleyen çok az sayıda çalışma bulunmaktadır. Bu çalışmanın amacı, yoksulluğun azaltılması ve yaşam kalitesinin arttırılabilmesi için enerji kullanımının gerekliliği hipotezini Türkiye için araştırmaktır. Çalışma, bu alanda yapılan araştırmaların az sayıda olması ve enerji tüketimi, enerji fiyatları ve insani gelişim endeksi arasındaki ilişkiyi 1990-2019 dönemine ait güncel veriler kullanılarak Otoregresif Dağıtılmış Gecikmeler modeli yardımıyla araştırması sebebiyle literatüre katkı sağlamaktadır. Ampirik analizden elde edilen bulgular, uzun dönemde insan refahının artması için enerji tüketiminin önemli olduğunu ve enerji fiyat değişikliklerine çok az tepki verdiğini göstermektedir. Kısa dönemde ise insani gelişim endeksinin enerji tüketiminden cari dönemde olumlu, bir gecikmesinden ise olumsuz etkilendiği ancak enerji fiyatlarına karşı nötr olduğu bulgusu elde edilmiştir.

Anahtar Kelimeler: *Enerji Tüketimi, Enerji Fiyatları, Yaşam Kalitesi, Türkiye, İnsani Kalkınma Endeksi*

JEL Sınıflandırması: *Q40, Q41, I31*

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1. Introduction

Energy is necessary both for the well-being of people and for economic activities. Empirical results from many studies have shown that energy consumption increases economic growth and welfare. Technological advances and increasing energy consumption have characterized the industrialization and economic development processes in the past century (Warr & Ayres, 2010). Although developed countries have achieved increases in energy efficiency by shifting their production structure from energy-intensive industries to less energy-intensive service activities throughout some structural changes. There is a strong relationship between economic growth, welfare and energy continues in developing countries (Ouedraogo, 2013).

It is not possible to maintain the current energy consumption patterns both physically and socially. After the industrialization reached its peak, developed countries started to switch to renewable energy consumption, especially with the depletion of oil resources. However, most of the non-industrialized countries face significant energy shortages. In addition, in developing countries, it becomes necessary to find solutions to energy shortages, to ensure the sustainability of energy and to contribute to human development goals.

It is important to consider the total energy needs of the global community before considering energy alternatives. In the face of increasing population, energy consumption is increasing exponentially. Despite this, half of the world is already faced with a serious energy shortage (Martinez & Ebenhack, 2008). According to the data obtained from the United Nations, it is estimated that approximately 1.6 billion people do not have access to electricity, and it is stated that more people have limited and costly access to energy (Martinez & Ebenhack, 2008). In this case, energy consumption and price of energy become important and the necessity of researching the relationship between the concept of human development, which expresses the quality of life, and energy arises.

Human development is defined as a process that aims to raise the living standards of individuals to contemporary living standards and enables individuals to live by using all their rights (Doğan & Tatlı, 2014). This situation is defined as a process that aims to maximize the capacities of individuals and to use the acquired capacity in the social, political, economic and cultural fields in the best way (UNDP, 2005). The United Nations Development Program (UNDP) created the Human Development Index (HDI) in 1990 to compare the level of socioeconomic development among all countries. The HDI, which tries to explain human development by considering the national income per capita, education and health values, indexes the improvement of individuals to an acceptable quality of life (Doğan & Tatlı, 2014). Countries with scarce energy resources that want to improve their quality of life will need more access to cleaner, more reliable and efficient energy resources. Therefore, the necessity of increasing people's energy access for countries that want to improve the current conditions of society becomes one of their goals.

For many countries around the world, there are numerous studies investigating the relationship between energy consumption and economic growth, as measured by monetary indicators such as Gross Domestic Product (GDP), Gross National Product (GNP) or GDP per capita. On the other hand, there are not many studies investigating the effect of energy consumption and energy price on quality of life. The contribution of this article to the literature is to investigate energy consumption, the relationship between energy prices and the index of human development during the period 1990-2019 that is the current data for Turkey. In this study, Autoregressive Distributed Lag (ARDL) bound test method is used while investigating this relationship.

In the continuation of the study, the literature examining the relationship between energy consumption and human development index is reviewed. The next section explains the methodology, data series, and empirical findings. Finally, the conclusion section is included that the findings are discussed.

