Identifying Causality Relationship between Energy Consumption and Economic Growth in Developed Countries

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Info Articles	Abstract
	The main purpose of this study is to evaluate the causality relationship between energy consumption and economic growth for developed countries. Within this context, annual data of 22 developed countries was examined by using Dumitrescu Hurlin panel causality analysis. As a result, it was determined that that there is a bidirectional relationship between energy consumption and economic improvement for developed countries. This condition provides two different results. Firstly, energy consumption has an influence on economic development for these countries. While considering this result, it can be said that any limitation in energy consumption will restrict economic growth. Moreover, it was also concluded that level of economic growth is the main reason of energy consumption for developed countries. In other words, developed countries tend to have more energy consumption when their economies are growing.

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INTRODUCTION

Energy plays an essential role for the people to satisfy their daily needs. In other words, it is a very significant factor to improve the life standards of the people and to provide sustainable development. In addition to those aspects, it is one of the most critical factors that influence political factors in the world (McKenna et. al., 2013), (Asafu-Adjaye, 2000), (Ebohon, 1996).

It can be classified into two different categories, such as primary and secondary energy (Perez-Lombard et. al., 2008). Primary energy refers to the energy that can be produced directly. Petrol and coal are the main examples of this type of energy. On the other side, secondary energy means the energy which is converted from the primary energy, such as electricity (Bullard and Herendeen, 1975).

Energy is also important for the economies of the countries. However, there are different views in the literature with respect to the relationship between energy consumption and economic improvement. Some researchers argue that energy consumption increases GDP growth rate. The main reason is that it is accepted as the driving force of the industry. Because it contributes the increase of the production level, it can be said that it supports to the improvement of the economy (Aqeel and Butt, 2001), (Özcan, 2013).

In addition to this aspect, there is also another view that supports bidirectional causality relationship between energy consumption and economic improvement. In this situation, the countries, which have high economic growth, tend to consume more energy. On the other side, according to other researchers, energy consumption does not influence economic growth. According to this view, it is necessary to decrease consumption level to enhance cost efficiency (Oh and Lee, 2004), (Zhang and Cheng, 2009).

Owing to this condition, it can be said that studies, which analyze the relationship between energy consumption and GDP growth rate, are very significant. While searching similar studies in the literature, it was defined that there are many studies regarding this subject which were analyzed by different methodologies. However, it was also identified that generally a single country was chosen in the studies. This issue shows that a new study that covers a group of countries will be very beneficial.

Parallel to this issue, this study aims to see the relationship between energy consumption and economic improvement in developed countries. For this purpose, annual data of 22 developed countries for the period between 1971 and 2014 was evaluated by Dumitrescu Hurlin causality analysis. According to the results of the analysis, it will be possible to give some recommendation to these countries regarding this concept.

There are four different parts in this study. After this introduction part, the second part reviews the literature. In this part, different studies related to this issue will be detailed. Additionally, the third part includes research and methodology. Within this scope, information about data, method and analysis results will be emphasized. Moreover, the final part summarizes results and underlines recommendation.

LITERATURE REVIEW

The subjects of energy consumption and economic growth are so popular subject in the literature that it attracted the attention of many different researchers. Some of them are emphasized on table 1.

