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Econometric Analysis of the Relationship between Renewable Energy Production, Traditional Energy Production and Unemployment: The Case of Azerbaijan

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ABSTRACT

The aim of this study is to determine the relationship between Azerbaijan's traditional energy production, renewable energy production and unemployment rates. While performing the analysis, it was first tested whether the data were stationary or not. The data were stabilized by using the Augmented Dickey–Fuller test (ADF). After making the data stationary, the VAR model was established, and appropriate lag lengths were determined. The relationship between the data was analyzed by using the Granger Causality test at the end. Finally, the direction and strength of the relationship between the variables were tried to be determined by making correlation analysis between the variables. According to the results of the Granger analysis, a causal relationship was found between unemployment and renewable energy production, and between renewable energy production and traditional energy production based on 2005-2015 data in Azerbaijan.

Keywords: Energy, Renewable Energy, Traditional Energy, Unemployment, Economy, Azerbaijan
JEL Classifications: O13, E24, O11

1. INTRODUCTION

People are being pushed to consume more as a result of globalization, increased international commerce volume, and extensive internet use. They all want to attain absolute growth, whether it's in the food, textile, or other areas. For this expansion to occur, every country need energy resources. If a country lacks natural resources, it must rely on imports to satisfy its needs. Countries are looking for new energy sources as an alternative to energy imports, which are more expensive and involve political concerns. For many years, conventional energy has been the most extensively used. However, resource scarcity and dwindling global stocks have prompted governments to seek for new energy sources. Renewable energy has become a need for states that do not have or have limited access to traditional energy. States are now competing to develop their own renewable energy sources rather than relying on existing energy sources. The benefits of renewable energy, as well as the environmental cleanup that occurs when it is properly handled, are critical in terms of avoiding a threat that may be exhausted. Many countries are now able to fulfill their own domestic energy needs by utilizing the benefits of renewable energy. It contributes significantly to the growth of the country's economy since it impacts the output level of either traditional or renewable energy.

As an example, Azerbaijan, which produces both renewable and traditional energy, is investigated in this study. It has been attempted to evaluate the link between the types of energy generated in this nation and the unemployment rate in this country. There are a few research on renewable energy in Azerbaijan, despite the fact that there are significant limitations. Bulut, Suleymanov, and Vidadili

(2017) presented adequate policy framework and research for Azerbaijan's sustainable energy development through the transition to renewable energy in a paper. According to the findings of this study, a full transition to renewable energy sources in Azerbaijan will provide long-term economic and environmental advantages, as well as lead to the development of sustainable energy in the country. In their research, Yesevi and Tiftikcigil (2015) look at the major trends and contributions of energy projects to Turkey-Azerbaijan ties. While the importance of energy is frequently stressed in Turkey-Azerbaijan ties, Turkey only imports 1.5 percent of Azerbaijan's oil, according to the study's findings. Energy and jobs are another major topic mentioned in the text. With its acknowledged natural gas capacity and cheap pricing, TANAP, which is strategically important for Azerbaijan and Turkey, the EU and Turkey, contributes to energy supply security. This pipeline will be used to transfer natural gas to new markets. TANAP, the world's second-largest project, will boost national economies by expanding job and investment prospects (Yesevi and Tiftikcigil, 2015).

2. THEORETICAL BACKGROUND

Energy is critical for achieving long-term economic growth (Sebri, 2015), but conditions that necessitate rapid consumption of traditional energy sources like oil, such as rising energy demand due to global population growth, jeopardize current economic well-being (Armeanu et al., 2017). In fact, lack of access to energy indicates an insufficient situation in terms of reducing poverty and accelerating development (Terrapon-Pfaff et al., 2014), but climate change issues have arisen as a result of greenhouse gas emissions from fossil fuel combustion (Bilen et al., 2008). Energy is necessary for economic success, yet current global population growth, rising energy prices, and environmental concerns all need more energy to be produced from conventional exhaustible sources, jeopardizing long-term economic growth. Transitioning to renewable energy, which is created organically from renewable sources, improves energy security while also addressing challenges like global warming and climate change (Armeanu et al., 2017). With all of this in mind, the impact of energy generation on production factors, whether it comes from traditional or renewable sources, cannot be overlooked. It is vital to study traditional energy production and renewable energy generation independently from this perspective.