2. Literature Review

Although there are many studies in the literature examining the relationship between energy consumption and economic growth, there are not many studies examining the relationship between energy consumption, energy prices and human development index. This section includes some of the current literature on the subject.

In his study, Pasternak (2001) examined the relationship between human well-being and energy and electricity consumption using 1997 data. It's found that the relationship between the human development index and energy consumption per capita and determined an electricity consumption threshold for the maximum human development index. This threshold has been used to estimate future global electricity consumption levels associated with high human development criteria up to 2020.

Dias et al. (2006), deals with the importance of human development balance, conservation of natural resources and seeking alternative development models for the environment through the concept of rational energy use in their studies. They gave a general discussion on the relationship between the human development index and energy consumption, based on the 1999 human development index and energy consumption data. They calculated the potential to reduce energy consumption in developed countries to prevent natural resource depletion.

Ediger & Tathdil (2007) recalculated the weights of 2000 human development index data for 173 countries. In their study that using Principal Component Analysis, they found significant differences in the country rankings after comparing the index they obtained with other energy-related indicators provided in the UN Human Development Report 2003.

Martinez & Ebenhack (2008) examined the relationship between per capita energy consumption and human development index for 120 countries. They found a strong relationship between the human development index and energy consumption for many countries. They obtained three different results in their studies. They obtained that, a significant increase in human development relative to energy consumption for energy-poor countries; a modest increase for countries in transition; and that there is no increase in human development for developed countries that consume large amounts of modern energy.

Wu et al. (2010) analyzed the inequality in energy consumption by using the Lorentz Curve, Gini Coefficient and Theil Index, which reflect the differences in the economic development levels of countries divided into high, medium and low groups, using data from 1998-2007. They argue in their study that energy consumption has a distinct and critical social dimension. Based on the UN Human development Index, it represents the equality problem involving the different HDI groups. In three groups, high human development level economics (HHDE), medium human development level economics (MHDE) and low human development level economics (LHDE), their behaviors are different in the inequality of energy consumption. Further, the results show that the United States' behavior is consistent in other nations in the HHDE countries, China's behavior impacts on the evolution of inequality in the MHDE.

Nui et al. (2013) examined the causality relationship between electricity consumption and human development, and used panel cointegration techniques for 50 countries divided into four groups according to income, based on 1990-2009 data. They chose five indices to reflect the relationship between variables. Human development level of the countries studied: percent GDP, per capita consumption expenditures, urbanization rate, life expectancy at birth and adult literacy rate. The results show that there is a long-term bi-directional causality between electricity consumption and five indicators. In addition, the higher a country's income, the higher its electricity consumption and the higher the level of human development. Also, the variables of the four income groups differ significantly. On the other hand, as income increases, the contribution of electricity consumption to

GDP and consumption expenditure increases, but the urbanization rate, life expectancy at birth and adult literacy tend to weaken. They found that the main reason for this was that the latest indicators in high-income countries were increasing to converge.

In his study, Pirlogea (2012) aimed to determine whether energy promotes or inhibits human development. In the study, various energy indicators were used as independent variables in panel data regression models for many European Union countries with very high and high human development. In the study, in which energy intensity was also included in the analysis, it was concluded that a nation's high level of energy intensity poses a threat to human development. In the study, it was stated that even though the analysis showed that energy contributes to human development, this is not a sufficient condition to maintain a certain HDI level.

In his study, Ouedraogo (2013) investigated the long-term and causality relationship between energy consumption, electricity consumption, energy prices and human development index by using 1988-2008 data for fifteen developing countries. In the study of panel cointegration and causality analysis, empirical results support the neutrality hypothesis about total energy or electricity consumption in the short term and show that there is no causality in either direction. In the short term, energy and electricity consumption has a neutral effect on the human development index. In the long run, the findings indicate that there is a negative cointegration relationship between energy consumption and human development index. There is a positive cointegration relationship between electricity consumption and HDI. In addition, the study found that a 1% increase in per capita energy consumption decreased the HDI by 0.8%, while a 1% increase in per capita electricity consumption increased the HDI by 0.22%. On the other hand, it was found that a 1% increase in the price of energy reduces the HDI by about 0.11%.