Table 1. Similar Studies in the Literature

Authors	Scope	Method	Result
Cheng (1995)	US	Granger Causality Analysis	It was analyzed that reducing energy consumption is not associated with economic improvement.
Asafu-Adjaye (2000)	Asian developing countries	Granger Causality Analysis	It was defined that there is a causality relationship between energy consumption and GDP growth rate.
Aqeel and Butt (2001)	Pakistan	Granger Causality Analysis	They identified that economic growth spurs energy consumption.
Hondroyiannis et. al. (2002)	Greece	Granger Causality Analysis	The adoption of energy conservation policy can be conducted without hampering economy.
Ghosh (2002)	India	VAR	It was found that electricity conservation policies have not deteriorated impact on economic growth.
Oh and Lee (2004)	Korea	VECM	They identified that GDP growth rate is not associated with energy consumption in the short term.
Paul and Bhattacharya (2004)	India	Granger Causality Analysis	There is a dual relation between energy consumption and economic improvement.
Lee and Chang (2005)	Taiwan	Granger Causality Analysis	They emphasized that energy consumption is the engine of economic growth.
Mehrara (2007)	Oil exporting countries	Regression	The results prove that the energy conservation policy can be implemented without the fear of decreasing economic growth.
Yuan et. al. (2008)	China	VECM	Electricity and oil consumption spurs economic growth.
Lee and Chang (2008)	16 Asian countries	Regression	Decreasing energy consumption does not influence economic growth in the short run.
Chontanawat et. al. (2008)	100 countries	Granger Causality Analysis	It was defined that energy consumption has great impact on economic growth.
Akinlo (2008)	11 Sub-Saharan countries	VECM	It was stressed that each country should implement self-appropriate policy.
Balat (2008)	Turkey	Descriptive Statistics	Energy consumption contributes the improvement of the economy.
Wolde-Rufael (2009)	African Countries	VAR	It was defined that energy consumption affects economic improvement.
Apergis and Payne (2009a)	The Commonwealth	Granger Causality Analysis	Energy consumption has important and positive impact on economic

	of Independent States		growth.
Zhang and Cheng (2009)	China	VAR	It was found that energy consumption does not have any impact on economic growth.
Apergis and Payne (2009b)	Central America countries	Granger Causality Analysis	They reached a conclusion that energy consumption spurs economic growth.
Odhiambo (2009)	Tanzania	ARDL	It was identified that energy consumption stimulates economic growth.
Özturk et. al. (2010)	Low and middle income countries	Regression	The results prove that energy consumption and economic growth are co-integrated variables for all countries.
Pao and Tsai (2010)	BRIC countries	VECM	There are unidirectional strong causalities from energy to output.
Chang (2010)	China	VECM	Energy consumption is required in order to increase economy.
Ozturk and Acaravci (2010)	Turkey	Granger Causality Analysis	They emphasized that energy conservation policy does not impair economic growth.
Apergis and Payne (2010)	OECD countries	Granger Causality Analysis	It was concluded that there is a bidirectional relation between renewable energy consumption and economic growth.
Kaplan et. al. (2011)	Turkey	VECM	They suggested that energy consumption affects economic development.
Wang et. al. (2011)	China	VECM	Reducing energy consumption has negative impact on economic growth.
Belke et. al. (2011)	25 OECD countries	VECM	It was defined that there is a bidirectional relationship between energy consumption and GDP growth.
Li and Leung (2012)	China	Regression	Energy conversation policies can probably hamper the economy of the industrial regions.
Öcal and Aslan (2013)	Turkey	ARDL	They induced that renewable energy consumption has a negative influence on economic growth.
Özcan (2013)	12 Middle East countries	Regression	It was concluded that economic growth has effect on energy consumption.
Öcal et. al. (2013)	Turkey	Granger Causality Analysis	Decreasing the consumption of the coal does not influence GDP growth in Turkey.

Tang and Tan (2014)	Malaysia	Granger Causality Analysis	Energy consumption and economic growth are correlated.
Lin and Wesseh (2014)	South Africa	Granger Causality Analysis	Energy conservation policies impair economic growth.
Sebri and Ben-Salha (2014	BRICS countries	ARDL	It was defined that bidirectional Granger causality can be observed between economic growth and renewable energy consumption.
Yavuz (2014)	Turkey	Regression	There is a long run relationship between energy consumption and economic growth.
Shahbaz et. al. (2014)	Pakistan	ARDL	They indicated that natural gas consumption is the main source for economy.
Nazlioglu et. al. (2014)	Turkey	Granger Causality Analysis	Electricity conservation policy does not impair the growth.
Aslan (2014)	Turkey	ARDL	IT was emphasized that there is a relationship between electricity consumption and GDP growth.
Alshehry and Belloumi (2015)	Saudi Arabia	VAR	Energy consumption does not impair economic growth.
Begum et. al. (2015)	Malaysia	ARDL	Energy consumption affects GDP growth in the long run.
Iyke (2015)	Nigeria	VECM	Electricity consumption is beneficial for economic growth.
Doğan (2015)	Turkey	Granger Causality Analysis	Electricity from non-renewable sources is more beneficial than renewable sources in terms of economic growth.
Bhattacharya et. al. (2016)	38 countries	Regression	They reached a conclusion that renewable energy consumption spurs the economic output.
Wang et. al. (2016)	China	Granger Causality Analysis	There is a bidirectional causality relationship between economic growth and energy consumption.
Alper and Oguz (2016)	New EU members countries	ARDL	Renewable energy consumption has positive effect on economic growth.