2.1. Traditional Energy Production

Pomeranz (2000) attributed Europe's economic progress relative to East Asia throughout the nineteenth century to a considerably expanded resource base, which included locally produced 4 coal and land-based resources like as food and textiles derived from the colonies. Per capita energy consumption was steady or declining throughout medieval and early modern Europe's conventional energy economy. The economic, social, and geopolitical geography of Europe and the world were redrawn by the First Industrial Revolution, which was based on coal and steam engines (Kander and Stern, 2014).

Since the dawn of time, the link between energy production and economic growth has been a hot topic. Examining the research that look at the link in question is beneficial from this perspective. The price situation in the Finnish energy market was investigated by Kantola and Saari (2013). The report found that the most damaging and widely used alternative, a combination of district heating and grid power, was also the costliest. Biogas is by far the most cost-effective option.

dos Santos Gaspar et al. (2017) evaluate the link between sustainable development and energy use using the Index of Sustainable Economic Welfare (ISEW). The findings point to a novel negative feedback hypothesis for an alternative measure of progress, as well as a conservative theory for economic growth with increased energy use.

Other studies found mixed results, such as Huang et al. (2008), who established the neutrality hypothesis for low-income countries and the conservation hypothesis for middle-income countries from 1972 to 2002 for 82 countries classified as low-income, lower middle-income, upper middle-income, and high-income countries. For the period 1980-2006, Ozturk and Acaravci (2010) used the ARDL approach in conjunction with the dynamic VEC model to uncover the feedback hypothesis for Hungary, whereas the neutrality hypothesis was established for Albania, Bulgaria, and Romania.

2.2. Energy Production and Economic Power

Renewable energy comes from naturally renewable but flow-limited sources; renewable resources are almost endless in terms of length, but the quantity of energy accessible per unit time is restricted. Renewable energy technologies provide clean, plentiful energy from self-renewing sources including the sun, wind, soil, and plants.

In this sense, renewable energy provides a chance to achieve more sustainable economic growth. From this perspective, it is vital to look at research that look into the link between renewable energy and economic growth. From 2004 to 2018, Smolović et al. (2020) investigated the link between renewable energy consumption and economic development in both old and new EU member states. In both nations, the effect of renewable energy consumption on economic growth was favorable and statistically significant in the long term, according to the findings of the study.

Few studies on renewable energy and economic growth in the EU have been conducted, and those that have been conducted do not differentiate between different degrees of development among EU member states, but rather examine them as a whole (Smolović et al., 2020). During the years 1997-2007, Menegaki (2011) looked studied the causal link between economic development and renewable energy in 27 European nations. In the long term, she discovered that a 1% increase in renewable energy's percentage of the entire energy mix boosts GDP by 4.4 percent. Marques and Fuinhas (2012) examined the influence of various energy sources on economic development in a panel of 24 European nations from 1990 to 2007. They discovered that renewable resources might have a favorable or negative impact on economic growth.

2.3. Relationship Traditional Energy, Renewable Energy, and Unemployment

One of the most significant socioeconomic consequences of the deployment of renewable energy sources is the influence on employment. One of the primary concerns of policymakers who create policies in this manner is this. Indeed, there is a wealth of information available on the influence of renewable energy on employment generation (El Moummy et al., 2021). However, just a few research have looked at the link between energy usage and joblessness. Over the last decade, empirical research on the dynamic link between renewable energy consumption and production growth for various economic areas or nations have been conducted extensively (Salim, Hassan and Shafiei 2014; Bloch, Rafiq and Salim 2012; Tugcu, Ozturk and Aslan 2012). Job creation is another rationale for the development in renewable energy capability (Bergmann et al., 2008; Blazevic, 2009; Menegaki, 2011; Wei et al., 2010). Green job advocates believe that green measures may generate both temporary and permanent employment opportunities.

Ohler (2015) investigates the transition between renewable and nonrenewable energy sources by looking at the link between per capita income and renewable energy consumption. Using both linear and non-linear panel data econometric models, Rafiq et al. (2018) aim to add to the research on the dynamic connection between sectoral economic activity, government expenditure, renewable and non-renewable energy consumption, and unemployment. The findings demonstrate that whereas industrialization, the services sector, government spending, and trade openness all help to reduce unemployment, agriculture and renewable energy usage actually raise it. Yilanci et al. (2020) investigated the influence of new energy technologies on employment and examined the causation between unemployment rates and renewable energy usage for several OEC member nations (OECD). The findings revealed that Australia, Austria, Chile, France, Germany, Japan, Mexico, Portugal, Spain, and the United States had a substantial co-integration link between the variables. Renewable energy consumption has a beneficial impact on unemployment rates in Austria, Portugal, and Spain, but has a negative impact in Australia, Chile, France, Germany, and Japan, according to the findings.