Wang et al. (2018) examined the relationship between renewable energy consumption, economic growth and human development index for the years 1990-2014 in Pakistan using the Two-Stage Least Square (2SLS) method. They applied the VECM Granger Causality approach to control the causal relationship between the variables in the study. In their analysis, they concluded that renewable energy consumption did not improve the state of the human development process in Pakistan. They also concluded that the higher the income of the country, the lower the level of human development. On the other hand, they concluded that CO2 emissions helped to improve the human development index and the trade deficit deterred the human development process in Pakistan. In addition, it was stated that causality analysis confirmed the feedback hypothesis between the environmental factor and the human development process in the long run.

Van Tran et al. (2019) collectively estimated the three simultaneous equations of human development, energy consumption and carbon dioxide emissions using a systems generalized moment approach (SGMM) covering ninety countries over the period 1990-2014. The results show that increased human development leads to reduced carbon emissions for the global sample and development countries. However, no significant relationship was found between carbon emissions and human development in developed countries. It is stated that the results obtained from the analysis do not show a significant causal relationship between energy consumption and human development. If the nonlinear human development term is included in the environmental equations, it has been determined that a U-Shape hypothesis is not valid in the study.

3. Data, Methodology and Empirical Findings

3.1. Model and Data Set

In this study, the model established to examine the relationship between energy prices, energy use and quality of life and the Human Development Index (HDI) is shown in Equation 1:

$$HDI_t = \beta_0 + \beta_1 EC_t + \beta_2 OP_t + \beta_3 NGP_t + u_t \quad (1)$$

HDI, which is the dependent variable, has been obtained from the United Nations Development Program (UNDP). This variable is taken as the average of the totals of life expectancy index (LEI), GDP index (GDPI) and education index (EI) in a country and its logarithm is used as a welfare variable (Ouedraogo, 2013). Energy Consumption (EC) is taken from the World Bank database as kg petroleum equivalent oil per capita, whose logarithm is taken. Real oil prices (OP) and real natural gas prices (NGP) indices are taken from Brent Oil as Brent Oil's annual energy prices, transform to real by using annual consumer price indices, and the values obtained by multiplying the annual real exchange rate average data obtained from the CBRT (Central Bank of the Republic of Turkey) and the logarithm of real energy price index has been created for Turkey (Antonietti & Fontini, 2019).

3.2. Methodology

The ARDL test, developed by Pesaran, Shin and Smith, is an effective method for estimating short- and long-term relationships, allowing it to be used in samples with a limited number of observations and to analyze the variables without the need for them to be as integrated as in the Johansen-Juselius and Engle-Granger cointegration tests. In other words, with this method, a variable at the level of variables, at the first difference or at the level of a variable can be included in the analysis as stationary at the first difference. In other words, one of the advantages of this test is that it can be applied regardless of which level the independent variables are cointegrated. In this study the ARDL bound cointegration test is used that developed by Pesaran & Pesaran (1997) and Pesaran et al. (2001). There is no need to perform unit root analysis is important for the purpose of learning stationary level of variables and the critical values. In addition, since the bound test to be used will give reliable results for small samples, it will increase the reliability of the findings (Yılancı, 2015).

After the unit root test is done, the long-term cointegration relationship is investigated for the series. For this, the model to be researched is adapted as in Equation 2:

$$\Delta HDI_t = a_0 + \sum_{i=1}^{N} a_{1i}\, \Delta HDI_{t-1} + \sum_{i=1}^{N} a_{2i}\, \Delta OP_{t-i} + \sum_{i=1}^{N} a_{3i}\, \Delta NGP_{t-i} \quad (2)$$

$$+a_4 HDI_{t-1} + a_5 OP_{t-i} + a_6 NGP_{t-i} + e_t$$

Δ in the equation denotes the first difference.

Bahmani-Oskooee & Goswami (2003) stated that the F value obtained while estimating the boundary test is sensitive to the length of the lag and stated that the N value, which indicates the lag length in equation (2), should be determined. Therefore, first the lag length should be determined and then the cointegration relationship should be tested. The basic hypothesis for the bounds test to be tested is as follows:

$Ho: a_{i=0}, \quad for\ i = 4,5,6$

Here, the F value has a non-standard distribution according to the structure of the model or the cointegration degree of the variables (Narayan, 2005). Therefore, the F critical value to be obtained here, for large samples it will be determined according to the critical values tabulated by Pesaran et al. (2001); for small samples, it will be determined according to Narayan (2005).