Table 1 shows that energy consumption affects economic growth positively in many different studies. Many researchers conducted a study to reach this objective by using Granger causality analysis (Asafu-Adjaye, 2000), (Aqeel and Butt, 2001), (Hondroyiannis et. al., 2002), (Lee and Chang, 2005), (Chontanawat et. al., 2008), (Apergis and Payne, 2009a), (Apergis and Payne, 2009b), (Özturk and Acaravci, 2010), (Lin and Wesseh, 2014). However, Mehrara (2007), Lee and Chang (2008), Li and Leung (2012), Yavuz (2014) also emphasized the similar result by using regression method. Furthermore, Yuan et. al. (2008), Chang (2010) and Wang et. al. (2011)

identified that energy consumption is an important aspect to spur economic growth with the help of vector error correction method.

Additionally, Wolde-Rufael (2009) and Alshehry and Belloumi (2015) used VAR method to understand whether energy consumption influence economic development. As a result, it was determined that energy conservation policies can likely hinder the economy. Moreover, Shahbaz et. al. (2014) tried to evaluate this relationship for Pakistan in their study. According to the results of the ARDL analysis, it was underlined that energy consumption is the primary source of economic growth. Furthermore, Odhiambo (2009) reached the similar conclusion by using the same method. Also, Balat (2008) conducted a study for Turkey and identified that energy consumption improves economic development.

In spite of the studies emphasized above, there are some studies in which economic growth is not associated with energy consumption. In other words, they indicate that energy conservation policies can be implemented to create healthy environment without the fear of economic shrinkage. Zhang and Cheng (2009) tried to evaluate this situation in China. According to the results of VAR, it was concluded that energy consumption does not influence economic improvement. Cheng (1995) and Öcal et. al. (2013) used different methodology and underlined the same conclusion. Oh and Lee (2004) made a study to define this issue in Korea by using VECM. It was stressed that there is not a relationship between those variables.

Furthermore, some studies underlined bidirectional causality relationship between energy consumption and GDP growth rate. Tang and Tan (2014) made a study to define this aspect in Malaysia. As a result of Granger causality analysis, it was underlined that energy consumption and economic growth are dependent to each other. Apergis and Payne (2010), Paul and Bhattacharya (2004) and Wang et. al. (2016) also reached similar conclusion by using the same method. Besides, with the help of VECM, Kaplan et. al. (2011), Pao and Tsai (2010) Belke et. al. (2011) determined that there is a bidirectional relationship between energy consumption and GDP growth. Özturk et. al. (2010) and Özcan (2013) conducted analysis by using regression method and indicated the same conclusion.

Additionally, the relation between electricity consumption and economic growth was also emphasized in some other studies. Ghosh (2002) made a study for India by using VAR method. It was identified that there is not a relationship between these variables in the short run. Nazlioglu et .al. (2014) emphasized this similar conclusion by Granger causality analysis. However, Iyke (2015) underlined the different conclusion that enhancing electricity consumption is beneficial for economic growth by using VECM. Nevertheless, mutual relation between electricity consumption and economic growth was underlined by Aslan (2014) for Turkey.

In addition to them, there are also some studies that focus on renewable energy consumption and economic growth. With the help of ARDL, Alper and Oguz (2016) concluded that renewable energy consumption spurs the economic output. Bhattacharya et. al. (2016) defined the similar result by using a different methodology. Furthermore, Ocal and Aslan (2013) determined that renewable energy consumption has a negative influence on economic growth in Turkey by using ARDL analysis. Also, this relationahip was underlined by Sebri and Ben-Salha (2014) for BRICS countries with the help of the same method.