3. RESEARCH METHODOLOGY

3.1. Purpose of the Study

The aim of this study is to determine the relationship between traditional energy production, renewable energy production and unemployment between 2005 and 2015. In the analysis made in this direction, it is measured whether there is a significant relationship between dependent and independent variables and how the variables affect economic growth, and a series of suggestions are made according to the results obtained. Unemployment, traditional energy production and renewable energy production were considered as variables in the analysis.

3.2. Data Set

In this part of the study, data collection and analysis methods are included. Results were obtained using VAR analysis and Granger method. Eviews statistics/econometrics program was used for analysis. The data used in the study were obtained from the World Bank. The data set includes the years 2005-2015. All data are included in the analysis annually.

Granger method used in the analysis; It is carried out to examine the causality of the numerical relationship between the variables. According to Granger, if the prediction of Y is more successful when the past values of X are used than when the past values of X are not used (other terms do not change), then X becomes the Granger cause of Y. If a time series is stationary, the Granger causality test is performed using the level values of two (or more) variables. If the time series variables are non-stationary, the Granger causality test is performed using the first (or higher) differences of the variables. The number of lags in the correlation equation is usually chosen using an information criterion such as the Akaike information criterion or the Schwarz information criterion.

Let y and x be stationary time series. Testing of H_0 "X" Granger is not the main hypothesis:

1) Find the appropriate lagged values of y (number of lags) in a univariate eigencoupling of y:

$$y_t = a_0+a_1y_{1-t}+a_2y_{2-t}+\ldots a_my_{m-t}+ \text{residue}_t \quad (1)$$

2) The self-coupling of y is expanded by adding the lagged values of x-in:

$$y_t = a_0+a_1y_{1-t}+a_2y_{2-t}+\ldots a_my_{m-t}+b_px_{t-p}+ \text{residue}_t \quad (2)$$

For the Granger causality test, first of all, it is necessary to determine the number of lags in the models. Since the Granger causality test is based on the VAR model, first of all, the lag number should be determined according to the VAR model by using the AIC and SC criteria.

3.3. Stationarity Analysis

In order to determine the most appropriate equation to be used in the analysis of the data, it is necessary to examine whether the time series used are stationary. In other words, it is known that economic time series contain a stochastic trend, and its average can change over time. If a time series is stationary, its mean, variance and covariance do not change over time. A time series' mean, variance, and covariance remain constant over time, which is defined as weak stationarity, and covariance is also expressed as stationarity or second-order stationarity. (Darnell, 1994).

The stationary conditions of any Yt series can be summarized as follows (Gujarati, 2004):

$E(Y_t) = \mu$ the average,

$Var(Y_t) = E(Y_t-\mu)^2= \sigma^2$ variance,

$Cov(Y_t-Y_{t+k}) = Y_k$ shows the covariance.

A time series can be said to be stationary if its mean (μ), variance (σ^2) and covariance (γ_k) remain constant over time.

The Dickey-Fuller test, which is used to detect the presence of a unit root, is the most well-known test used to determine the stationarity of time series. The standard Dickey-Fuller test is based on the assumption of random and homogeneous distribution of error terms. Since the error term can sometimes be distributed as different variances or serial correlations, this test was developed to cover all cases and is called the Extended Dickey-Fuller test.

To better understand the extended Dickey–Fuller test methodology, the process can be represented as p-th-order autoregressive as follows (Patterson, 2000: 239-240):

$$yt = \alpha_0 + \alpha_1 y_{t-1} + \alpha_2 y_{t-2} + ... + \alpha_{p-1} y_{t-p+1} + \alpha_p y_{t-p} + u_t \quad (3)$$

both sides of the equation "$\alpha_p y_{t-p+1}$" added and subtracted;

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \alpha_2 y_{t-2} + ... + \alpha_{p-2} y_{t-p+2} + (\alpha_{p-1} + \alpha_p) y_{t-p+1} \alpha_p \Delta y_t -_{p+1} + u_t \quad (4)$$

equation is reached.

4. ANALYSIS AND RESULTS

While making the analysis, it has been measured whether there is a relationship between Azerbaijan's traditional energy production, renewable energy production and unemployment levels. In order for the data to yield statistically significant results, first of all, the stationarity test was performed with the help of the ADF (Augmented Dickey-Fuller) unit root test and the results are presented in Table 1.