Boundary values will be determined according to the stability of the obtained F test statistic variables. Three situations are encountered here. These; If the F statistic value is less than the lower boundary value, it can be said that there is no long-term relationship, if it is greater than the upper value, there is a long-term relationship, and if it is between the lower and upper values, it can be said that there is no conclusion about the cointegration relationship.

3.3 Empirical Findings

In the study, first, the stationarity of the series was tested with Augmented Dickey Fuller (ADF) and Phillips-Perron tests. Unit root analysis results of the variables are shown in Table 1.

Table 1: Results for Unit Root Tests

	ADF		Phillips-Perron	
Level	**Level**	**Difference**	**Level**	**Difference**
HDI	0.130	-3.820***	-0.451	-3.436**
EC	0.328	-3.122**	0.095	-11.362***
OP	-3.534**	-3.165**	-3.389***	-3.130**
NGP	-3.504**	-1.312	-3.143**	-3.719***

Note: *,** and *** refers to the level of significance at the level (10%), (5%), (1%) respectively.

When Table 1 is examined, according to both ADF and Phillips-Perron unit root test results, the HDI and EC become stationary at the first difference, and the OP and NGP become stationary in their level values.

After the stationarity test was applied, the maximum lag length was taken as 4 and the ARDL information criterion was obtained. While obtaining this value, the Akaike information criterion was used and the basic hypothesis, which states that there is no cointegration relationship between the variables, is rejected because the F test statistic (5.826) is greater than the upper limit (4.194). Thus, in Turkey, there is co-integration relationship between energy consumption, energy prices and human welfare have been identified.

For the estimation of the long-term relationship, Akaike information criterion is used, and the appropriate model is chosen as ARDL (4,2,0,0)[1]. The long-term coefficients that obtained are shown in Table 2.

Table 2: Long Term Coefficients

Dependent Variable	**EC**	**OP**	**NGP**	**C**
HDI	0.288***	0.051**	-0.034**	-1.109***
	0.075	0.019	0.016	0.215

Note: *,** and *** refers to the level of significance at the level (10%), (5%), (1%) respectively.

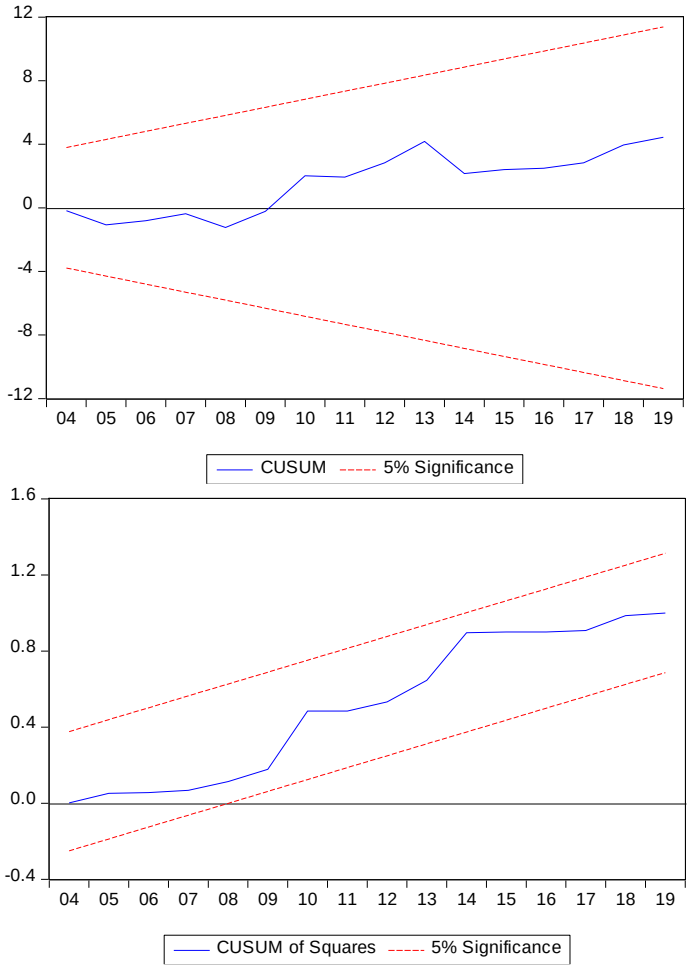
When Table 2 is examined, it is seen that all variables are statistically significant. While the increase in EC and OP increases HDI, the decrease in NGP decreases HDI. When the coefficients are