As it can be seen from table 1, it was understood that there are lots of studies regarding this concept. Additionally, it was also seen that different analysis methodologies in these studies were taken into the consideration, such as Granger causality analysis, vector error correction method, regression and ARDL. Furthermore, with respect to the scope, generally a single country was chosen in the studies. Therefore, it can be understood that there is need of new study which evaluates a group of a country, such as developed countries.

RESEARCH AND APPLICATION

Data and Scope

In this study, annual data of 22 developed countries for the years between 1971 and 2014 was taken into the consideration. This data was obtained from the website of World Bank. All developed data could not be included in the analysis due to the lack of data. The list of these countries was explained on table 2.

Table 2. List of 22 Developed Countries

Australia	Austria	Belgium	Canada
Denmark	Finland	France	Germany
Greece	Iceland	Ireland	Israel
Italy	Japan	Luxembourg	Netherlands
Norway	Portugal	Spain	Sweden
United Kingdom	United States		

Dumitrescu Hurlin Causality Test

Dumitrescu Hurlin (DH) panel causality analysis was developed to understand the relationship for panel variables. Therefore, it can be said that it is an advanced form of Granger causality analysis. Therefore, it was accepted that Dumitrescu Hurlin panel causality analysis has some benefits over Granger causality analysis. For example, it is more successful in analyzing unbalanced panel data and cross sectional dependency between countries. The main requirement of this analysis is that all variables should be stationary on their level values. The details of this test were demonstrated below (Dumitrescu and Hurlin, 2012).

$$Y_{i,t} = a_i + \sum_{k=1}^{K} Y_i^k Y_{i,t-k} + \sum_{k=1}^{K} B_i^k X_{i,t-k} + \varepsilon_{i,t} \quad (1)$$

In equation (1), K refers the optimum lag interval. In addition to this aspect, Y and X represent the variables of which causality analysis will be analyzed. In other words, it can be said that the aim of this analysis is to determine whether X is the cause of Y or not.

Analysis Results

In the analysis process, firstly, Levin Lin Chu panel unit root test was applied to understand whether the variables of energy consumption and GDP growth are stationary or not. Table 3 shows that both of these variables are stationary because probability values of them are less than 0.05. Owing to this condition, it is possible to implement Dumitrescu Hurlin panel causality analysis.

Table 3. LLC Test Results

Variables	Levin, Lin & Chu Test (p Value)
Energy Consumption	0.0000
Economic Growth	0.0000

After stationary analysis, Dumitrescu Hurlin panel causality analysis was used to see the causality relationship between energy consumption and economic improvement. In this analysis, the conditions in three different lags were considered. The details of this analysis were given on table 4.

Table 4. Dumitrescu Hurlin Panel Causality Test Results

Null Hypothesis	Prob Values (lag=1)	Prob Values (lag=2)	Prob Values (lag=3)
"Energy Consumption" is not the cause of "Economic Growth"	0.0000	0.0000	0.0126
"Economic Growth" is not the cause of "Energy Consumption"	0.0000	0.0013	0.2279

Table 4 shows that the null hypothesis of "Energy consumption is not the cause of economic growth" can be rejected in both three lags. The main reason is that probability values of these lags for this hypothesis are less than 0.05. This situation demonstrates that energy consumption has an impact on economic growth for developed countries. While considering this result, it can be said that limiting energy consumption will restrict economic growth for these countries. In the literature, lots of different studies achieved this conclusion (Apergis and Payne, 2009), (Tang and Tan, 2014). On the contrary, Zhang and Cheng (2009), Cheng (1995), Öcal et. al. (2013) and Lee (2004) emphasized that economic growth is not associated with energy consumption.

In addition to this aspect, it was also concluded that there is also a causality relationship from economic growth to energy consumption because the probability values of the first and second lag are less than 0.05 with respect to the second null hypothesis. On the other hand, the probability value of the third lag is more than 0.05. While considering first two lags, it was defined that the level of economic growth has an effect on energy consumption for developed countries. This result shows that developed countries tend to have more energy consumption when they have high economic growth. Wang et. al. (2016), Sebri and Ben-Salha (2014) and Özcan (2013) also reached the similar conclusion in their studies.