Vertical-Fuller unit root test results regarding the levels of unit root variables in the series are shown with one percent, five percent and ten percent error margins (H_0: Series is not stationary, H_1: Series is stationary. It is not H_0-reason, we reject, it is H_1-reason, we accept).

When we examine the data, we see that all three probability values are greater than 0.05 (Renewable energy/p = 0.2639 ≥ 0.05, Traditional energy/p = 0.5754 ≥ 0.05, Unemployment/p = 0.4345 ≥ 0.05. In this case, it is seen that the null hypothesis is accepted, that is, the data are not stationary. In addition, t statistical value for Renewable energy series, |−2.051074|< Test critical values |−4.420595|, |−3.259808|, |−2.771129|, t statistical value for Traditional energy series, |−0.229293|, t-statistic value Unemployment for series, |−2.213907| is happening. In general, for the Renewable energy, Traditional energy and Unemployment series, the fact that the t statistical values are smaller than the test critical values at all significance levels indicates that the Renewable energy, Traditional energy and Unemployment series are not stationary. For this reason, we tried to take the difference of the series in order to make it stationary. When only the quadratic difference is taken, the series become stationary. For this reason, the series that became stationary by retesting are presented in Table 2.

Table 2 shows that the variables used in the study are stationary at second differences for the 2005-2015 periods (P ≤ 0.05). We can examine the stationarity of each series as follows. T statistics value for Renewable energy series |−3.352292|>Test critical values |−2.886101|, |−1.995865|, |−1.599088| is happening. When we evaluate for the traditional energy series, t statistical value |−3.871270|>Test critical values |−3.582648|, |−3.720969|, |−3.831384| is happening. When we evaluated for the Unemployment series, t statistical value |−4.772216|>Test critical values |−2.886101|, |−1.995865|, |−1.599088| is happening. The fact that the T statistical value is greater than the test critical values in absolute value at every significance level shows that the given series are stationary. It is observed that the data discussed in the tables become stationary with their second difference or they do not contain a unit root. The VAR model was established by using the level values of the variables and the appropriate lag number was determined with the help of Akaike (AIC), LL, LR, FBE, SC and HQ information criteria. The analysis results regarding the determination of the appropriate lag length are presented in Table 3.

According to Table 4, it has been revealed whether the total renewable energy production, traditional energy production and unemployment values are the cause of each other in Azerbaijan. According to the results of the analysis, the increase in renewable energy production in the country is not the reason for the increase in unemployment. In other words, renewable energy production is not the Granger cause of unemployment. As a result of the analysis, only a causality was determined between traditional energy production and renewable energy production. There is a Granger relationship between these variables (P < 0.05). In this case, we accept the H_1 hypothesis for these variables and reject the H_0 hypothesis. No causal relationship was found between the remaining data. In this case, the other variables do not cause each other, that is, the H_0 hypothesis is accepted.

After the Granger analysis, correlation analysis was performed to see in what direction and to what extent the other variable changes when one variable changes, and the results are presented in Table 5.

Table 1: Level values of series

	Renewable energy		Traditional energy		Unemployment	
	t-statistics	Possibility	t-statistics	Possibility	t-statistics	Possibility
ADF testing statistics	−2.051074	0.2639	−0.229293	0.5754	−2.213907	0.4345
Test critical values						
1%	−4.420595	−2.847250	−2.847250	−5.295384	−5.295384	
5%	−3.259808	−1.988198	−1.988198	−4.008157	−4.008157	
10%	−2.771129	−1.600140	−1.600140	−3.460791	−3.460791	

Table 2: Second difference values of series

	Renewable energy		Traditional energy		Unemployment	
	t-statistics	Possibility	t-statistics	Possibility	t-statistics	Possibility
ADF testing statistics	–3.352292	0.0045	–3.871270	0.0257	–4.772216	0.0005
Test critical values						
1%	–2.886101		–3.582648		–2.886101	
5%	–1.995865		–3.720969		–1.995865	
10%	–1.599088		–3.831384		–1.599088	

Table 3: Appropriate delay length

Lag	LogL	LR	FPE	AIC	SC	HQ
0	6.759077	NA	9.48e-05	–0.751815	–0.661040	–0.851396
1	54.25770	56.99835*	4.94e-08*	–8.451541*	–8.088438*	–8.849863*

*Indicates the appropriate lag length for the relevant test. As a result of the analysis, the most appropriate lag length was determined as one. The value with the most stars indicates the optimal delay length