[1] Since there is no criterion for the maximum delay length, the maximum delay length was chosen as 4 in order to decide the appropriate delay length. Then, using the maximum 4 lag lengths we have given when the model is run for dependent and independent variables, the ARDL model is estimated with appropriate delays, and the ARDL (4,2,0,0,) model is found as a suitable model by using the Akaike information criterion. In the literature, there are studies in which the maximum number of lags is 4 or different values using annual data (Koçak, 2014).

examined, 1% increase in EC and OP increases the HDI by approximately 0.29% and 0.05%, respectively, while a 1% increase in NGP decreases the HDI by approximately 0.03%.

Seeing the state of the regression coefficients will create a hunch for the reliability of the model. Therefore, we performed CUSUM tests for the systematic change in regression coefficients, and performed CUSUMSQ tests for sudden and random changes and are shown in Figure 1.

Figure 1: Results for CUSUM and CUSUMSQ.



When Figure 1 is examined, the function is stable according to both CUSUM and CUSUMSQ tests. Therefore, the effect of explanatory variables on the dependent variable is stable in the relevant period.

ARDL error correction model was estimated to investigate the short-term relationship between variables and the results are shown in Table 3.

Table 3: ARDL Short-Term Model Estimation and Diagnostic Test Results

Variable	Coefficient	T-statistics	p-value
ECT(-1)	-0.196***	0.033	0.000
D(HDI(-1))	0.330**	0.128	0.020
D(HDI(-2))	-0.135	0.122	0.285

D(HDI(-3))	0.530***	0.109	0.000
D(EC)	0.071***	0.015	0.000
D(EC(-1))	-0.051***	0.018	0.008
Diagnostic Tests			

	LM	BPG	JB	RR
χ^2	0.694	0.803	0.095	0.521
p value	0.516	0.620	0.954	0.481

Note: *,** and *** refers to the level of significance at the level (10%), (5%), (1%) respectively. LM; Breusch Godfrey LM autocorrelation test, BPG; Breusch Pagan Godfrey heteroskedasticity test, JB; Jarque-Bera shows normality test statistic, RR shows Ramsey Reset test statistic.

When Table 3 is examined, the first and third lags of the HDI and the level and first lags of EC affect HDI at 5% and 1% significance levels, respectively. A 100% increase in EC will cause 7.1% increase in welfare. In addition, the error correction coefficient (ECT), which expresses the long-term relationship between errors, is negative and significant at the level of 1% in accordance with the theoretical expectation.

Findings show that; In Turkey, a both long and short-term relationship between EC, energy prices and quality of life are available. The increase in EC and OP increases human welfare. Because of mostly imported natural gas, on the other hand, ~~is~~ generally used in the housing sector, the price increase will affect human welfare negatively. Therefore, while EC is necessary for the quality of life, low elasticity of energy prices has shown that the price increases that will be experienced can have little positive / negative effects on human welfare.

4. Conclusion

Energy is necessary both for the well-being of people and for economic activities. Empirical results from many studies have shown that energy consumption increases economic growth and welfare. For many countries around the world, there are numerous studies investigating the relationship between energy consumption and economic growth. On the other hand, there are not many studies investigating the effect of energy consumption and energy price on quality of life. In this case, energy consumption and price of energy become important in researching of human development and thus the quality of life. In this context, the contribution of this article is to investigate energy consumption, the relationship between energy prices and the index of human development during the period 1990-2019 that is the current data for Turkey. In this study, ARDL bound test method is used while investigating this relationship.

Findings show that; there is a both long and short-term relationship between energy consumption, energy prices and quality of life are available in Turkey. The increase in energy consumption and oil price increases human welfare. According to the findings, a 1% increase in energy consumption in Turkey increases the welfare level by 0.07%. Natural gas, on the other hand, affects human welfare negatively. Therefore, while energy consumption is necessary for the quality of life, low elasticity of energy prices illustrate that the price increases might have little positive / negative effects on human welfare. Since energy is used as an input in many activities, increasing its consumption plays an important role in both ensuring economic growth and raising the level of welfare. Therefore, policy makers supporting energy investments and reducing energy costs (such as natural gas) will support increasing the level of welfare.