CONCLUSION

Energy is a very important concept for many different aspects. For example, it plays a very strategic role for the economies of the countries. It was accepted that higher energy consumption contributes economic growth. On the other hand, there are some different views for this issue that energy consumption does not have any effect on economic growth. While considering this thought, it can be said that energy consumption level can be decreased to have cost efficiency.

Parallel to this situation, this study aims to identify the relationship between energy consumption and GDP growth in developed countries. Therefore, annual data of 22 developed countries for the period between 1971 and 2014 was taken into the consideration. Additionally, Dumitrescu Hurlin panel causality analysis was used for this purpose.

First of all, Levin Lin Chu panel unit root test was performed to determine whether the variables of energy consumption and economic growth are stationary or not. As a result, it was identified that both of these variables are stationary because their probability values are less than 0.05. After this analysis, Dumitrescu Hurlin panel causality test was applied to see the causality relationship between these variables.

According to the results of the analysis, it was defined that there is a bidirectional relationship between energy consumption and economic growth for developed countries. This situation presents

two different results. Firstly, energy consumption influences economic improvement for these countries. That is to say, it means that limiting energy consumption will restrict economic growth.

Another important result of this issue is that the level of economic growth has an effect on energy consumption for developed countries. That is to say, developed countries, which have high economic growth, tend to have more energy consumption. With this study, it was aimed to make a contribution to the literature. Nevertheless, in the future, a new study that analyzes the causality relationship between these variables for developing or underdeveloped countries will be very beneficial.

REFERENCES

Akinlo, Anthony. 2008. Energy consumption and economic growth: Evidence from 11 Sub-Sahara African countries. Energy economics, 30(5): 2391-2400.

Alshehry, Atef Saad, and Mounir Belloumi. 2015. Energy consumption, carbon dioxide emissions and economic growth: The case of Saudi Arabia. Renewable and Sustainable Energy Reviews, 41: 237-247.

Apergis, Nicholas, and James E. Payne. 2009a. Energy consumption and economic growth in Central America: evidence from a panel cointegration and error correction model. Energy Economics: 312, 211-216.

Apergis, Nicholas, and James E. Payne. 2009b. Energy consumption and economic growth: evidence from the Commonwealth of Independent States. Energy Economics, 315: 641-647.

Apergis, Nicholas, and James E. Payne. 2010. Renewable energy consumption and economic growth: evidence from a panel of OECD countries. Energy policy, 381: 656-660.

Aqeel, Anjum, and Mohammad Subihuddin Butt. 2001. The relationship between energy consumption and economic growth in Pakistan. Asia-Pacific Development Journal, 82, 101-110.

Asafu-Adjaye, John. 2000. The relationship between energy consumption, energy prices and economic growth: time series evidence from Asian developing countries. Energy economics, 226: 615-625.

Aslan Alper Oguz Öcal. 2016. The role of renewable energy consumption in economic growth: Evidence from asymmetric causality. Renewable and Sustainable Energy Reviews, 60: 953-959.

Aslan, Alper. 2014. Causality between electricity consumption and economic growth in Turkey: An ARDL bounds testing approach. Energy Sources, Part B: Economics, Planning, and Policy, 91: 25-31.

Aurelia, T.S., 2017. Reflections on the possibility of using statistical analysis science and innovation in the republic of moldova. *International Business and Accounting Research Journal*, *1*(1), pp.9-17.

Balat, Mustafa. 2008. Energy consumption and economic growth in Turkey during the past two decades. Energy Policy, 361: 118-127.

Begum, Rawshan Kazi Sohag, Sharifah Mastura Syed Abdullah & Mokhtar Jaafar. 2015. CO 2 emissions, energy consumption, economic and population growth in Malaysia. Renewable and Sustainable Energy Reviews, 41: 594-601.

Belke, Ansgar, Frauke Dobnik, and Christian Dreger. 2011. Energy consumption and economic growth: New insights into the cointegration relationship. Energy Economics, 335: 782-789.

Bhattacharya, Mita, Sudharshan Reddy Paramati, İlhan Ozturk and Sankar Bhattacharya. 2016. The effect of renewable energy consumption on economic growth: Evidence from top 38 countries. Applied Energy, 162: 733-741.