Table 4: Granger causality test

H_0 (Zero hypothesis)	F-value	Probability value (p)	Decision at 5% significance level
Renewable energy generation is the cause of unemployment	1.064654	0.5872	Reject
Traditional power generation is the cause of unemployment	0.063889	0.9686	Reject
Unemployment is the cause of renewable energy production	0.667764	0.7161	Reject
Unemployment is the cause of traditional energy production	36.15732	0.0000	Acceptable
Renewable energy generation is the reason for traditional energy generation	23.21194	0.0000	Acceptable
Conventional power generation is the reason for renewable energy generation	2.567251	0.2770	Reject

Table 5: Correlation relationship

	Renewable energy	Traditional energy	Unemployment
Renewable energy	1	0.3666954845641045	–0.0535140934281792
Traditional energy	0.3666954845641045	1	–0.8940634435041705
Unemployment	–0.0535140934281792	–0.8940634435041705	1

When Table 5 is examined, a positive relationship was found between the given traditional energy production and renewable energy production. In other words, the development of one of these production sectors shows its own effect on the development of the other production sector. There is a negative relationship between unemployment rates and traditional energy production and renewable energy production. In other words, the development of these sectors causes unemployment rates to decrease. The stronger development of this relationship in the traditional energy field is due to the fact that this country is dependent on the traditional energy sector.

5. DISCUSSION AND CONCLUSION

The aim of this study is to determine the relationship between traditional energy production, renewable energy production and unemployment levels of Azerbaijan between 2005 and 2015. In order to measure whether there is a significant relationship between these variables or the effect of the relationship, the VAR model was established, and Granger causality analysis was performed. Data for analysis were obtained annually from the World Bank. During the study phase, our non-stationary data were made stationary. Then, appropriate lag lengths were determined and finally Granger causality analysis was performed. According to the results of the Granger analysis, unemployment in Azerbaijan is the cause of renewable energy production. In other words, unemployment is the Granger cause of renewable energy production. A stable causality relationship was found between renewable energy production and conventional energy production. Another causality relationship was found between conventional energy and renewable energy production. According to this result, renewable energy production is the Granger cause of traditional energy production. In other words, the opening of new production areas has its own effect on the withdrawal of unemployment rates.

According to the result of the later correlation analysis, there is a strong relationship between traditional energy production and renewable energy production in Azerbaijan, although not very strong. In other words, the country's self-development in one of these types of energy has a positive effect on its own development in the other alternative energy field. It was obtained as a result of a negative correlation between unemployment rates and traditional energy production and renewable energy production. This supports the hypotheses of the article. So, they are in a movement in the opposite direction. When we look at the correlation values, there is a strong relationship between traditional energy production and unemployment. This is due to the fact that the country generally concentrates on traditional energy production. The country's insufficient development in the field of renewable energy reflects its own impact on the direction level of the relationship between unemployment rates.

Considering that there are very few such studies on Azerbaijan in the literature, it is hoped that this study will fill the gap in this context in the literature, albeit a little.

REFERENCES

Apergis, N., Payne, J.E. (2010), Renewable energy consumption and economic growth: Evidence from a panel of OECD countries. Energy Policy, 38(1), 656-660.

Armeanu, D.Ş., Vintilă, G., Gherghina, Ş.C. (2017), Does renewable energy drive sustainable economic growth? Multivariate panel data evidence for EU-28 countries. Energies, 10(3), 381-402.

Bergmann, A., Colombo, S., Hanley, N. (2008), Rural versus urban preferences for renewable energy developments. Ecological Economics, 65(3), 616-625.

Bildirici, M.E. (2013), Economic growth and biomass energy. Biomass and Bioenergy, 50, 19-24.

Bilen, K., Ozyurt, O., Bakırcı, K., Karslı, S., Erdogan, S., Yılmaz, M., Comakli, O. (2008), Energy production, consumption, and environmental pollution for sustainable development: A case study in Turkey. Renewable and Sustainable Energy Reviews, 12(6), 1529-1561.

Blazevic, B. (2009), The role of renewable energy sources in regional tourism development. Tourism and Hospitality Management, 15(1), 25-36.

Bloch, H., Rafiq, S. Salim, R. (2012), Coal consumption, CO_2 emission and economic growth in China: Empirical evidence and policy responses. Energy Economics, 34(2), 518-528.

Bulut, C., Suleymanov, E., Vidadili, N. (2017), Transition to renewable energy and sustainable energy development in Azerbaijan. Renewable and Sustainable Energy Reviews, 80(C), 1153-1161.