REFERENCES

Antonietti, R., & Fontini, F. (2019). Does energy price affect energy efficiency? Cross-country panel evidence. *Energy Policy*, *129*, 896-906. doi: 10.1016/j.enpol.2019.02.069

Bahmanı-Oskooee, M. M. & Goswamı, G. G. (2003). A disaggregated approach to test the j-curve phenomenon: Japan versus her major trading partners. *Journal of Economics and Finance, 27*(1), 102-113. Retrieved from: https://link.springer.com/content/pdf/10.1007/BF02751593.pdf

Dias, R. A., Mattos, C. R., & Balestieri, J. A. (2006). The limits of human development and the use of energy and natural resources. *Energy Policy*, *34*(9), 1026-1031. doi.org/10.1016/j.enpol.2004.09.008

Doğan, E.M. & Tatlı, H. (2014). İnsani gelişme ve insani yoksulluk bağlamında Türkiye'nin dünyadaki yeri. *Atatürk Üniversitesi İktisadi ve İdari Bilimler Dergisi, 28*(1), 99-124. Retrieved from: https://dergipark.org.tr/en/pub/atauniiibd/issue/2712/35952

Ediger, S. E. & Tathdil, H. (2007). Energy as an indicator of human indicator development: a statistical approach. *Energy Policy*, *35*, 2969-2977.

Engle, R. F., & Granger, C. W. (1987). Co-integration and error correction: representation, estimation, and testing. *Econometrica: journal of the Econometric Society*, 251-276.

Johansen, S., & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration—with appucations to the demand for money. *Oxford Bulletin of Economics and statistics*, *52*(2), 169-210.

Koçak, E. (2014). Türkiye'de çevresel kuznets eğrisi hipotezinin geçerliliği: Ardl sınır testi yaklaşımı. *İşletme ve İktisat Çalışmaları Dergisi*, *2*(3), 62-73.

Martinez D. M. & Ebenhack B. W. (2008). Understanding the role of energy consumption in human development through the use of saturation phenomena. *Energy Policy*, *36*, 1430-1435. doi: 10.1016/j.enpol.2007.12.016

Narayan, P. K. & Narayan, S. (2005). Estimating income and price elasticities of imports for fiji in a cointegration framework. *Economic Modelling*, *22*(3), 423-438. doi:10.1016/j.econmod.2004.06.004

Niu, S., Jia, Y., Wang, W., He, R., Hu, L., & Liu, Y. (2013). Electricity consumption and human development level: A comparative analysis based on panel data for 50 countries. *International Journal of Electrical Power & Energy Systems*, *53*, 338-347. doi.org/10.1016/j.ijepes.2013.05.024

Ouedraogo, N. S. (2013). Energy consumption and human development: Evidence from a panel cointegration and error correction model. *Energy*, *63*, 28-41. doi:10.1016/j.energy.2013.09.067

Pasternak, A. D. (2001). Global energy futures and human development: a framework for analysis. Retrieved from: https://www.osti.gov/etdeweb/servlets/purl/20264287

Pesaran, M. H. & B. Pesaran (1997), *Working with Microfit 4.0: interactive econometric analysis*, Oxford University Press.

Pesaran, M. H., Y. Shin & R. J. Smith (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics, 16*(3), 289-326. doi: 10.1002/jae.616

UNDP (2005). Human development report, international cooperation at a crossroads. Retrieved from: http://hdr.undp.org/sites/default/files/reports/266/hdr05_complete.pdf

Warr B.S, & Ayres R.U. (2010). Evidence of causality between the quantity and quality of energy consumption and economic growth. *Energy, 35*, 1688-1693. doi:10.1016/j.energy.2009.12.017

Wu, Q., Clulow, V., & Maslyuk, S. (2010). Energy consumption inequality and human development. In *2010 International Conference on Management Science & Engineering 17th Annual Conference Proceedings* (p. 1398-1409). IEEE. Retrieved from: https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=5719973&casa_token=2MIi1V3aFKEAAAAA:Vn-lN1ceY_q1fA1un3dEmxruivy8Tt-SjkqHZ_FPGGpMxP0vGp-O2_wehCM6g7dr-nj-h5bpNQ&tag=1

Yılancı, V. (2015). Türkiye'de para talebi istikrarlılığının testi: kayan pencerelerde sınır testi yaklaşımı. *Dumlupınar Üniversitesi Sosyal Bilimler Dergisi, 33.* Retrieved from: https://dergipark.org.tr/en/download/article-file/55789