Bullard, Clark W., and Robert A. Herendeen. 1975. The energy cost of goods and services. Energy policy, 34: 268-278.

Chang, Ching-Chih. 2010. A multivariate causality test of carbon dioxide emissions, energy consumption and economic growth in China. Applied Energy, 8711: 3533-3537.

Cheng, Benjamin S. 1995. An investigation of cointegration and causality between energy consumption and economic growth. Journal of Energy and Development, 211.

Chontanawat, Jaruwan, Lester C. Hunt, and Richard Pierse. 2008. Does energy consumption cause economic growth?: Evidence from a systematic study of over 100 countries. Journal of Policy Modeling, 302: 209-220.

Dogan, Eyüp. 2015. The relationship between economic growth and electricity consumption from renewable and non-renewable sources: A study of Turkey. Renewable and Sustainable Energy Reviews, 52: 534-546.

Dumitrescu, Elena-Ivona, and Christophe Hurlin. 2012. Testing for Granger non-causality in heterogeneous panels. Economic Modelling, 294: 1450-1460.

Ebohon, Obas John. 1996. Energy, economic growth and causality in developing countries: a case study of Tanzania and Nigeria. Energy policy, 24(5): 447-453.

Ghosh, Sajal. 2002. Electricity consumption and economic growth in India. Energy policy, 302: 125-129.

Heidari, Hassan, Salih Turan Katircioğlu, and Lesyan Saeidpour. 2015. Economic growth, CO2 emissions, and energy consumption in the five ASEAN countries. International Journal of Electrical Power & Energy Systems, 64: 785-791.

Hondroyiannis, George, Sarantis Lolos, and Evangelia Papapetrou. 2002. Energy consumption and economic growth: assessing the evidence from Greece. Energy Economics, 244: 319-336.

Iyke, Bernard Njindan. 2015. Electricity consumption and economic growth in Nigeria: A revisit of the energy-growth debate. Energy Economics, 51: 166-176.

Kaplan, Muhittin, Ilhan Ozturk, and Huseyin Kalyoncu. 2011. Energy consumption and economic growth in Turkey: cointegration and causality analysis. Romanian Journal of Economic Forecasting, 231: 31-41.

Kiow, T.S., Salleh, M.F.M. and Kassim, A.A.B.M., 2017. The determinants of individual taxpayers' tax compliance behaviour in peninsular malaysia. *International Business and Accounting Research Journal*, *1*(1).

Lee, Chien-Chiang, and Chun-Ping Chang. 2005. Structural breaks, energy consumption, and economic growth revisited: evidence from Taiwan. Energy Economics, 276: 857-872.

Lee, Chien-Chiang, and Chun-Ping Chang. 2008. Energy consumption and economic growth in Asian economies: a more comprehensive analysis using panel data. Resource and energy Economics, 301: 50-65.

Li, Raymond, and Guy CK Leung. 2012. Coal consumption and economic growth in China. Energy policy, 40: 438-443.

Lin, Boqiang, and Presley K. Wesseh Jr. 2014. Energy consumption and economic growth in South Africa reexamined: A nonparametric testing approach. Renewable and sustainable energy reviews, 40: 840-850.

McKenna, Russell, Erik Merkel, Daniel Fehrenbach, Stephanie Mehne and Wolf Fichtner. 2013. Energy efficiency in the German residential sector: a bottom-up building-stock-model-based analysis in the context of energy-political targets. Building and Environment, 62: 77-88.

Mehrara, Mohsen. 2007. Energy consumption and economic growth: the case of oil exporting countries. Energy policy, 355: 2939-2945.

Natalia, P. and Aurelia, T.S., 2017. The Main Directions of The Scientific Reform in Republic of Moldova. *International Business and Accounting Research Journal*, *1*(1), pp.44-54.

Nazlioglu, S., Kayhan, S., & Adiguzel, U. 2014. Electricity consumption and economic growth in Turkey: cointegration, linear and nonlinear granger causality. Energy Sources, Part B: Economics, Planning, and Policy, 94: 315-324.