Darnell, A.C. (1994), A Dictionary of Econometrics. Hartnolls Limited: Bodmin-Cornwall, England.

El Moummy, C., Salmi, Y., Baddih, H. (2021), The Role of Renewable Energy Sector in Reducing Unemployment: The Moroccan Case. In: E3S Web of Conferences, No. 234.

Gaspar, J.D., Marques, A.C., Fuinhas, J.A. (2017), The traditional energy-growth nexus: A comparison between sustainable development and economic growth approaches. Ecological Indicators, 75, 286-296.

Gujarati, D.N. (1995), Basic Econometrics. 3th ed. İstanbul: Literatür Yayıncılık.

Huang, B.N., Hwang, M.J., Yang, C.W. (2008), Causal relationship between energy consumption and GDP growth revisited: A dynamic panel data approach. Ecological Economics, 67(1), 41-54.

Kander, A., Stern, D.I. (2014), Economic growth and the transition from traditional to modern energy in Sweden. Energy Economics, 46, 56-65.

Kantola, M., Saari, A. (2013), Renewable vs. Traditional energy management solutions-A Finnish hospital facility case. Renewable Energy, 57, 539-545.

Lin, B., Moubarak, M. (2014), Renewable energy consumption-economic growth nexus for China. Renewable and Sustainable Energy Reviews, 40, 111-117.

Lise, W., Van Montfort, K. (2007), Energy consumption and GDP in Turkey: Is there a co-integration relationship? Energy Economics, 29(6), 1166-1178.

Marques, A.C., Fuinhas, J.A. (2012), Is renewable energy effective in promoting growth? Energy Policy, 46, 434-442.

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.

Ocal, O., Aslan, A. (2013), Renewable energy consumption-economic growth nexus in Turkey. Renewable and Sustainable Energy Reviews, 28, 494-499.

Ohler, A.M. (2015), Factors affecting the rise of renewable energy in the US: Concern over environmental quality or rising unemployment? The Energy Journal, 36(2), 97-115.

Ozturk, I., Acaravci, A. (2010), The causal relationship between energy consumption and GDP in Albania, Bulgaria, Hungary and Romania: Evidence from ARDL bound testing approach. Applied Energy, 87(6), 1938-1943.

Pomeranz, K., Lee, S. (2001), The great divergence: Europe, China and the making of the modern world economy. International Journal, 56(4), 703.

Rafiq, S., Salim, R., Sgro, P.M. (2018), Energy, unemployment and trade. Applied Economics, 50(47), 5122-5134.

Sadorsky, P. (2009), Renewable energy consumption and income in emerging economies. Energy policy, 37(10), 4021-4028.

Salim, R.A., Hassan, K., Shafiei, S. (2014), Renewable and non-renewable energy consumption and economic activities: Further evidence from OECD countries. Energy Economics, 44, 350-360.

Sebri, M. (2015), Use renewables to be cleaner: Meta-analysis of the renewable energy consumption-economic growth nexus. Renewable and Sustainable Energy Reviews, 42, 657-665.

Sebri, M., Ben-Salha, O. (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.

Smolović, J.C., Muhadinović, M., Radonjić, M., Đurašković, J. (2020), How does renewable energy consumption affect economic growth in the traditional and new member states of the European Union? Energy Reports, 6, 505-513.

Terrapon-Pfaff, J., Dienst, C., König, J., Ortiz, W. (2014), A cross-sectional review: Impacts and sustainability of small-scale renewable energy projects in developing countries. Renewable and Sustainable Energy Reviews, 40, 1-10.

Tugcu, C.T., Ozturk, I., Aslan, A. (2012), Renewable and non-renewable energy consumption and economic growth relationship revisited: Evidence from G7 countries. Energy economics, 34(6), 1942-1950.

Wei, M., Patadia, S., Kammen, D.M. (2010), Putting renewables and energy efficiency to work: How many jobs can the clean energy industry generate in the US? Energy Policy, 38(2), 919-931.

Yesevi, C.G., Tiftikcigil, B.Y. (2015), Turkey-Azerbaijan energy relations: A political and economic analysis. International Journal of Energy Economics and Policy, 5(1), 27-44.

Yilanci, V., İslamoğlu, E., Yildirimalp, S., Candan, G. (2020), The relationship between unemployment rates and renewable energy consumption: Evidence from fourier ADL cointegration test. Alphanumeric Journal, 8(1), 17-28.