Ocal, Oğuz and Alper Aslan. 2013. Renewable energy consumption–economic growth nexus in Turkey. Renewable and Sustainable Energy Reviews, 28: 494-499.

Ocal, Oguz, Ilhan Ozturk, and Alper Aslan. 2013. Coal consumption and economic growth in Turkey. International Journal of Energy Economics and Policy, 32, 193.

Odhiambo, Nicholas M. 2009. Energy consumption and economic growth nexus in Tanzania: An ARDL bounds testing approach. Energy Policy, 372: 617-622.

Oh, Wankeun, and Kihoon Lee. 2004. Energy consumption and economic growth in Korea: testing the causality relation. Journal of Policy Modeling, 268: 973-981.

Ozcan, Burcu. 2013. The nexus between carbon emissions, energy consumption and economic growth in Middle East countries: A panel data analysis. Energy Policy, 62: 1138-1147.

Ozturk, Ilhan, Alper Aslan, and Huseyin Kalyoncu. 2010. Energy consumption and economic growth relationship: Evidence from panel data for low and middle income countries. Energy Policy, 388: 4422-4428.

Ozturk, Ilhan, and Ali Acaravci. 2010. CO 2 emissions, energy consumption and economic growth in Turkey. Renewable and Sustainable Energy Reviews, 149: 3220-3225.

Pao, Hsiao-Tien, and Chung-Ming Tsai. 2010. CO 2 emissions, energy consumption and economic growth in BRIC countries. Energy Policy, 3812: 7850-7860.

Paul, Shyamal, and Rabindra N. Bhattacharya. 2004. Causality between energy consumption and economic growth in India: a note on conflicting results. Energy economics, 266: 977-983.

Pérez-Lombard, Luis, José Ortiz, and Christine Pout. 2008. A review on buildings energy consumption information. Energy and buildings, 403: 394-398.

Sebri, Maamar, and Ousama Ben-Salha. 2014. On the causal dynamics between economic growth, renewable energy consumption, CO 2 emissions and trade openness: fresh evidence from BRICS countries. Renewable and Sustainable Energy Reviews, 39: 14-23.

Shahbaz, Muhammad, Mohamed Arouri, and Frédéric Teulon. 2014. Short-and long-run relationships between natural gas consumption and economic growth: Evidence from Pakistan. Economic Modelling, 41: 219-226.

Söylemez, A.O., 2017. Volatılıty Spıllovers from The Internatıonal Capıtal Inflows to Economıc Growth in Turkey. *International Business and Accounting Research Journal*, *1*(1), pp.18-25.

Tang, Chor Foon, and Bee Wah Tan. 2014. The linkages among energy consumption, economic growth, relative price, foreign direct investment, and financial development in Malaysia. Quality & Quantity, 1-17.

Wang, S. S., Zhou, D. Q., Zhou, P., & Wang, Q. W. 2011. CO 2 emissions, energy consumption and economic growth in China: a panel data analysis. Energy Policy, 399: 4870-4875.

Wang, Shaojian, Qiuying Li, Chuanglin Fang and Chunshan Zhou. 2016. The relationship between economic growth, energy consumption, and CO 2 emissions: empirical evidence from China. Science of the Total Environment, 542: 360-371.

Wolde-Rufael, Yemane. 2009. Energy consumption and economic growth: the experience of African countries revisited. Energy Economics, 312: 217-224.

Yavuz, N. Ç. 2014. CO2 emission, energy consumption, and economic growth for turkey: evidence from a cointegration test with a structural break. Energy Sources, Part B: Economics, Planning, and Policy, 93, 229-235.

Yuan, Jia-Hai, Jian-Gang Kang, Chang-Hong Zhao and Zhao-Guang Hu. 2008. Energy consumption and economic growth: evidence from China at both aggregated and disaggregated levels. Energy Economics, 306: 3077-3094.

Yüksel, S., 2017. The impacts of research and development expenses on export and economic growth. *International Business and Accounting Research Journal*, *1*(1), pp.1-8.

Zhang, Xing-Ping, and Xiao-Mei Cheng. 2009. Energy consumption, carbon emissions, and economic growth in China. Ecological Economics, 6810: 2706-2712.